Abstract Book

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TABLE OF CONTENTS

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Wednesday, May 6, 2026

Plenary 1

8:30 AM – 10:15 AM

1

A NOVEL LUMINAL SPRING APPROACH TO APPLY MECHANICAL STRAIN TO INNERVATED HUMAN INTESTINAL ORGANOIDS

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Abstract: Purpose: During embryogenesis, circular smooth muscle contractions generate longitudinal strain on nascent intestine. These forces are critical for enteric nervous system (ENS) development and patterning. While innervated human intestinal organoids (HIOs) model small intestinal development, their ENS lacks the structural complexity of native intestine. Current HIO culture conditions are largely static, replicating biochemical cues but neglecting the biomechanical forces of normal intestinal morphogenesis. We applied a novel luminal spring approach to model in vivo mechanical strain in innervated HIOs, aiming to create a more physiologic environment for ENS development.

Methods: HIOs and ENS precursors generated from human embryonic stem cells were co-cultured for 28-40 days before transplantation (tHIO+ENS) beneath the kidney capsule of immunodeficient mice. After 12 weeks of engraftment (Figure 1A), a second procedure inserted a gelatin-encapsulated nitinol spring (free length=12mm, force=0.92 N/m; Figure 1B) into the lumen of the tHIO+ENS (Figure 1C). The resulting tHIO+ENS+strain (Figure 1D) was harvested 2 weeks after spring implantation, pinned flat, and fixed. Neurons and glia were immunostained using HuC/D and S100β, respectively. Tissues were cleared, mounted, and imaged by confocal microscopy (20x, 1μm Z increments). Neurons and glia from 2 ganglion-like structures were counted in Image J. Volumes of the ganglion-like structures were determined using Imaris. The mean±SEM of neurons, glia, and neuron/glia ratio were calculated.

Results: tHIO+ENS+strain survived spring implantation and displayed organized ganglion-like structures after 14 weeks of total engraftment. Neurons and glia persisted following 2 weeks of luminal strain, enabling 3D volumetric analysis and quantification of ganglion-like structures (Figure 1E). Ganglion-like structures within tHIO+ENS+strain contained 11,312,830±1,645,286 neurons and 9,439,994±1,404,633 glia, for a neuron-to-glia ratio of 1.2 (Figure 1F).

Conclusions: This project demonstrates the feasibility of using intraluminal springs to introduce mechanical strain into innervated HIOs after engraftment. Additionally, 3D volumetric analysis

and objective ENS quantification were successful in in tHIO+ENS+strain. This approach establishes a novel approach for studying the role of biomechanical forces during ENS spatial and cellular development within HIOs. Future studies will compare ENS cell density, neuronal subtype composition, and synaptic organization in strain-conditioned versus static HIOs to assess whether biomechanical forces enhance ENS maturation.

Abbreviations: ENS - enteric nervous system
HIO - human intestinal organoids
tHIO - transplanted HIO

2

RECURRENT SMALL BOWEL OBSTRUCTION FOLLOWING CONTRAST CHALLENGE VERSUS SURGICAL INTERVENTION AT INDEX PRESENTATION: 1-YEAR FOLLOW-UP OF THE ADHESIVE BOWEL OBSTRUCTION IN CHILDREN (ABC) STUDY

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Abstract: Purpose: While literature on the utility of contrast challenge (CC) in pediatric adhesive small bowel obstruction (ABSO) is growing, long-term outcomes have not been reported. This study assesses the incidence of recurrence after CC vs surgical intervention one-year after index admission for ABSO.

Methods: This is the planned 1-year follow up of a multi-institutional prospective implementation study of a standardized CC algorithm in children (< 18years) admitted with ASBO (10/2021-09/2024) who qualified for initial non-operative management. Patients requiring urgent or emergent surgery at presentation were not included in this study. Patients were followed for 1 year after index admission for recurrence (defined as readmission for ASBO). Nonparametric tests were performed to compare groups.

Results: Of the 264 patients enrolled, 1-year follow-up data were available for 262 patients (99%). Two patients were deceased unrelated to ASBO; neither received contrast for ASBO management. Within 1 year, 36 patients (14%) were admitted for recurrent ASBO, 19 (53%) of which underwent surgery (Table 1). There was no difference in 1-year recurrence rates between those who initially received a CC and those who did not receive one (14% CC vs 14% no CC; p>0.99). Receiving a CC did not increase the need for surgery at the time of recurrence (50% CC vs 60% no CC; p=0.72). Proceeding to surgery at index admission was not associated with a decrease in recurrence (12% surgery vs 15% no surgery; p=0.58) nor need for surgery at recurrence (73% previous surgery vs 44% no previous surgery; p=0.16). Undergoing a CC for recurrence was not associated with increased surgical intervention (55% CC vs 50% no CC; p>0.99).

Conclusion: In the largest, prospective pediatric ASBO study to date, we found that the rate of recurrence at 1 year was less than 15%. The utilization of a contrast challenge did not increase the rates of recurrence or surgery at 1 year. Additionally, surgery during index admission did

not decrease the rate of recurrence or need for surgery at 1 year. Therefore, avoidance of surgical intervention through use of a contrast challenge at presentation or for recurrence is a safe treatment option for children.

Abbreviations: ASBO - Adhesive small bowel obstruction
CC - Contrast Challenge

	1-year Recurrence	p-value	Surgery for Recurrence	p-value
Index Admission				
Contrast Challenge				
Yes (189)	26 (14%)	>0.99	13 (50%)	0.72
No (73)	10 (14%)		6 (60%)	
Surgery for Index ASBO				
Yes (95)	11 (12%)	0.58	8 (73%)	0.16
No (167)	25 (15%)		11 (44%)	
Subsequent Admission				
Contrast Challenge				
Yes (22)			12 (55%)	>0.99
No (14)			7 (50%)	

3

NONOPERATIVE MANAGEMENT OF PRENATALLY DIAGNOSED CONGENITAL PULMONARY AIRWAY MALFORMATIONS AT MAJOR CHILDREN'S HOSPITALS IN THE UNITED STATES

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Abstract: Introduction:
The natural history and complication rate of asymptomatic congenital pulmonary airway malformations (CPAM) is poorly defined, resulting in varying management strategies. This study aimed to evaluate the prevalence of nonoperative management for asymptomatic CPAMs among major children's hospitals and to identify patient factors associated with a nonoperative management strategy.

Methods:
An IRB-approved retrospective cohort study was conducted across 18 major U.S. children's hospitals (2016-2024). Asymptomatic children with a prenatally diagnosed lesion, subsequently identified as a CPAM by postnatal CT scan during infancy, were included. Patients who underwent neonatal resection or required neonatal ventilation were excluded. Nonoperative management was defined as no resection performed by 12 months of age. Statistical analyses were performed using Chi-square analysis, Mann-Whitney U test, and ANOVA, as appropriate ($p < 0.05$).

Results:
Among 1,772 CLM cases, 480 (27.1%) patients met inclusion criteria. Of those, 108 (22.5%) patients underwent initial nonoperative management across 16 (88.9%) institutions. The median age at initial CT scan was 4.1 months in the nonoperative group, compared to 2.8 months in those managed operatively ($p < 0.001$). Nonoperative cases were more likely to have microcystic disease (40.0% vs. 20.2%; $p = 0.006$), were associated with smaller maximum CPAM volume ratios (0.43 cm2, IQR 0.23 – 0.76 vs. 0.70 cm2, IQR 0.36 -1.35; $p < 0.001$), and had smaller initial CT lesion volumes (11.0 cm3, IQR 4.3 – 22.5 vs. 20.3 cm3, IQR 7.4 – 45.6; $p = 0.001$). Forty-seven (43.5%) patients who were initially managed nonoperatively converted to operative resection at a median age of 1.3 years (IQR 1.12 – 2.38; $p < 0.001$). However, symptomatic disease accounted for only 12.5% of conversion. Six patients who required conversion to resection developed preoperative pneumonia.

Conclusion:
In this multicenter cohort study, 23% of infants with asymptomatic, prenatally diagnosed CPAMs did not undergo operative management during the first 12 months of life. While conversion rates to operative intervention are high, only a small subset of these patients became symptomatic. Smaller, microcystic CPAMs are associated with non-operative management. Long-term prospective studies are needed to better understand the natural history and conversion rates to operative management in this patient population.

Abbreviations: Congenital pulmonary airway malformation (CPAM)
Congenital lung malformation (CLM)

4

ENDOLUMINAL VACUUM-ASSISTED CLOSURE FOR PEDIATRIC ESOPHAGEAL LEAKS: OUTCOMES AND FACTORS ASSOCIATED WITH CLINICAL SUCCESS

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Abstract: Purpose:
The management of esophageal leaks in children remains challenging, and "conservative" strategies rely on withholding oral intake, chest drainage, and prolonged observation. Endoluminal vacuum-assisted closure (EVAC) has emerged as a minimally invasive, active approach to leak management that may accelerate healing while avoiding surgery. We evaluated factors associated with EVAC success.

Methods:
Retrospective single-center review of children treated with EVAC for esophageal leaks (2019–2025). Clinical, procedural, and EVAC therapy data were collected. EVAC success was defined as leak resolution without surgical intervention. Descriptive statistics were generated, and logistic regression assessed predictors of success.

Results:
Thirty children (43% female) underwent EVAC therapy for an esophageal leak. Median age was 1.2 years (IQR 0.5–1.9; range, 5 weeks-18 years). Leak etiologies: post-endoscopic therapy (43%), anastomotic leak (43%), delayed ischemia after mobilization (10%), and foreign body related (3.3%).
Median (IQR) time to EVAC for surgical leaks was 11 days (9–15) after anastomosis and 8 hours (0–19) after leak detection. Most (55%) EVACs were placed retrograde via gastrostomy. Median time to leak resolution was 11 days (IQR 6–14), with a median of 2 (IQR 1-3) EVACs exchanges every 4 days (IQR 3.8–7.0). With EVAC therapy, most leaks (77%) were managed without a chest tube, and most children (63%) continued enteral feeds via threaded gastro-jejunostomy tubes.
Overall EVAC success was 80%. Early EVAC placement was associated with improved success: most endoscopic perforations were treated immediately (85%) and achieved 92% success, whereas delayed placement (n=4, >24h after leak detection) showed lower success (14%, p=0.06). EVAC success for anastomotic leaks was 69%. Long-term, 46% of surgical and 46% of endoscopic leaks developed refractory strictures requiring resection. No EVAC-specific adverse events were encountered.

Conclusion:
EVAC is a safe, effective, and proactive strategy for pediatric esophageal leaks. Early initiation, ideally within 24 hours of leak detection, was associated with the highest success, with most children recovering in under two weeks, often without chest tubes and while continuing enteral feeds. These outcomes contrast with the traditional "conservative" approach of prolonged drainage and fasting, suggesting that EVAC represents an active paradigm of non-operative leak management.

Abbreviations: EVAC – Endoluminal Vacuum-Assisted Closure; IQR – Interquartile Range

5

A NATIONAL ASSESSMENT OF THE PEDIATRIC SURGERY WORKFORCE AND PRACTICE STRUCTURE IN THE UNITED STATES

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Abstract: Purpose: Pediatric general surgeons provide vital specialized care for children, yet the geographic distribution and resources of practices have not been well-characterized previously. This study describes the current structure of pediatric surgical practices in the U.S., with a focus on workforce composition and care delivery.

Methods: The APSA membership directory was used to identify U.S. pediatric surgery practices. Each was contacted to obtain data on surgeon composition, use of locum tenens (LT), use of advanced practice providers (APPs), and the number of hospitals, clinics, consultation sites, and operating rooms covered as of July 31, 2025. Service locations were catalogued by zip code. Descriptive statistics and the number of children per surgeon by state were calculated using population data from the 2020 U.S. Census. Data are presented as median [interquartile range].

Results: A total of 248 practices employing 1,191 surgeons were identified across 49 states and the District of Columbia (D.C.), with none in Wyoming. States with the most surgeons were Texas (n=123), California (n=114), and Florida (n=81), while the fewest were in Mississippi and Montana (2 each). Fifteen (6%) practices deliver care across multiple states. Of all states and D.C., 26 (51.0%) had the expected ratio of surgeons to children, 15 (29.4%) had a lower-than-

expected ratio, and 10 (19.6%) had a higher-than-expected ratio. A visual comparison of the expected versus observed pediatric surgeon-to-pediatric population ratio across U.S. states is shown in Figure 1. The median group size was 3.5 [2.0-6.0] surgeons. APPs were employed in 79% of practices, with 67.8% having 1–4 APPs and 20.0% having 5–9. LT was used in 24% of practices. The median number of associated coverage locations included 1.0 [1.0-2.0] hospitals, 2.0 [1.0-4.0] clinics, 1.0 [1.0-2.0] consultation sites, and 2.0 [1.0-3.0] operating sites.

Conclusion: Pediatric surgical practices in the U.S. vary in size, resources, and geographic distribution. Most rely on APPs, and nearly one-quarter depend on locum tenens for coverage. Child-to-surgeon ratios range broadly at state levels, underscoring care access disparities. This novel workforce assessment provides critical data for workforce planning, policy initiatives, and efforts to improve equitable access to surgical care for children.

Abbreviations: Locum tenens (LT); Advanced Practice Providers (APPs); District of Columbia (D.C.), United States (U.S.)

6

SPATIAL TRANSCRIPTOMICS OF FETAL CDH LUNGS UNCOVERS CSF1R+ MACROPHAGES AS DRIVERS OF PULMONARY HYPOPLASIA.

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Abstract: Purpose: The pathogenesis of pulmonary hypoplasia secondary to congenital diaphragmatic hernia (CDH) remains elusive. Recent studies have shown that hypoplastic lungs in both human and experimental CDH exhibit an inflammatory profile characterized by macrophage enrichment. However, the specific contribution of macrophages to CDH-associated lung underdevelopment remains undefined. Herein, we applied spatial transcriptomics (ST), a novel approach never adopted to interrogate fetal CDH lungs, to delineate region-specific transcriptional changes in naïve and macrophage-deficient mouse fetuses with CDH.
Methods: Following ethical approval (IACUC#64247), B6.Cg-Csf1rtm1.1Jwp/J dams were fed with nitrofen+bisdiamine to induce CDH or olive oil only (control) at embryonic day (E) 8.5 (Figure 1a). Lungs of homozygous knock-out or wild-type fetuses were harvested at E18.5 and analyzed via ST. The R packages Seurat, Scanpro, and DESeq2 (Pseudo-bulk approach) were used for cell clustering and annotation, cell proportion assessment, and differential gene expression analysis, respectively. Hematoxylin and eosin staining was performed to verify anatomical niches within the fetal lung sections.
Results: ST analysis identified four main lung cell lineages (epithelial, mesenchymal, endothelial, immune), corresponding to 19 unique cell clusters (Figure 1b-c). Cell proportion analysis revealed that naïve mice with CDH had a higher number of transitional AT1/AT2 cells and proliferating general capillaries and fewer alveolar capillaries compared to normal controls. Conversely, macrophage-deficient mice with CDH had no significant changes in cellular proportions relative to controls (Figure 1d). Differential gene expression analysis revealed that, compared with naïve controls, naïve CDH lungs showed dysregulation of genes critical for epithelial (e.g., Pdpn, Sox9, and Tgfb2), mesenchymal (e.g., Wt1, Tgfb3, and Csf1r), and endothelial (e.g., Vegfa, Nos2, and Nos3) development (Figure 1e). Interestingly, more than two-thirds of these genes were either unchanged or inversely regulated in macrophage-deficient CDH lungs, implicating macrophages as key modulators of the transcriptional response driving pulmonary hypoplasia.
Conclusion: This study shows unprecedented evidence for the detrimental role of macrophages in the pathogenesis of experimental fetal pulmonary hypoplasia secondary to CDH. Ablation of macrophages mitigates key cellular alterations observed in naïve CDH lungs. These findings identify macrophage modulation as a potential therapeutic strategy to rescue lung development in CDH.

Abbreviations:

7

METABOLIC AND MITOCHONDRIAL DYSFUNCTIONS CHARACTERIZE EPITHELIAL INJURY IN EXPERIMENTAL NECROTIZING ENTEROCOLITIS

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Abstract: Purpose: Necrotizing enterocolitis (NEC) is a severe gastrointestinal emergency primarily affecting premature neonates. NEC is characterized by acute inflammation, epithelial necrosis, and impaired intestinal regeneration. Yet, the metabolic underpinnings of these pathological features remain incompletely defined. The epithelium relies heavily on tightly coordinated metabolic programs to sustain barrier integrity, mucosal homeostasis, and regenerative capacity. To address metabolic dysregulation as a potential driver of NEC pathology, we investigated the cell-type-specific metabolic landscape of NEC at single-cell resolution.
Methods: NEC was induced on postnatal day (P) 5-9 mouse pups using intermittent hypoxia, gavage feeding with formula, and lipopolysaccharide, with breastfed pups used as controls. Intestinal tissues were evaluated upon sacrifice at P9 for histological assessment and single-nuclei RNA sequencing (snRNA-seq) for transcriptomic analysis. Metabolic alterations in the NEC intestine were assessed using curated databases of metabolic pathways, mitochondrial genes, as well as a genome-scale metabolic model.
Results: Single-cell transcriptomic analysis revealed a global reduction of metabolic activity in NEC, with the epithelial population showing the most profound dysregulation. Pathway analysis highlights suppression of energy metabolism, nitrogen and amino acid metabolism, and glycan biosynthesis (Figure A). Within epithelial cells, a substantial subset of differentially expressed genes encoded mitochondrial proteins, which were predominantly downregulated, suggesting mitochondrial dysfunction (Figure B). Immunostaining confirmed epithelial accumulation of 4-hydroxynonenal (4-HNE), indicative of oxidative stress potentially arising from mitochondrial electron transport defects (Figure C). Reporter metabolite analysis identified downregulation of metabolic intermediates critical for cellular bioenergetics and biosynthesis, including CoA, NADH, amino acids, and glycosaminoglycans in epithelial cells (Figure D). Cell-type-resolved analysis revealed that intestinal stem cells, transit-amplifying cells, and enterocytes exhibited the most profound metabolic impairment of mitochondrial bioenergetic and biosynthetic functions (Figure E).
Conclusion: These findings establish mitochondrial and metabolic dysfunction as central features of NEC pathology, highlighting the metabolic vulnerability of intestinal epithelial cells. The coordinated suppression of bioenergetic and biosynthetic pathways, together with oxidative damage, defines a state of metabolic distress that potentially undermines intestinal regeneration. Our study reveals a mitochondrial collapse in NEC and suggests epithelial metabolism as a potential therapeutic target.

Abbreviations: NEC: Necrotizing enterocolitis
P: Postnatal day
snRNA-seq: Single-nuclei RNA sequencing
4-HNE: 4-hydroxynonenal
CoA: Coenzyme A
NADH: Nicotinamide adenine dinucleotide + hydrogen

8

RISK FOR METACHRONOUS TUMORS AND RENAL INSUFFICIENCY IN CASES OF SPORADIC, UNILATERAL, MULTICENTRIC WILMS TUMOR

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Abstract: Purpose: Presentation with or predisposition to bilateral Wilms tumor ("Predisposed-Bilateral-WT") poses unique challenges in balancing oncologic outcomes with kidney preservation. For children with Predisposed-Bilateral-WT, neoadjuvant chemotherapy and nephron-sparing surgery (NSS) represent the standard of care. However, for sporadic, unilateral but multicentric WT ("Sporadic-Multicentric-WT"), optimal treatment remains controversial given uncertain risks for metachronous tumors and subsequent renal insufficiency. The aim of this study was to compare rates of metachronous tumors and renal insufficiency among children with WT.

Methods: A research collaborative comprising 14 institutions analyzed oncologic outcomes and the development of renal insufficiency between Sporadic-Multicentric-WT, Predisposed-Bilateral-WT and sporadic, unilateral, unicentric WT ("Sporadic-Unicentric-WT") groups. Descriptive statistics were performed for standard patient and disease characteristics. Categorical and continuous variables were evaluated using Pearson's Chi-Squared and Kruskal-Wallis tests. Four-year and actuarial metachronous-free, relapse-free, and overall survival analyses were completed applying Kaplan-Meier methods.

Results: This cohort (n=1200; age < 18y) comprised 874 (72.8%) Sporadic-Unicentric-WT, 251 (20.9%) Predisposed-Bilateral-WT, and 75 (6.3%) Sporadic-Multicentric-WT. No difference emerged between groups regarding sex (56% female, p=0.26) or race (63% white, 19.3% black; p=0.24). Predisposed-Bilateral-WT presented at younger median age (26 [13-44] months) than Sporadic-Unicentric-WT (41 [24-65] months) and Sporadic-Multicentric-WT (46 [32-62] months; p< 0.001). NSS was performed in 51.6% of Predisposed-Bilateral-WT, 8.0% of Sporadic-Multicentric-WT, and 1.5% of Sporadic-Unicentric-WT (p < 0.001). Unfavorable histology (UH) occurred similarly between Predisposed-Bilateral-WT (13.3%) and Sporadic-Multicentric-WT (12.0%), compared to Sporadic-Unicentric-WT (7.3%; p=0.011). Sporadic-Multicentric-WT and Sporadic-Unicentric-WT showed similar frequencies of lymph node involvement, positive margins, and tumor spill. Nephrogenic rests were present in 72% of Predisposed-Bilateral-WT, 56% of Sporadic-Multicentric-WT, and 21.9% of Sporadic-Unicentric-WT (p < 0.001). Eight patients with Predisposed-Bilateral-WT (3.3%) developed metachronous tumors relative to none with Sporadic-Multicentric-WT (p < 0.001). Further, patients with Predisposed-Bilateral-WT showed reduced metachronous-free (p < 0.0001), relapse-free (p=0.0078), and overall survival (p=0.0003; Figure 1a-c), and increased need for dialysis (6.6%; p< 0.001) and kidney transplant (4.5%; p=0.016; Figure 1d).

Conclusion: Sporadic-Multicentric-WT showed increased incidences of nephrogenic rests, UH, and relapse rates relative to Sporadic-Unicentric-WT. Further, no patients with Sporadic-Multicentric-WT developed metachronous tumors or significant risk for renal insufficiency as observed with Predisposed-Bilateral-WT. Taken together, optimal therapy for patients with Sporadic-Multicentric-WT should include upfront total nephrectomy when feasible without prioritizing NSS strategies.

Abbreviations: WT, Wilms Tumor
NSS, nephron-sparing surgery

UH, unfavorable histology

9

MISSED OPPORTUNITIES IN PEDIATRIC ONCOFERTILITY CARE: A MULTICENTER RETROSPECTIVE ANALYSIS OF FERTILITY PRESERVATION PRACTICES FOR CHILDREN AT HIGH-RISK OF TREATMENT-RELATED INFERTILITY

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Abstract: Purpose: Fertility loss is a significant potential consequence of cancer treatment in children with extracranial solid tumors (ECSTs). Despite guidelines advocating for pre-treatment oncofertility counseling and presentation of fertility preservation options, data on pediatric oncofertility care remains limited. This study investigates current clinical practices surrounding oncofertility consultation and fertility preservation for children with ECSTs at high-risk of treatment-related infertility.

Methods: A retrospective multicenter study was conducted across 34 North American hospitals participating in a research consortium. Patients (ages 0–21 years) newly diagnosed with Ewing sarcoma, high-risk neuroblastoma, or rhabdomyosarcoma between 2020 and 2022 were included. Treatment regimens for these ECST patients are associated with the highest risk of infertility due to gonadotoxic therapy, therefore qualifying patients for fertility preservation. Categorical variables were analyzed using chi-squared or Fisher's exact tests (α=0.05).

Results: A total of 926 patients with ECSTs were included: Ewing sarcoma (n=298), high-risk neuroblastoma (n=296), and rhabdomyosarcoma (n=332). Of these, 352 patients (38.0%) received an oncofertility consultation. Patients with Ewing sarcoma were more likely to receive fertility counseling than those with high-risk neuroblastoma and rhabdomyosarcoma (38.6% vs 25.9% vs 35.5%, respectively; $p< 0.001$). Patients who received counseling were more likely to be older at diagnosis (124.5 months vs 70.5 months; $p< 0.001$), White (72.7% vs 62.4%; $p=0.039$), and privately insured (59.7% vs 51.4%; $p = 0.018$). Among those counseled, 172 patients (48.8%) underwent fertility preservation. Figure 1 demonstrates institutional rates of oncofertility counseling (1a) and fertility preservation procedures (1b) for children with ECSTs at high-risk for treatment-related infertility.

Conclusion: Despite established guidelines, oncofertility counseling and fertility preservation remain inconsistently delivered to young patients with ECSTs at high-risk for treatment-related infertility. There is significant institutional variability in oncofertility counseling and fertility preservation procedures. These findings underscore the need for standardized pediatric oncofertility care to ensure timely and inclusive fertility preservation for all at-risk patients.

Abbreviations: extracranial solid tumors (ECSTs)

10

PAN-RAS INHIBITOR CAN DECREASE TUMOR GROWTH IN NEUROBLASTOMA WITH WILD-TYPE OR MUTANT RAS

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Abstract: Purpose:
Despite low incidence of RAS mutations in neuroblastoma, elevated RAS activity is emerging as critical for tumorigenesis due to mutations in upstream activators of RAS or loss-of-function mutations in negative regulators. It was previously demonstrated that inhibition of H-RAS and K-RAS-mediated signaling using RAS monobody, NS1 delayed tumor formation. We hypothesized that treatment with pan-RAS inhibitor RMC-7977 that targets the GTP-bound state of all RAS isoforms and interferes with effector engagement could decrease tumor growth.

Methods:
Two neuroblastoma cell lines with different RAS mutational status, SKNFI (N-Myc non amplified, wild-type H-, N-, K-RAS) and NB-EBc-1 [N-Myc non-amplified, wild-type H, N-RAS, mutant K-RAS (G12D)] were cultured, and the effect of RMC-7977 (100nM) on their in vitro growth was determined by proliferation assay. Western blot was performed to determine ERK activation after the cells were treated with increasing concentration of RMC-7977. 106 neuroblastoma cells were injected into the left adrenal gland of immunocompromised mice to generate orthotopic xenografts which were then treated with RMC-7977 (10mg/kg, 5x/week) by oral gavage when tumor was >10mm3. Mouse tumor sizes were measured by bi-weekly ultrasound, and mice were euthanized when tumors reached >1000 mm3 or after 40 days of treatment. Data were analyzed with t-test or log-rank test; $p< 0.05$ was considered statistically significant.

Results:
SKNFI and NB-EBc-1 cells had decreased proliferation after RMC-7977 treatment compared to controls (FigA). RMC-7977 also decreased ERK activation (pERK level) in SKNFI (10nM) and NB-EBc-1 (5nM) despite different RAS mutational status in a dose-dependent manner (FigB). Orthotopic SKNFI and NB-EBc1 xenografts had decreased tumor growth when treated with RMC-7977 (FigC,E) compared to those treated with control vehicle ($p < 0.05$). Mice bearing SKNFI or NB-EBc-1 tumors had longer survival with RMC-7977 treatment compared to those with control vehicle (FigD,F) ($p < 0.05$).

Conclusion:
Pan-RAS inhibitor RMC-7977 decreased the cell proliferation in vitro and tumor growth in vivo in neuroblastoma cell lines with either wild-type or mutant RAS. RAS inhibition is a potential therapeutic approach in neuroblastoma, especially in N-Myc non-amplified tumors.

Abbreviations:

Scientific Session 1: General Pediatric Surgery

3:00 PM – 4:30 PM

S1

DISENTANGLING FEEDING PRACTICES FROM SOCIOECONOMIC FACTORS IN PYLORIC STENOSIS RISK

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Abstract: Purpose

The incidence of hypertrophic pyloric stenosis (HPS) appears to be declining. Although the etiology remains unknown, it is thought to be associated with genetic and environmental factors. The purpose of this study is to investigate risk factors for HPS and trend the annual incidence during a recent 12-year period.

Methods

We identified 735 patients who underwent pyloromyotomy at a high-volume children's hospital between 2012 and 2025. These patients were matched 1:1 by sex, gestational age, age (within 0.1 years), race, and ethnicity with 735 controls from the general pediatrics clinic at the same institution during the same timeframe. Patients with gastrointestinal co-morbidities including congenital diseases or the use of an enteral feeding tube were excluded. A linear regression model of HPS cases per year as well as univariate and multivariate analyses of predictors of HPS were implemented.

Results

A linear regression model of HPS cases from 2013 to 2024 showed an annual average decrease of 4 cases per year (slope = -4.1, 95% CI: -6.30, -1.9, R2=0.63, p=0.002). Univariate analysis of risk factors revealed formula feeding (OR 11.8, 95% CI 8.57-15.7, p< 0.001), maternal tobacco use (OR 9.92, 95% CI 3.49-41, p< 0.001), family history of HPS (OR 35.9, 95% CI 11.2-219, p< 0.001), and public medical insurance (OR 1.62, 95% CI 1.3-2.01, p< 0.001) were associated with HPS. Patients who were fed a combination of breastmilk and formula did not have a greater risk of HPS (OR 0.88, 95% CI 0.66-1.17, p=0.4). On multivariate analysis, formula feeding, maternal tobacco use, and family history of HPS remained significant (p < 0.001, p=0.003, p< 0.001), however, public insurance was no longer significant (p=0.2).

Conclusions

Formula feeding, maternal tobacco use, and a family history of HPS were associated with pyloric stenosis with large effect size compared to previously published research. Our results further suggest that adding breast milk to formula might be protective. The decline in incidence of HPS is likely multifactorial and requires further investigation.

Abbreviations: HPS = hypertrophic pyloric stenosis

	Descriptives		Univariate		Multivariate	
Characteristic	Control N = 735[1]	PS N = 735[1]	**OR (CI)[2]**	**p-value**	**OR (CI)[2]**	**p-value**
Insurance						
Private	522 (71%)	444 (60%)				
Public	213 (29%)	290 (39%)	1.62 (1.30, 2.01)	<0.001	1.21 (0.92, 1.58)	0.2
Self-Pay	0 (0%)	1 (0.1%)				
Family History of PS						
Yes	2 (0.3%)	64 (8.7%)	35.9 (11.2, 219)	<0.001	32.2 (9.61, 200)	<0.001
No	733 (100%)	671 (91%)				
Maternal Smoking						
Yes	3 (0.4%)	29 (4%)	9.92 (3.49, 41.6)	<0.001	7.07 (2.16, 31.9)	0.003
No	732 (100%)	690 (96%)				
Unknown	0	16				
Feeding						
Breastfeeding	302 (41%)	133 (18%)				
Formula	92 (13%)	470 (64%)	11.6 (8.57, 15.7)	<0.001	11.2 (8.23, 15.4)	<0.001
Both	341 (46%)	131 (18%)	0.88 (0.66, 1.17)	0.4	0.88 (0.65, 1.19)	0.4
Unknown	0	1				

[1] n (%)

[2] OR = Odds Ratio, CI = Confidence Interval

S2

A MULTICENTER STUDY OF MALROTATION: EVALUATION OF PREOPERATIVE ULTRASOUND AND REOPERATION RATES FOR VOLVULUS AND SMALL BOWEL OBSTRUCTION

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Abstract: PURPOSE
While upper gastrointestinal (UGI) contrast study remains the diagnostic gold standard for malrotation, many centers are utilizing abdominal ultrasound to diagnose malrotation ± volvulus. We sought to describe the use of preoperative ultrasound in patients who underwent Ladd's procedure for malrotation.

METHODS
Multicenter retrospective review of patients ≤15 years who underwent a Ladd's procedure between January 2014 and September 2021 across 10 US pediatric hospitals was conducted. Only patients with a preoperative abdominal ultrasound were included. Data collected included patient demographics, clinical characteristics, preoperative imaging findings and intraoperative findings. Descriptive statistics were used to summarize our findings.

RESULTS
Among 697 patients who underwent Ladd's, 126 patients (18.1%) had a pre-operative abdominal ultrasound. Most patients with preoperative abdominal ultrasound were neonates (38.1%) or infants (35.7%), with a median age of 2.1 months [IQR 0.4, 12.0] and median weight

of 4.4 kg [IQR 3.4, 9.1]. The median gestational age of all patients was 38.0 weeks [IQR 37.0, 39.0], and 17.5% of patients were born premature (< 38 weeks). The majority were male (53.2%), white (54.0%) and non-Hispanic/Latino (62.7%). Bilious emesis was the most common preoperative symptom (38.9%). Malrotation ± volvulus was diagnosed in 60/126 (47.6%) ultrasounds. Ultrasound detected volvulus in 28 of the 53 (52.8%) patients found to have volvulus intraoperatively. Among patients diagnosed with malrotation ± volvulus on ultrasound, ultrasound demonstrated transposition of the superior mesenteric vessels in 88.3%, lack of blood flow in one or both superior mesenteric vessels in 20.0%, swirling of the superior mesenteric vessels in 46.7%, and intraperitoneal D3 segment of the duodenum in 18.3%. Ultrasounds that were diagnostic for malrotation ± volvulus documented a significantly higher mean number of key anatomical elements compared to non-diagnostic ultrasounds [2.2/4 (SD±1.1) vs. 0.9/4 (SD±1.4), p< 0.001]. Documentation of key anatomical elements for midgut rotation is reported in Table 1.

CONCLUSION

Ultrasound is a useful diagnostic modality for malrotation ± volvulus. However, more than half of patients with malrotation had nondiagnostic studies. Systematically documenting key anatomic elements of midgut rotation is critical in improving diagnostic accuracy in ultrasound for malrotation.

Abbreviations: UGI: upper gastrointestinal study
US: United States
IQR: interquartile range

Table 1: Comparison of Documented Anatomical Elements of Midgut Rotation on Ultrasound

Anatomical Elements	Documented in Ultrasound Report N=126	Documented in Diagnostic Ultrasound N=60	Documented in Non-Diagnostic Ultrasound N=66	*p-value*
Orientation of superior mesenteric vessels	73 (57.9%)	53 (88.3%)	20 (30.3%)	<0.001
Blood flow in superior mesenteric vessels	37 (29.4%)	23 (38.3%)	14 (21.2%)	0.035
Whether swirling of superior mesenteric vessels was present	54 (42.9%)	40 (66.7%)	14 (21.2%)	<0.001
Position of D3 segment of duodenum	24 (19.0%)	14 (23.3%)	10 (15.2%)	0.243

S3

NATIONAL TRENDS IN THE MANAGEMENT AND OUTCOMES OF INGUINAL HERNIAS IN PREMATURE INFANTS

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Abstract: Background:
The optimal timing of inguinal hernia repair in premature infants has been extensively evaluated. A recent randomized trial found that repair after 55 weeks postmenstrual age (PMA) was associated with a lower likelihood for an adverse event compared with NICU repair and an incarceration incidence of only 4%. We hypothesized that national practice has evolved toward outpatient repair, but the incidence of incarceration has increased without the routine NICU surgical evaluation inherent in a study protocol.
Methods:
The Pediatric Health Information System database was searched for infants born at less than 37 weeks gestational age between January, 2017 and December, 2024 who were diagnosed with an inguinal hernia. The PMA at repair was recorded. Incidences of incarceration, incarceration with gangrene, and recurrent hernia for each year of the study period were identified based on ICD-10 codes. Variation in practice by hospital and temporal trends in operative timing and complications were evaluated.
Results:
An inguinal hernia was diagnosed in 6803 patients. Among 5321 who were operated on in the first year of life, the proportion of repairs done as an outpatient increased steadily between 2017-2020 (53%) and 2020-2024 (60%)($p < .001$) (Figure) and the corresponding occurence of hernia repair prior to 45 weeks PMA decreased from 39% to 32% ($p < .001$). An incarcerated hernia was identified significantly more frequently in recent years (5.4% in 2017-2020 vs 7.2% in 2021-2024, $p = .008$), although only six cases of incarceration with gangrene were reported—all in the last four years of the series. The incidence of recurrent inguinal hernia did not vary over the study period (4.0% in 2017-2020 vs 4.1% in 2021-2024, $p = .12$).
Conclusion:
In a large population of premature infants with inguinal hernias managed at US children's hospitals we found that outpatient repair was progressively more common over the last eight years. This was associated with an increasing risk for incarcerated hernia. While outpatient herniorrhaphy is likely appropriate for many premature infants, an individualized consideration regarding the propriety of repair prior to NICU discharge should be made for every patient based on hernia anatomy and social factors.

Abbreviations: PMA=postmenstrual age

S4

ASCENDING TESTIS AS A COMPLICATION OF PEDIATRIC INGUINAL HERNIA REPAIR: A NATIONAL COHORT COMPARISON OF LAPAROSCOPIC VERSUS OPEN APPROACHES

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Abstract: Purpose: Ascending testis (AT) is a rare postoperative complication of inguinal hernia repair, often requiring additional surgical management with long-term impacts on testicular function and male fertility. We hypothesize that there is a lower risk of AT following laparoscopic repair (LR) as compared to open repair (OR) of inguinal hernia due to reduced inflammation of the spermatic cord. We aimed to investigate this hypothesis in a large national cohort.

Methods: Male patients (< 18 years) who underwent either LR or OR for unilateral or bilateral inguinal hernia were identified in the Mariner PearlDiver database (2010–2022). Children with complicated hernias or congenital cryptorchidism were excluded. Prematurity was stratified as extreme preterm (< 28 weeks) or preterm (28-36 weeks). The primary outcome was orchiopexy performed ≥30 days after hernia repair; secondary outcomes were hernia recurrence and 90-day surgical site infection. Kaplan-Meier analysis and multivariable Cox proportional hazards regression models adjusting for surgical approach, age, prematurity, and hernia laterality were used to estimate AT- and recurrence-free survival.

Results: 76,151 children met study criteria, of which 8,259 (10.8%) underwent LR. In unadjusted analysis, AT occurred in 330 children (0.4%) within 3 years, with higher incidence after LR compared to OR (0.6% vs 0.4%, p=.008). Adjusted analysis further supported the association between LR and higher AT risk (HR 1.47, 95% CI: 1.15–1.85). Both preterm (HR 2.14, 95% CI: 1.35-2.44) and extreme preterm history (HR 2.56, 95% CI: 2.01-4.19) were associated with increased AT risk. Regarding secondary outcomes, LR demonstrated higher long-term hazard of recurrence (HR 1.82, 95% CI: 1.59–2.08), with older children (13-17 years) displaying progressively higher rates (HR 3.04, 95% CI: 2.46–3.52). Bilateral repair significantly reduced recurrence risk (HR 0.66, 95% CI: 0.57–0.76). Surgical-site infection did not differ significantly between approaches (0.5% vs 0.5%, p=.638).

Conclusion: Contrary to our hypothesis, LR was not protective against AT, while prematurity was found to be significantly associated with increased rates of AT. As in previous studies, LR is associated with higher incidence of hernia recurrence. These findings should inform surgical decision-making and pre-operative discussions with family members, particularly in high-risk populations.

Abbreviations: Ascending testis (AT)
Laparoscopic repair (LR)
Open repair (OR)

S5

DOES AGE MATTER? COMPARING POST-OPERATIVE OUTCOMES FOLLOWING GASTROSTOMY TUBE PLACEMENT IN YOUNG CHILDREN: A NSQIP-PEDIATRIC STUDY

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Abstract: Purpose: Young infants may be at higher risk of complications after gastrostomy tube (g-tube) placement compared to older children and may benefit from a prolonged nasogastric tube feeding trial to potentially avoid g-tube placement. The purpose of this study was to determine whether a child's age at time of g-tube placement is associated with post-operative complications.

Methods: Using the American College of Surgeons National Surgical Quality Improvement Program-Pediatric database, we identified children aged 0 to 18 months who underwent g-tube placement between 2014-2023. Patients who underwent major concurrent procedures were excluded. We compared composite 30-day complications across three age groups: 1) < 60 days, 2) 60 days to < 7 months, and 3) 7 to < 19 months. A multivariable logistic regression model was used to identify patient factors associated with a 30-day complication.

Results: Between 2014-2023, 29,749 patients met inclusion criteria, of which 25.3% were < 60 days, 45.3% were 60 days to < 7 months, and 29.4% were 7 to < 19 months. Patients < 60 days had the highest percentage of 30-day complications (12.4%), compared to patients 60 days to < 7 months (9.5%) and those 7 to < 19 months (6.8%) ($p < 0.0001$). Post-operative length of stay (LOS) was longest in the < 60-day age group [7 days, interquartile range (IQR) 4-11] compared to the 60 days to < 7 months group (6 days, IQR 2-11), and 7 to < 19 months group (2 days, IQR 1-4) ($p < 0.0001$). The youngest age group had the highest proportion of unplanned reoperations compared to the middle and oldest age groups (4.3% vs. 3.2% vs. 2.6%, $p = 0.0002$) On multivariable regression, age was the strongest predictor of post-operative morbidity, with prematurity, underlying comorbidities, ASA class, and steroid use also associated with higher odds of morbidity (Table).

Conclusions: Children aged < 60 days have the highest proportion of 30-day complications following g-tube placement. Delaying g-tube placement until at least 60 days of life for patients who are eligible for prolonged nasogastric feeding tube trial is likely to result in decreased morbidity and post-operative LOS, and may prevent unnecessary g-tube placement for patients who learn to eat by mouth.

Abbreviations: g-tube = gastrostomy tube
IQR = interquartile range
LOS = length of stay

Table: Multivariable logistic regression comparing patient demographic and clinical factors and 30-day complications.

Patient Characteristic	Odds Ratio (OR)	95% Confidence Interval
Age		
<60 days	1.74	1.56-1.95
60 days to <7 months	1.20	1.08-1.34
7 to <19 months	(Reference)	(Reference)
Male (vs female)	1.16	1.07-1.25
Ethnicity		
Hispanic	1.12	1.01-1.25
Other/unknown	1.34	1.19-1.51
Non-Hispanic	(Reference)	(Reference)
Prematurity	1.17	1.07-1.27
Cardiac risk factors	1.20	1.10-1.32
Structural pulmonary/airway abnormalities	1.26	1.15-1.38
Structural CNS abnormalities	1.22	1.11-1.34
Hematologic disorders	1.41	1.28-1.55
ASA class		
I/II	(Reference)	(Reference)
III	1.28	1.13-1.45
IV/V	2.46	2.13-2.85
Steroid use	1.53	1.34-1.75

ASA=American Society of Anesthesiologists CNS= central nervous system

S6

PUBERTAL GROWTH AND NUTRITIONAL SUPPORT IN PEDIATRIC INTESTINAL FAILURE

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Abstract: Background: Puberty is a time of increased metabolic requirements. Patients with intestinal failure (IF) have limited capacity to absorb adequate calories and nutrients, potentially requiring peripubertal augmentation of specialized nutrition. This study tests the hypothesis that specialized nutritional needs are increased through puberty in intestinal failure patients and identifies risk factors for needing increased supplementation.
Methods: IF patients aged 8-16 managed at an intestinal rehabilitation program January 2015-December 2024 were reviewed for demographic and clinical variables pertinent to growth and nutrition. Patients with documented advancement into puberty (Tanner stage 2) were included. The primary outcome was the need for increased supplemental nutrition (parenteral nutrition, enteral formula, and/or oral supplementation) caloric ratio by 5% of estimated total daily energy expenditure (%TDEE) above baseline after onset of puberty. Risk factors for increased nutrition needs were identified via multivariable logistic regression analysis based on demographic and clinical factors.
Results: A total of 89 patients were included with a median followup of 32.1 months after pubertal onset. Of these, 30 (33.7%) required parenteral nutrition (PN) at onset of puberty. Over the study period, 43 (48%) required an increase in nutritional supplementation at a median of 10.3 months after onset of puberty. On multivariable analysis, both a diagnosis of NEC and receipt of PN were associated with the need for increased supplementation (OR 4.17 and 7.78, respectively, Table 1). As a proxy for adequate growth, height for age z-score (HAZ) remained stable, with no significant difference between HAZ at pubertal onset and last follow up on Wilcoxon signed rank test (-0.03, p=0.99).
Conclusion: Patients with intestinal failure often require specialized nutrition throughout adolescence to ensure adequate growth. An increase in supplemental nutrition was required in 48% of patients during the pubertal period, with those on PN and those with NEC at a significantly increased risk. These data identify at-risk patients and verify the need for close monitoring and adjustment of specialized nutritional supplementation through this metabolically dynamic life stage.

Abbreviations:

Multivariable Logistic Regression Analysis of Needing Increased Supplementation

Covariate	Adjusted Odds Ratio	95% CI	P value
Age at Tanner 2 (years)	1.14 per year	(0.8, 1.62)	0.458
Female Sex	2.09	(0.67, 6.52)	0.203
IF Etiology of NEC (vs non-NEC)	**4.17**	**(1.23, 14.2)**	**0.022***
% Residual bowel length remaining	1.01 per percent	(0.99, 1.04)	0.257
PN at pubertal onset	**7.78**	**(2.12, 28.6)**	**0.002***

*Statistically significant.

S7

SEVERE NEUTROPENIA AND STEROID USE ARE RISK FACTORS FOR PORT INFECTION: A SINGLE INSTITUTION RETROSPECTIVE STUDY

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Abstract: Purpose:
Chemotherapy for cancer is the most common indication for port placement in the pediatric population, and many children have associated neutropenia. While often a marker of immunosuppression, there is little consensus and weak evidence regarding the relationship between absolute neutrophil count (ANC) and port infection. In our large cohort of pediatric patients, we sought to identify risk factors for port infection.

Methods:
All ports placed from 01/01/2013-12/312024 at our children's hospital were retrospectively reviewed. Exclusion criteria was absence of 72-hour preoperative ANC data. Neutropenia was defined as ANC < 1500 and severe neutropenia as ANC < 500. Multivariate logistic regression was performed to control for various potential confounders including prophylactic antibiotic use and determine risk factors associated with port infection within 30 days of placement (with significance level of $p< 0.05$).

Results:
A total of 1566 ports met inclusion criteria. Of these, 257 (16.4%) were placed in children with severe neutropenia and 233 (14.9%) in children with mild-moderate neutropenia. The most common reason for placement was liquid tumor (n= 693, 44.3%) followed by solid tumor (n=661, 42.2%) and benign diagnoses (n=212, 13.5%). The overall 30-day port infection rate was 5.6% (n=87), and of the infected ports, 31.0% (n=27) required removal. Compared to children with normal ANC, those with severe neutropenia were significantly more likely to develop port-associated infections, both overall (aOR 1.834, 95%CI [1.011-3.327], p=0.0460) and within the liquid malignancy subgroup (aOR 1.988[1.017-3.884], p=0.0445). In fact, when compared to healthy children with normal ANC, the odds of infection in children with the combination of leukemia/lymphoma and severe neutropenia is 3.4-fold higher (95%CI [1.423-8.123], p=0.0059). Preoperative steroid use was also associated with increased infection risk (aOR 1.796[1.117-2.887], p=0.0157) as well as increased risk of port removal (aOR 3.604[1.578-8.231], p=0.0024).

Conclusions:
In a large-scale cohort of pediatric patients undergoing port placement, both steroid use and severe neutropenia increase the odds of port infections. As infectious complications can be particularly devastating in these patients and lead to delays, particularly in oncologic care, our findings suggest that for these children, it may be prudent to consider delaying definitive central access if neutrophil counts are expected to improve.

Abbreviations: ANC = Absolute Neutrophil Count

S8

DELAYED APPENDECTOMY IN PEDIATRIC CANCER PATIENTS WITH LEUKOPENIA IS ASSOCIATED WITH WORSENED OUTCOMES

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Abstract: PURPOSE: Acute appendicitis in leukopenic pediatric cancer patients presents a clinical challenge. Management strategies include antibiotics alone, delayed appendectomy or upfront appendectomy, and outcomes based on the degree of leukopenia have not been studied. We hypothesized that delayed appendectomy in leukopenic patients with cancer, irrespective of white blood cell count (WBC) at diagnosis, was associated with worsened outcomes.
METHODS: Using National Surgical Quality Improvement Program data from 2016-2023, we identified 310 oncology patients ≤17-years-old who underwent appendectomy for acute appendicitis with WBC at diagnosis and time to surgery available. Non-leukopenic patients were compared to leukopenic patients (WBC < 4K), which were then sub-stratified by WBC: < 1K, 1K-2.5K, 2.5K-4K. Relevant surgical data and outcomes were extracted including prevalence of complicated appendicitis, percutaneous drainage of abscess, length of stay, and antibiotics prescribed at discharge. Chi-squared and Kruskal-Wallis test were used; $p < 0.05$ was significant.
RESULTS: Leukopenic patients were more likely to have received steroids (24.2% vs. 12.3%, $p=0.007$), blood transfusion (27.3% vs. 3.8%, $p < 0.0001$), and preoperative CT scan (73.7% vs. 26.5%, $p<.0001$). Median time to operation was significantly longer for leukopenic versus non-leukopenic patients (22.7 hours vs. 11.8 hours, $p < 0.0001$). Non-leukopenic patients were significantly more likely to have appendectomy within 24 hours of diagnosis compared to leukopenic patients (82.9% vs. 51.5%, $p < 0.0001$). Furthermore, within each WBC stratum of leukopenic patients, appendectomy after 24 hours of diagnosis was associated with significantly longer length of stay (all p-values < 0.02). Importantly, leukopenic patients with appendectomy delayed over 24 hours from diagnosis were more likely to have complicated appendicitis compared to those with earlier surgery (29.2% vs. 2.0%, $p < 0.001$); this effect was not observed in non-leukopenic patients. There were no differences in operative time, postoperative percutaneous abscess drainage, or mortality between leukopenic and non-leukopenic patients.
CONCLUSION: In this large study of pediatric leukopenic oncology patients with acute appendicitis, there were no significant risks with upfront appendectomy, even amongst children with more severe leukopenia. Moreover, delayed appendectomy over 24 hours in leukopenic patients was associated with an increased risk of complicated appendicitis and prolonged hospitalization.

Abbreviations: white blood cell count (WBC), interquartile range (IQR), computed tomography (CT), operating room (OR)

S9

INTERHOSPITAL TRANSFERS IN CHILDREN WITH SUSPECTED APPENDICITIS-A REFERRAL CENTER EXPERIENCE

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Abstract: Purpose: Interhospital transfers (IHTs) occur when a patient's needs exceed the capacity of the initial facility. Suspected appendicitis is a common reason for IHT to a children's hospital emergency department (ED). We hypothesize a significant number of IHTs could be prevented through improved diagnostics or community-based surgical care. This study evaluates IHTs by analysing records of children transferred to a children's hospital. Specifically, we sought to 1) quantify the number of children transferred to the ED with presumed appendicitis; 2) determine treatment and outcomes post-transfer; and 3) categorize potentially avoidable transfers (PATs) and identify associated patient and health-system factors.

Methods: We conducted an IRB approved retrospective review of patients transferred to a children's hospital ED with suspected appendicitis over one year. Patients were identified using ICD-10 codes or transfer-in notes referencing appendicitis. Referring hospital characteristics were extracted from a public database. In this region, hospitals are categorized based on the paediatric services available; Paediatric Level of Care 2 (PLC2) or higher hospitals could reasonably be expected to manage paediatric appendicitis. Two categories of PAT were defined: 1) PATs through improved diagnostics (PATDx), defined as children discharged from the ED without appendicitis; and 2) PATs through community surgical partnership (PATSx), defined as children ≥12 years with confirmed appendicitis transferred from PLC2 or higher hospitals. Univariate analysis was performed to evaluate associations between patient and health system factors and PATs.

Results: We identified 513 cases of presumed appendicitis transfers. The median age was 7.5 years; 43% were female and 92% had no comorbidities. A total of 87% were referred from PLC2 hospitals. Overall, 229 patients (45%) had PATDx. Among the remaining patients, 39 (13.7%) were PATSx. 245 patients (48%) had non-avoidable transfers according to our criteria. Younger age was associated with PATDx (p=0.004).Shorter distance was associated with higher PATSx rates (p=0.03) (Table 1).

Conclusion: Nearly half of IHTs for suspected appendicitis were potentially avoidable—either through improved diagnostics in the community or through surgical partnerships enabling community-based care. Providing diagnostic support, developing standardized transfer criteria, and appropriately resourcing hospitals to deliver paediatric care or community-based surgical consultation may potentially reduce transfers.

Abbreviations: IHTs: interhospital transfers
ED: emergency department
IRB: Institutional Review Board
PLC: paediatric level of care
PAT: potentially avoidable transfer
PATDx: potentially avoidable transfer through improved diagnostics
PATSx: potentially avoidable transfer through community surgical partnership

Table 1: Demographics and univariate analysis of transferred patients with suspected appendicitis. (PAT-Dx, potentially avoidable transfers through improved diagnostics; PAT-Sx, potentially avoidable transfer through community surgical partnership)

		All patients N (%)	PAT – Dx N (%)			PAT – Sx N (%)		
		N=513	Yes 229 (45%)	No 284 (55%)	p	Yes 39 (14%)	No 245 (86%)	p
Median age (years)(IQR)		7.5 (4.1)	7.1 (4)	8 (4)	0.004	14 (2)	7 (3)	<0.001
Female population		220 (43%)	108 (47%)	112 (39%)	0.095	16 (41%)	96 (39%)	0.96
Patients from rural areas		23 (4%)	4 (2%)	19 (7%)	0. 009	0	19 (8%)	<0.001
Referring Hospital Peer Group					0.3			0.03
	Small and no paediatric in-patient care	70 (14%)	39(17%)	31 (11%)	-	0	31 (12%)	-
	Medium	157 (31%)	68 (30%)	89 (31%)	-	8 (21%)	81 (33%)	-
	Large	246 (48%)	107 (47%)	139 (49%)	-	27 (69%)	112 (46%)	-
	AHSC (Academic Health Sciences Centre)	40 (8%)	15 (7%)	25 (9%)	-	4 (10%)	21 (9%)	-
Referring hospital Paediatric Level of Care					0.1			-
	Level 1 and lower (no paediatric in-patient care)	66 (13%)	30 (13%)	36 (13%)	-	0	36 (15%)	-
	Level 2	447 (87%)	199 (87%)	248 (87%)	-	39 (100%)	209 (85%)	-
Median transfer distance (km) by road (IQR)		36 (27)	36.3 (26.8)	37 (29)	0.6	25 (16)	38 (30)	0.03

S10

A NATIONAL GEOSPATIAL ANALYSIS OF PEDIATRIC SURGICAL PRACTICES AND THE CHILDREN THEY SERVE

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Abstract: Purpose: This study characterizes the geographic distribution of pediatric surgical practices in the U.S. relative to the pediatric population (ages 0–21 years). Prior analyses estimated that over 10 million children live more than 60 miles from a pediatric surgeon. However, those studies assigned each surgeon a single zip code, overlooking outreach clinics that extend access and reduce travel distances. Our goal was to generate a more accurate assessment of travel burden using comprehensive data that includes both primary and outreach practice locations.

Methods: The APSA membership directory identified U.S. pediatric surgery practices. Practices were contacted for information on faculty, locum tenens, advanced practice providers, and the number and location of hospitals, clinics, and operating rooms as of July 31, 2025. Practice locations were compared to the US 2020 Census data on where children reside, calculating straight-line driving distances both across and within state lines. Values are expressed as median and interquartile range [IQR].

Results: Among 248 pediatric surgery practices, the median travel distance to the practice's primary location for children traveling across state lines was 42.1 [18.5-71.1] miles, and within-state travel was 45.4 [19.3-83.3] miles, with 13.2% of children living >60 miles from care (n =

9,662,011). Including all hospitals served by these practices (n = 932), average distances decreased slightly to 38.4 [15.4-66.8] miles across states and 41.7 [16-77.2] miles within states, with 11.1% >60 miles (n = 8,125,546). For primary clinics (n = 248), distances were similar to hospitals (41.9 [18.2-70.7] miles across states, 45.3 [19.1-82.8] miles within states; 13.0% >60 miles, n = 9,486,335). Considering all clinics (n = 760), distances decreased to 29.2 [10.8-54.9] miles across states and 31.3 [11-61.9] miles within states, with only 6.7% of children >60 miles away (n = 4,928,417).

Conclusions: Pediatric surgical care is unevenly distributed in the U.S., with many children living more than 60 miles from primary hospitals or clinics. Outreach hospitals and clinics substantially reduce travel distances, emphasizing their role in improving access. These findings support workforce planning and resource allocation to ensure pediatric surgeons are available where children need them most.

Abbreviations: Interquartile range [IQR]

S11

LOCUM TENENS: A NATIONAL ASSESSMENT OF THE PEDIATRIC SURGERY WORKFORCE

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Abstract: Purpose: Workforce shortages and geographic disparities limit access to pediatric surgical care. Locum tenens (LT) surgeons help fill staffing gaps, yet their role in pediatric surgery remains poorly defined. This study evaluates the prevalence, practice settings, and clinical coverage of LT pediatric surgeons to inform workforce planning and access strategies.

Methods: The APSA membership list was used to identify US pediatric surgery practices. Each was contacted to obtain data on surgeon composition, locum tenens (LT), advanced practice providers (APPs) composition, and the number of hospitals, clinics, consultation sites, and operating rooms covered as of July 31, 2025. Service locations were geocoded by zip code. Values are expressed as median and interquartile range [IQR]. Comparisons between LT and NLT practices used Mann-Whitney U tests, with $p < 0.05$ considered significant.

Results: Among 248 practices, 59 (23.8%) reported the use of LT. LT practices are in 29 of 50 states and the District of Columbia (56.9%), most commonly in Florida (n=6), Texas (n=5), New Jersey, and Pennsylvania (n=4 each). LT surgeons cover a median of 1 [1–1] hospitals. Compared with non-LT (NLT) practices, groups using LT were significantly smaller (median 2 [2–3] vs. 4 [3–6.5] surgeons, $p < 0.001$) and less likely to host a fellowship (8.5% vs. 24.9%, $p = 0.006$). They covered fewer hospitals, clinics, consultation sites, and operating sites (all $p < 0.01$). APP employment and practices that work in neighboring states were similar between

groups. Maintaining LT-supported practices substantially improves access, reducing median travel distances by almost half (from 48.6 to 29.2 miles across state lines and from 51.5 to 31.3 miles within state lines). The proportion of children living >60 miles from surgical care dropped from 19.9% to 6.7%, reducing the number affected from ~14.5 million to about 5 million (Figure 1).

Conclusions: LT surgeons play a critical role in pediatric surgery, expanding access and reducing travel distances for children, particularly in smaller, non-fellowship practices. While LT reliance fills gaps, it highlights potential workforce vulnerabilities. Understanding LT utilization is essential for planning a resilient pediatric surgical workforce and ensuring equitable care nationwide.

Abbreviations: Locum tenens (LT); Advanced practice providers (APPs); Interquartile range (IQR),

Scientific Session 2: Advocacy and Trauma

3:00 PM – 4:30 PM

S12

A CENTURY OF PROGRESS: EVOLVING RACIAL AND ETHNIC DIVERSITY IN U.S. AND CANADIAN PEDIATRIC SURGERY TRAINING

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Abstract: Purpose: Diversity among pediatric surgery trainees plays a critical role in shaping the future workforce and the quality of care delivered to children. This study presents the first comprehensive analysis of all pediatric surgery graduates in the U.S. and Canada, evaluating racial/ethnic representation over time and identifying areas where progress remains limited.

Methods: A retrospective review was conducted of all pediatric surgery fellowship graduates, both official and unofficial, across the U.S. and Canada from 1919-2025. Data sources included The Genealogy of North American Pediatric Surgery, Celebrating 50 Years of CAPS/ACCP, APSA membership listings, and correspondence from program directors. Race/ethnicity were classified according to U.S. Census categories using a combination of name analysis, photographs, professional affiliations, personal contacts, and the Namsor.app tool. Graduates were grouped into five time periods to assess temporal trends. Racial distribution by sex was analyzed using Chi-square and Fisher exact tests, with significance set at $p< 0.05$.

Results: Across 79 programs, 2,235 graduates were identified (1,673 men [74.9%], 562 women [25.1%]). Racial and ethnic diversity increased significantly ($p < 0.0001$). Asian representation rose from 1.8% to 15.4% ($p < 0.001$), Hispanic/Latino from 1.8% to 6.0% ($p=0.0017$), and Black from 0.0% to 3.7% ($p=0.002$). American Indian/Alaska Native (AI/AN) representation remained negligible, while non-minority representation declined from 96.5% to 74.8% ($p < 0.001$). Racial distribution differed by sex ($p < 0.001$): Black pediatric surgeons more likely to be female (4.8% vs 1.6%, $p < 0.001$), Asian pediatric surgeons slightly more likely to be female (13.3% vs 10.5%, $p = 0.069$), and Hispanic/Latino representation similar by sex (4.2% vs 4.4%, $p = 0.808$). Non-minority pediatric surgeons were more likely to be male (83.6% vs. 77.6%, $p = 0.0018$), suggesting that the increase in female graduates has contributed meaningfully to overall workforce diversity.

Conclusion: Over the past century, pediatric surgery training in the U.S. and Canada has become increasingly diverse. Notable gains among Asian, Hispanic/Latino, and Black surgeons

reflect progress, though AI/AN representation remains nearly absent, and sex-based disparities persist. Continued efforts in equitable recruitment, mentorship, and career advancement are needed to ensure that the pediatric surgical workforce mirrors the diversity of the children and families it serves.

Abbreviations: American Indian/Alaska Native (AI/AN)

S13

IMPACT OF TRAVEL DISTANCE ON OUTCOMES FOR COMMON PEDIATRIC SURGICAL PROCEDURES

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Abstract: Introduction
As pediatric surgical care becomes increasingly centralized to fewer centers, many children must travel farther to access surgical care. We evaluated how travel distance influences surgical outcomes and healthcare utilization for common pediatric procedures.

Methods
Children (18 years or younger) who underwent one of five common procedures (appendectomy, cholecystectomy, pyloromyotomy, inguinal hernia repair, or gastrostomy/jejunostomy tube placement) from 2018-2021 were identified using Healthcare Utilization Project State Inpatient Databases (HCUP SID) across 12 states. Driving distance was estimated between population-weighted patient ZIP code centroids and hospital ZIP code centroids. Outcomes (complications, length of stay [LOS], total hospital charges) were compared across travel distance categories (< 30 miles, 30-60 miles, >60 miles) using multivariable models adjusted for age, sex, rural residence, year, procedure type, surgical priority, children's hospital status, and payer type.

Results
Among the 71,451 children, 52,498 (73.5%) lived within 30 miles of the treating hospital, 10,359 (14.5%) lived 30–60 miles away, and 8,594 (12.0%) lived more than 60 miles away. Compared with patients living within 30 miles, those traveling more than 60 miles were younger (median age 3 vs. 10 years, p< 0.0001), more likely to reside in rural areas (47% vs. 5%, p< 0.0001), more often treated at children's hospitals (28% vs. 15%, p< 0.0001), more likely to have been transferred for care (39.1% vs 12.9%, p< 0.0001) and less likely to have an unplanned admission (72% vs. 85%, p< 0.0001). In adjusted analyses, greater travel distance was associated with higher odds of complications (>60 miles: adjusted odds ratio [aOR] 1.20, 95% CI 1.11–1.31), increased LOS (30–60 miles: adjusted risk ratio [aRR] 1.04, 95% CI 1.02–1.06; >60 miles: aRR 1.13, 95% CI 1.10–1.16) and higher hospital charges (30–60 miles: aRR 1.06, 95% CI 1.04–1.08; >60 miles: aRR 1.11, 95% CI 1.08–1.14) (Table).

Discussion
Pediatric patients traveling more than 60 miles for surgical care experienced higher complication rates, longer hospital stays, and higher hospital charges. Although regionalizing complex procedures may improve some quality measures, increased travel burden for common procedures may limit access and worsen outcomes. Timely access to surgical care remains essential for optimal outcomes.

Abbreviations: length of stay [LOS]
adjusted odds ratio [aOR]
adjusted risk ratio [aRR]

confidence interval [CI]
Healthcare Utilization Project State Inpatient Databases [HCUP SID]

Table 1. Associations between travel distance and outcomes for patients undergoing common pediatric surgical procedures

Outcome	Distance	Effect Estimate (95% CI) [d]	p-value
Any complication[a,b]	30-60 miles	1.06 (0.98-1.14)	0.152
	>60 miles	1.20 (1.11-1.31)	<0.0001
LOS[c]	30-60 miles	1.04 (1.02-1.06)	<0.0001
	>60 miles	1.13 (1.10-1.16)	<0.0001
Hospital charges[c]	30-60 miles	1.06 (1.04-1.08)	<0.0001
	>60 miles	1.11 (1.08-1.14)	<0.0001

Abbreviations: aOR, adjusted odds ratio; aRR, adjusted relative risk; CI, confidence interval; LOS, length of stay.

[a] Complications were defined using ICD-10-CM codes aligned with National Surgical Quality Improvement Program definitions.

[b] Estimates for binary outcomes are from multivariable logistic regression models and represent adjusted odds of outcome.

[c] Estimates for continuous outcomes (LOS, charges) are from log-transformed linear regression models and represent multiplicative change (aRR).

S14

REDUCING BARRIERS TO PEDIATRIC SURGICAL CARE: THE VALUE OF A RURAL CLOSE-TO-HOME CLINIC

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Abstract: Purpose
Accessing pediatric surgical care can pose significant challenges for rural families given long travel distances, financial burden of travel and lost wages, and logistical challenges for other family members. Rural and socioeconomically distressed regions of the United States have higher instances of poor health outcomes. This study assessed barriers to care among rural families attending appointments at either a centralized Main Campus (MC) or decentralized Close to Home (CTH) clinic.

Methods
A stakeholder-guided survey was created and administered to families from rural ZIP codes upon check-in to the MC pediatric surgery clinics from 12/2023 to 9/2024. After the rural CTH clinic opened, the same survey was administered to families at that site from 11/2024 to 8/2025. Survey questions evaluated family experiences and barriers to care, including distance traveled, travel time, financial strain, missed work/lost wages, and comfort with travel, parking, and locating the clinic. Data were summarized using descriptive statistics, and family experiences between MC and CTH clinics were compared using chi-squared tests.

Results
Among 276 families approached, 79% agreed to participate. Across both locations, most families traveled >1 hour (86.2%), spent >$20 on travel (77.3%), and missed work (70.1%) and wages (52.6%) to attend the appointment (Table). Travel burden >1 hour was more common among those attending MC compared to CTH appointments (92.2% vs 37.5%, p< 0.001), and travel costs >$20 were also more common among MC clinic attendees (81.8% vs 41.7%, p< 0.001). Those attending the CTH clinic had significantly decreased perceived burden of accessing care, as measured overall and specifically regarding comfort in traveling to the appointment, navigating the campus, and finding the clinic (p<=0.003 for all comparisons). Overall, 76.5% of respondents noted preference for CTH clinic appointments, including 95.8% of those who had attended the CTH clinic.

Conclusion
Rural families seeking pediatric surgical care face notable logistical and financial barriers. A new rural CTH clinic has been well-received by families, significantly reducing travel burden and improving perceived accessibility. Future efforts should prioritize expanding geographically accessible care to support rural family engagement and improve access to pediatric surgical care.

Abbreviations: CTH: Close to Home
MC: Main Campus

TABLE

Perceived burden of access to care.

	Overall n = 217 (%)	Main Campus n = 193 (%)	Close to Home n = 24 (%)	p value*
Travel time >1 hour	187 (86.2)	178 (92.2)	9 (37.5)	**<0.001**
Travel cost >$20	167 (77.3)	157 (81.8)	10 (41.7)	**<0.001**
Missed work for appointment	150 (70.1)	135 (71.1)	15 (62.5)	0.47
Missed wages for appointment	112 (52.6)	102 (54.0)	10 (41.7)	0.58
How comfortable were you traveling to your appointment (stress of travel, traffic, etc.)?	4.0 (3.0-4.0)	3.0 (3.0-4.0)	5.0 (4.0-5.0)	**<0.001**
How comfortable were you navigating the clinic campus and parking?	4.0 (3.0-5.0)	4.0 (3.0-4.0)	5.0 (4.0-5.0)	**<0.001**
How comfortable were you finding the actual clinic?	4.0 (3.0-5.0)	4.0 (3.0-4.0)	5.0 (4.0-5.0)	**0.001**
Overall perceived high burden of care	99 (45.6)	95 (49.2)	4 (16.7)	**0.003**
Preference for appointment at Close to Home location	163 (76.5)	140 (74.1)	23 (95.8)	**0.018**

*Bold denotes significance at p<0.05.

S15

INSTITUTIONAL VARIABILITY IN PEDIATRIC ONCOFERTILITY RESOURCES: A MULTICENTER SURVEY OF NORTH AMERICAN HOSPITALS CARING FOR CHILDREN

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Abstract: Purpose: Although childhood cancer survival has improved significantly, treatments result in long-term side-effects such as infertility. Pediatric oncofertility initiatives aim to preserve the reproductive potential of survivors through timely counseling and interventions such as sperm banking, oocyte cryopreservation, ovarian tissue cryopreservation (OTC), and testicular tissue cryopreservation (TTC). Despite their importance, the availability of fertility preservation services for pediatric oncology patients remains poorly characterized. This study evaluates institutional oncofertility resources across North American hospitals.

Methods: A cross-sectional survey was conducted to evaluate institutional oncofertility resources across pediatric centers participating in a research collaborative. Investigators from 56 institutions were invited to complete an electronic survey querying fertility preservation (FP) services available at their institutions. Descriptive statistics summarized resource availability; categorical variables were analyzed using chi-squared or Fisher's exact tests (α=0.05).

Results: Of the 56 investigators invited, 50 fully completed the institutional resources survey, yielding a response rate of 89%. The majority of responding centers were urban (86%) and university-affiliated (90%), and over half (54%) were free-standing children's hospitals. Overall, 54% of institutions house a dedicated FP program. Institutions treating > 150 new pediatric cancer diagnoses annually were significantly more likely to have a FP program compared to those with fewer diagnoses (83% vs 33%; $p< 0.001$). The presence of a surgical oncology program was not significantly associated with the presence of a FP program (62% vs 41%; $p=0.163$). All institutions with a FP program offered sperm banking; however, 30% did not offer OTC for prepubertal patients, 22% did not offer OTC for post-pubertal patients, and 44% did not offer TTC. Table 1 outlines fertility preservation options available at surveyed institutions. Among institutions without a FP program, 96% (22/23) expressed interest in establishing one.

Conclusion: FP programs are more common in high-volume centers, and centers with FP programs offer fertility preservation at a higher rate than those without. However, even institutions with established programs lack access to key FP methods. With advancements in oncologic care leading to increased survivorship, the establishment and refinement of FP programs is essential in mitigating adverse treatment effects and improving quality of life in pediatric cancer survivors.

Abbreviations: ovarian tissue cryopreservation (OTC), testicular tissue cryopreservation (TTC), fertility preservation (FP)

S16

THE USE OF SOCIAL MEDIA FOR HEALTH INFORMATION IN MEDICAL DECISION MAKING: A CROSS-SECTIONAL SURVEY OF PATIENT PREFERENCES

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Abstract: Purpose: Widespread access to social media presents an unprecedented source of vast information for patients. However, ease of accessibility does not guarantee accurate information, leaving patients to determine which sources are trustworthy. This study aims to explore the health information sources used by patients and characterize the degree of trust they place in social media and health professionals.

Methods: A cross-sectional online survey examining shared decision making in the context of pediatric appendicitis was administered in September 2025 via an online market research platform (Prime Panels, Cloud Research) to US adults with a child 18 years or younger. Participants indicated which health information resources they used and trusted in the past month and completed questions assessing their preference for how doctors relate to patients. Descriptive statistics were reported as frequencies and modes.

Results: Of all respondents, 321 participants (70% female) met our survey quality check and were included in analysis. Social media and health professionals were used as sources of health information at roughly the same frequency in the past month (44% vs. 46%), yet only 14% reported they trusted social media for health information compared to 51% trusting health professionals. Regarding how patients prefer doctors relate to their patients, the statements participants most agreed with were, “I prefer that my doctor offers me choices and asks my opinion” (91%) and “I prefer my doctor is a human being (and not a robot) even if that means they may make a mistake” (88%). The statement least agreed with was, “I prefer to rely on my doctor’s knowledge and not try to find out about my condition on my own” (51%).

Conclusions: In an online survey-based study, patients tended to trust health information presented by their healthcare professionals more than social media, even while recognizing that doctors can make mistakes. Patients preferred to be involved in their own medical decision making rather than solely relying on one healthcare professional (or health information source). To protect the public from misinformation, doctors and patients would both benefit from developing accurate and easily accessible healthcare resources.

Abbreviations:

S17

UTILITY OF LARGE LANGUAGE MODELS IN PEDIATRIC TRAUMA TRIAGE: AN AGE-STRATIFIED ANALYSIS OF PROMPT ENGINEERING

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Abstract: Purpose

Pediatric trauma triage is uniquely challenging due to age-dependent physiology and low exposure volume (~8% of EMS interactions). We previously demonstrated that large language models (LLMs) may triage trauma comparably to human experts (HE). Here, we evaluate (1) whether progressive prompt engineering improves LLM accuracy and consistency and (2) whether LLM performance generalizes across pediatric developmental strata.

Methods

We analyzed 316 pediatric trauma activation transcripts (2023–2025) from two Level I pediatric trauma centers. EMS calls were transcribed using WhisperAI, and triage decisions were generated through an LLM API pipeline. Human and LLM decisions were compared against ground truth Injury Severity Score (ISS >15 = Level 1). Three prompt iterations were tested:
• V1 (Original): zero-shot GPT prompt using basic ACS-COT triage criteria,
• V2 (Refined): consensus ensemble of aggressive, conservative, and neutral prompts with structured tiebreakers,
• V3 (Best): refined consensus prompt incorporating selective redaction of subjective EMS descriptors (e.g., mental status).
Accuracy was stratified by age (0–4, 5–9, 10–14, 15–18 years) and injury severity. Logistic regression assessed continuous age-related performance trends.

Results

Overall accuracy was 77.8% for HE and improved from 67.6% (V1) to 82.3% (V2) and 87.0% (V3) for the LLM (V3 vs HE, p=0.0001). Prompt refinement reduced variability across age groups (range of accuracies: V1=18.7%, V2=14.9%, V3=13.4%). The LLM significantly outperformed HE in the 10–14-year group (88.7% vs 75.5%, p=0.001). Both groups demonstrated higher accuracy in Level 2 than Level 1 cases; however, the LLM showed superior Level 2 discrimination (84.6% vs 79.6%, p=0.006). LLM accuracy increased with age (OR 1.06 per year, 95% CI 1.01–1.12, p=0.03), whereas HE performance did not vary by age (p=0.88).

Conclusion

Progressive prompt refinement transformed LLM performance from underperforming to significantly outperforming human experts while improving cross-age consistency. Selective redaction of subjective EMS descriptors further enhanced stability and accuracy, driven by improved Level 2 discrimination without loss of Level 1 sensitivity. These findings support LLMs

as tunable, scalable trauma triage co-pilots with demonstrated generalizability across pediatric developmental stages.

S18

COST-EFFECTIVENESS OF SAFE STORAGE IN PREVENTING PEDIATRIC FIREARM INJURIES

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Abstract: PURPOSE:
Firearm injury is now the leading cause of death among children and adolescents in the United States, with mortality rates rising annually. Prior to the COVID-19 pandemic, approximately one in three US households contained a firearm; in households with children, at least one in five stored a firearm unlocked and loaded, placing an estimated 4.6 million children at risk. Evidence consistently demonstrates that unsecured storage practices raise mortality risk, whereas counseling, storage device provision, and safe storage legislation can reduce access. Our aim was to evaluate the cost-effectiveness of firearm safety devices in households with children and their impact on injury, mortality, and healthcare costs.

METHODS:
A decision-analytic model (Figure) was developed using TreeAge Pro software to compare outcomes in the pediatric population who live with at least one firearm locked or unlocked. Our theoretical cohort included 12.4 million, the estimated number of households in the US with at least one firearm and one child. Outcomes included firearm injury, mortality, emergency department discharge, survival through hospital admission, costs, and quality-adjusted life years (QALYs). We used a willingness-to-pay for the incremental cost-effectiveness ratio (ICER) of $100,000/QALY. Model inputs were derived from the literature; all costs and QALYs were adjusted to 2025 using a discount rate of 3%.

RESULTS:
In our theoretical cohort, locking a firearm with or in a secure storage device led to 3,275 fewer injuries and 598 fewer deaths. Among survivors, there were 2,676 fewer emergency department visits and 1,474 fewer hospital stays in the group practicing secure storage. This strategy was associated with a cost of $1.1 billion and 17,137 additional QALYs, resulting in an ICER of $65,234.23 per QALY gained.

CONCLUSION:
This study estimates that promoting secure storage of firearms (e.g. trigger lock, lockbox) among families with children is a cost-effective and health-improving strategy. Moving forward, policy and advocacy efforts are essential to increase the adoption of safe storage practices, with the potential to significantly reduce firearm-related injuries and enhance public health across the United States.

Abbreviations: quality-adjusted life years (QALYs).
incremental cost-effectiveness ratio (ICER)

S19

FACTORS ASSOCIATED WITH REFERRALS AFTER SUBSTANCE USE SCREENING IN ADOLESCENT TRAUMA PATIENTS

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Abstract: Purpose: Adolescent substance use is closely linked with high-risk behavior and traumatic injury, yet opportunities to connect injured adolescents to treatment rely on referrals following drug screening. Routine drug screening for injured adolescents is recommended but not required by the American College of Surgeons. Little is known about referral patterns for substance use support services for injured adolescents. This study aimed to (1) identify gaps between positive drug screens and referral to substance use support services and (2) identify patient and clinical factors associated with referral to substance use support services following drug screening among injured adolescents.
Methods: This single center retrospective cohort study at a tertiary pediatric trauma center examined injured adolescents 12-17y from January 2021-June 2024. Sociodemographic and clinical data were abstracted from electronic medical records and the local trauma registry. Receipt of referral for substance use support services after biochemical screening or interview-based screening was evaluated. Screening was defined as receipt of urine toxicology and/or receipt of a Screening, Brief Intervention, and Referral to treatment (SBIR). Factors associated with referral after screening were analyzed using bivariate and multivariable logistic regressions.
Results: A total of 683 injured adolescents were identified; 433 (63.4%) underwent substance use screening with 81 (11.9%) receiving urine toxicology and 406 (59.4%) receiving SBIR. Among those screened, 50 (61.7%) had a positive urine toxicology and 55 (13.5%) a positive SBIR. Among those with positive drug screenings (n=87), only 32 (36.8%) had a documented referral to substance use support services. On bivariate analysis, older age, interview-based screening, and use of cannabis, alcohol, and/or psychedelics were significantly associated with referrals ($p < 0.05$). On multivariable logistic regression analysis, a positive drug screen was associated with referral (OR 6.82; 95% CI: 3.48-13.35), but not a positive alcohol screen (OR 2.02; 95% CI: 0.87-4.65) (Table).
Conclusion: Substance use screening among injured adolescents remains underutilized. Referral for treatment remains infrequent, even for those with a positive drug screen, and is not associated with clinical or demographic factors. These findings highlight a critical gap in connecting the high-risk injured adolescents to appropriate treatment and support services.

Abbreviations: SBIR - Screening, Brief Intervention, and Referral
OR - odds ratio
CI - confidence interval
GCS - Glasgow Coma Score

S20

SURGICAL ANTIBIOTIC PROPHYLAXIS USE IN PEDIATRIC AND ADOLESCENT OVARIAN SURGERY: A NSQIP-PEDIATRIC ANALYSIS

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Abstract: Purpose: The American College of Obstetricians and Gynecologists (ACOG) recommends avoidance of surgical antibiotic prophylaxis (SAP) for ovarian procedures without entry into the bowel or vagina. However, these recommendations do not include patients < 18 years of age. With lack of pediatric-specific guidelines, we hypothesized that many patients continue to receive SAP during ovarian surgery. This study aims to understand SAP use in pediatric ovarian surgery and its association with surgical site infection (SSI).

Methods: Perioperative SAP details from the National Surgical Quality Improvement Program – Pediatrics (NSQIP-P) were obtained for patients < 18 years of age who underwent clean open or laparoscopic ovarian surgery from 2021-2023. Those undergoing salpingo-oophorectomy (SPO), ovarian-preserving surgery (OPS), and oophorectomy were identified using CPT codes. Patients with pre-existing infection and those with concurrent/other surgeries were excluded. SSI, reoperation, and readmission were assessed between the SAP and No-SAP groups.

Results: Among 2,137 patients who underwent ovarian surgery, 1,080 (50.5%) received SAP. The surgical approach was laparoscopic in 1,731 (81.0%), open in 307 (14.3%), and combined in 99 (4.6%). The SAP group more frequently had open procedures (19.6% vs 9.0%, p< 0.001). SAP administration varied by specialty: pediatric surgery (64.8%, n=832), general surgery (64.8%, n=48), and gynecology (31.9%, n=184, p< 0.001). However, there was no difference in SSI risk by surgical specialty (p=0.091). Overall, SSI risk was 1.1% (n=24): 0.5% (n=5) with SAP and 1.8% with No-SAP (n=19, p=0.003). No SSI occurred in the SPO group. SSI occurred in 3.2% in the oophorectomy group and 1.5% in the OPS subgroups (Table 1). On multivariable logistic regression, SAP was associated with decreased SSI (OR 0.24, 95% CI: 0.08-0.62, p=0.006). Additionally, SSI was associated with BMI >85th percentile (OR 3.20, 95% CI: 1.41-10.3, p=0.038). The number needed to treat for SAP administration was 74.9 to prevent one SSI in the entire cohort, 41.9 in the oophorectomy group, and 87.6 in the OPS group.

Conclusions: The use of SAP for pediatric ovarian procedures is common and variable between specialties. The overall risk of SSI is low. For patients with higher BMI, SAP may be considered. However, this topic warrants further prospective study.

Abbreviations: ACOG: American College of Obstetricians and Gynecologists
SAP: Surgical Antibiotic Prophylaxis
SSI: Surgical Site Infection
NSQIP-P: National Surgical Quality Improvement Program-Pediatric
SPO: Salpingo-oophorectomy
OPS: Ovarian-preserving surgery

CPT: Current Procedural Terminology
BMI: Body Mass Index

Table 1. Outcomes in pediatric oophorectomy and ovarian-preserving surgery by SAP vs No-SAP.

	Oophorectomy (n=418)			Ovarian-Preserving Surgery (n=1648)		
	SAP (n=233)[1]	No-SAP (n=185)[1]	p-value[2]	SAP (n=793)[1]	No-SAP (n=855)[1]	p-value[2]
All SSI	2 (0.9%)	6 (3.2%)	0.15	3 (0.4%)	13 (1.5%)	**0.018**
Superficial SSI	2 (0.9%)	6 (3.2%)	0.15	3 (0.4%)	9 (1.1%)	0.11
Deep SSI	0 (0%)	0 (0%)	-	0 (0%)	0 (0.1%)	-
Organ Space SSI	0 (0%)	0 (0%)	-	0 (0%)	3 (0.4%)	0.25
Readmission	0 (0%)	5 (2.7%)	**0.016**	12 (1.5%)	17 (2.0%)	0.46
Reoperation	0 (0%)	0 (0%)	-	7 (0.9%)	9 (1.1%)	0.73

[1] n (%)
[2] Fisher's exact test; Wilcoxon rank sum test

S21

PERINATAL PALLIATIVE CARE APPROACH TO FETAL DIAGNOSIS OF TRISOMY 18

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Abstract: Background: Pregnancies affected by Trisomy 18 are often identified early due to non-invasive prenatal screening. We aimed to describe Perinatal Palliative Care treatment for these families.
Methods: Retrospective data was collected on families referred to the perinatal palliative care clinic (PPCC) from 2020 to 2024. Data for visits, goals of care, and procedures during the neonatal admission were gathered. Families opting for life prolonging care (LPC) versus comfort care (CC) were compared. Descriptive statistics compared demographics between groups.
Results: 6812 families were seen in the Fetal Care Clinic from 2020 to 2024. 358 families were referred to the PPCC and 50 had a fetal trisomy 18 diagnosis. 78% (39) attended an appointment. The median number of appointments was 2. Of the 11 that did not attend PPCC, 45% (5) had a fetal demise (IUFD) prior to their appointment. 53.8% (21) initially chose life prolonging measures at birth but following their PPCC visits, 10/21 placed restrictions on life prolonging measures. 33% of the LPC group (7) transferred to a higher-level NICU after birth with a median [interquartile range] length of stay of 23 [7-81] days. 3 underwent gastrostomy tube placement and 2 underwent tracheoesophageal fistula repair. 38% (8) of the LPC group transitioned to comfort care after delivery. 10% (2) had IUFD. 10% (2) were discharged home. 19% (4) were discharged to hospice. 48% (10) died prior to discharge. In comparing families that chose CC to those that chose LPC, there was no difference in number of pregnancies (CC: 3 [1-5] versus LPC: 4 [2-6], p=0.561). There was also no difference in mother's reported religious affiliation, p= 0.492. Day of life at death did not differ between groups, (CC: 0 [0,85] versus LPC: 5 [1-30], p=0.277). Overall survival in patients with known outcomes was 2% (1/47).
Conclusion: With variable state laws affecting prenatal care it is vital that accurate information is given to families facing a high-risk fetal diagnosis. For families affected by the diagnosis of Trisomy 18 and opting for life prolonging care, early discussions with a palliative care team informs and empowers families in their decision making.

Abbreviations: CC: comfort care
LPC: life prolonging care
IUFD: intrauterine fetal demise
PPCC: Perinatal Palliative Care Clinic

S22

TRENDS IN HEALTHCARE UTILIZATION FOR CONGENITAL ANOMALY CARE FOLLOWING THE REVERSAL OF FEDERAL ABORTION PROTECTIONS

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Abstract: Purpose: Prior evidence suggests that states with abortion bans experienced higher rates of congenital anomalies following their implementation in the post-Dobbs era. This study aimed to investigate (1) whether the implementation of abortion bans increases healthcare utilization for congenital anomaly care, and (2) to compare cost and resource utilization trends between abortion-restrictive states and abortion-protective states.

Methods: We queried the Pediatric Health Information System for patients with any cardiac (ICD-10: Q20-Q29) or gastrointestinal (ICD-10: Q40-Q49) congenital anomalies. Patients were classified based on whether they were born in states with active abortion bans. Patients born within the first 9-months following the institution of a ban were excluded to allow for the lag time in legal implementation and its impact on early gestation pregnancies. Those presenting over the subsequent 1-year period were termed “exposed” to an abortion ban. Control/unexposed patients were selected by matching 1:1 for age, sex, GA and case mix index of the treating hospital. We considered two independent control/unexposed groups for analysis: (i) controls in the same state prior to the implementation of the abortion ban and (ii) controls in abortion-protective states over the same time period. The primary outcome was the aggregated number of admissions. Secondary outcomes were total hospital days and total state-adjusted hospital costs.

Results: Among 21,576 infants included, 9,261 were born in states with active abortion restrictions. The median age at first admission was one day (IQR 0–48), and 62% were publicly insured. Within-state comparisons demonstrated no significant differences in admissions ($p=0.94$), hospital days ($p=0.33$), or costs ($p=0.16$) before versus after policy implementation. However, compared with abortion-restrictive states, hospitals in abortion-protective states had more admissions for congenital anomalies ($p < 0.001$), longer hospital stays ($p < 0.001$), and greater total healthcare spending ($p < 0.001$).

Conclusion: Despite prior evidence of higher rates of congenital surgical anomalies following abortion bans, we did not find evidence of increased congenital anomaly care utilization within abortion-restrictive states. Given that most affected infants rely on public insurance, these findings underscore the importance of pragmatic policy planning and resource allocation to expand healthcare services for congenital anomaly care in states restricting abortion access.

Abbreviations: ICD = International Classification Disease

Scientific Session 3: Fetal

3:00 PM – 4:30 PM

S23

EXPERT CONSENSUS ON EX-UTERO INTRAPARTUM TREATMENT: A DELPHI STUDY FROM THE NORTH AMERICAN FETAL THERAPY NETWORK (NAFTNET)

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Abstract: Purpose:
Ex-utero intrapartum treatment (EXIT) may be indicated in fetuses at risk for cardiorespiratory compromise at birth. However, standardized guidelines for its application remain lacking. We conducted a study of the North American Fetal Therapy Network (NAFTNet) to establish expert consensus on indications, maternal eligibility, and resource allocation for EXIT.

Methods:
A three-round Delphi study was conducted among maternal-fetal medicine, pediatric surgery, otolaryngology, neonatology, and related specialists within 54 NAFTNet centers. Consensus was defined as ≥70% agreement. Statements that reached 50-70% agreement were further investigated in subsequent rounds. Panelists reviewed clinical scenarios across iterative surveys.

Results:
Consensus was achieved on 61 statements. The most impactful findings related to multidisciplinary coordination, diagnostic indications for EXIT, perioperative imaging, and maternal-fetal co-morbidities. Multidisciplinary collaboration between obstetricians, otolaryngologists, fetal surgeons, neonatologists, geneticists, and cardiologists was considered integral when considering EXIT (75–94% agreement). Consensus statements regarding diagnostic indices of severity, delivery techniques, and maternal and fetal co-morbidities are outlined in Table 1. Concern for airway compromise was consistently identified as the primary driver for EXIT. Isolated imaging measurements or clinical findings were typically not sufficient alone to warrant EXIT. Prenatal imaging with ultrasound (100%), fetal echocardiography (83.7%), fetal MRI at diagnosis (93.6%) and within one week of anticipated delivery (72.3%) was recommended to guide operative planning. Inadequate preparation and missing personnel were frequently reported themes for resource under-allocation, whereas unnecessary EXIT procedures and redundant team members were reported themes for resource over-allocation.

Conclusions:
We establish the first multi-institutional, multi-disciplinary expert consensus on EXIT indications and techniques. Findings emphasize imaging features concerning for airway compromise and specific diagnostic indices of severity as central drivers for pursuing EXIT, clarify maternal-fetal eligibility, and define appropriate imaging practices and timing. Together, these consensus statements provide a foundation for standardizing EXIT procedures. Future prospective cohort studies could further refine these recommendations and enhance decision-making in these complex cases.

Abbreviations: EXIT – Ex-utero Intrapartum Treatment

NAFTNet – North American Fetal Therapy Network

MRI – Magnetic Resonance Imaging

Table 1. Indications for EXIT

Domain	Consensus Statement 1	Consensus Statement 2	Consensus Statement 3	Consensus Statement 4	Consensus Statement 5	Consensus Statement 6
Head & Neck Masses	EXIT consultation is indicated for prenatally diagnosed head and neck masses (100%).	Lymphovascular malformations (75%) and teratomas (97%) warrant consideration for EXIT.	Nasoldolacrimal (82%), lipomas (87%), and branchial cleft cysts (89%) do not necessitate EXIT consultation.	The inability to demonstrate airway patency on imaging warrants EXIT regardless of other diagnostic indices of severity (96.7%). Isolated findings of abnormal flow of mouth location (79%), neck extension (72%), TEDI >12 (73%), presence of solid components (74%), suspected teratoma (82%), neck vessel compression (90%) are not sufficient alone to determine need for EXIT. In patients with long-segment tracheal atresia, EXIT or comfort care are both considered appropriate options (76.3%, 71.1%, respectively). For patients with aerodigestive tract obstruction the presence of agnathia/dysgnathia warrants EXIT (91.9%). However, abnormal frontonasal angle (83.8%), mandibular length (86.5%), and maxilla width ratio (91.9%) are not sufficient indications alone. BPS (76%) and duplication cysts (85%) without airway compression do not warrant EXIT.	The presence of polyhydramnios with a head/neck mass warrants consideration for EXIT (100%). In patients with tracheal stenosis, EXIT or delivery attended by an airway surgeon are considered appropriate options (84.2%, 89.5%, respectively). CVR >1.4 (79%) alone is not sufficient to warrant EXIT-to-resection.	Head and neck masses are considered potentially appropriate for resection on placental support (75%). In patients with an inverted diaphragm, the presence of non-immune hydrops/ascites warrants EXIT (75%) while the presence of polyhydramnios (53%) did not reach consensus. CLMs without severe features should not undergo EXIT (100%); cesarean with immediate resection in an adjacent operating room may be a better choice for these patients (85%).
Craniofacial Skeletal Conditions	EXIT consultation is indicated for craniofacial skeletal conditions (91.8%).	Isolated cleft lip with aerodigestive obstruction warrant consideration for EXIT (91.9%).	For patients with a craniofacial skeletal condition, polyhydramnios and an abnormal jaw index is sufficient to warrant EXIT (89%)			
Thoracic/Mediastinal Masses	EXIT consultation is indicated for thoracic and mediastinal masses (85.7%).	Teratomas and lymphatic malformations warrant consideration for EXIT-to-resection (73%).	The presence of airway compression warrants EXIT-to-resection (82.1%).		CVR >1.4 (79%) alone is not sufficient to warrant EXIT-to-resection.	
Other Rare Diagnoses	EXIT consultation is indicated for patients requiring removal of tracheal occlusion balloons (86.7%). Trisomy 21	Isolated congenital heart disease (24.5%) does not warrant EXIT consultation.	Sacrococcygeal teratomas did not reach consensus as an indication for EXIT consultation (50.4%).			
Maternal and Fetal Co-morbidities	(86%), minor cardiac defects (80%), multiple maternal cesarean deliveries (77%), maternal hepatitis B/C (90%), and maternal HIV (85%) should not preclude EXIT.	EXIT should not be considered in the setting of trisomy 18 (90%), trisomy 13 (74%).				

Consensus threshold was ≥70% agreement. Negative statements reflect responses that did not reach 50% agreement and are reported as inverse statements and italicized. Legend: TEDI = Tracheoesophageal Displacement Index; CVR = Congenital Pulmonary Airway Malformation Volume Ratio. BPS = bronchopulmonary sequestration

S24

THE ROLE OF PRENATAL DIAGNOSIS IN PREDICTING NEONATAL COMPLICATIONS AND OUTCOMES FOLLOWING EX-UTERO INTRAPARTUM TREATMENT

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Abstract: Purpose: This study aims to identify associations between prenatal diagnosis and outcomes in neonates who undergo ex-utero intrapartum treatment (EXIT).

Methods: A retrospective review was performed of EXIT procedures at seven specialized fetal centers (1/1999-2/2025). Prenatal imaging, procedure details, and neonatal outcomes were abstracted. EXIT procedures were grouped by indication relating to predicted airway compromise (i.e., tracheal displacement, atresia, iatrogenic occlusion) or predicted cardiopulmonary compromise (i.e., complete heart block, cardiac compression from mass effect, high-output heart failure). Descriptive, univariate, and multivariate analyses were used.

Results: Seventy EXIT procedures were performed for 71 neonates. Prenatal diagnoses included: head/neck mass (31), congenital diaphragmatic hernia (11), congenital high airway obstruction syndrome (8), mandibular and/or cleft anomaly (8), sacrococcygeal teratoma (6), congenital lung lesion (3), pericardial mass (1), complete heart block (1), and thoraco-omphalopagus twins (1). Indications were 83% airway-related and 17% cardiopulmonary-related. Gestational age (GA) at EXIT was later in airway cases (34.8 weeks [IQR:33.0-36.4] vs 32.6 weeks [IQR:28.5-35.4]; p=0.02). About half of all cases were urgent/emergent (59% vs 42%; p=0.28). Intraoperative resuscitative efforts (medications, fluids, blood products, chest

compressions, procedures) were performed in 67% of airway and 92% of cardiopulmonary cases (p=0.16). Intraoperative complications (bradycardia, hypothermia, hypoxemia, hypoglycemia, pneumothorax) were similar between groups (47% vs 67%; p=0.34). Only one cardiopulmonary case resulted in intra-operative deaths (both thoraco-omphalopagus twins). Of 69 surviving neonates, 45% of airway and 64% of cardiopulmonary cases had at least one postnatal complication (p=0.33), with no difference by individual complication except in necrotizing enterocolitis (0% vs 18%; p=0.02) (FIGURE). Survival-to-discharge was similar between groups (78% vs 82%; p>0.99). In multivariate regression models controlling for indication and intraoperative complication, resuscitative efforts of any kind were associated with increased odds of a postnatal complication (OR:9.05, 95%CI:2.18-37.61) and all-cause mortality (OR:8.72, 95%CI:1.01-75.20).

Conclusion: EXIT procedures for airway indications are more common, occur at later GA, and carry fewer complications than those for cardiopulmonary indications, though neonatal survival-to-discharge is similar. Regardless of EXIT indication, intraoperative resuscitative efforts are associated with postnatal complications and increased mortality. Prospective studies are needed to identify unique predictors of intraoperative resuscitative efforts in airway and cardiopulmonary EXIT procedures.

Abbreviations: EXIT – Ex-utero intrapartum treatment
GA – Gestational age

S25

PERINATAL MANAGEMENT OF CONGENITAL LUNG MALFORMATIONS: A MULTICENTER COMPARISON OF EXIT, IMMEDIATE RESECTION, AND EMERGENT SURGERY

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Abstract: Purpose:
Congenital lung malformations (CLMs) comprise a class of anomalies often diagnosed prenatally. Perinatal intervention may optimize cardiorespiratory stability in select cases. We report characteristics, perioperative management, and outcomes for a national cohort of patients undergoing perinatal or immediate postnatal therapy for CLMs.

Methods:
A retrospective analysis of prenatally diagnosed CLMs (2016–2024) from a 17-center consortium was performed. Prenatal findings and neonatal outcomes for fetuses who underwent EXIT, cesarean section-to-immediate resection (STR), or standard delivery with resection within 24 hours of birth (emergent early resection, ER) were reviewed.

Results:
Of 1756 CLM patients, 15 (0.9%) were delivered via EXIT at 5 centers and 10 (0.6%) underwent DOL0 resection at 6 centers. Among EXIT patients, 13 (86.7%) underwent EXIT-to-resection, while 2 (13.3%) underwent EXIT-to-thoracostomy tube with delayed resection. DOL0 resections were either performed as planned STR due to large lesions (n=4) or emergently due to respiratory compromise after birth, ER (n=6). Prenatal characteristics are outlined in Table 1.

Among EXIT cases, the majority of pathology-based diagnoses were congenital pulmonary airway malformations (CPAMs) (60%). Extralobar sequestration, malignancy (pleuropulmonary blastoma/adenocarcinoma), bronchial atresia, and congenital lobar emphysema each compromised 6.7%. 13.2% did not report pathology. 100% of STR cases were CPAMs. Among ER cases, 33.3% were CPAMs, 50% were malignancies, and 16.7% were bronchial atresias.

Need for postnatal ventilatory support was nearly universal amongst groups (100% EXIT, 75% STR, 100% ER). Median ventilator days were longer for EXIT (6 [3–8]) than ER (1 [0.5–1.5]); Ventilator days were not reported for STR patients. ECMO use was 13%, 50%, and 17% for EXIT, STR, and ER, respectively. Procedure survival was high for all (100% EXIT, 100% STR, 83.3% ER). Thirty-day survival was 87%, 100%, and 50% in the EXIT, STR, and ER groups, respectively and median length of stay was 36 days [24–60 IQR], 24 days [19–39 IQR], and 17 days [9–26 IQR] in the groups.

Conclusions:
EXIT, STR, and ER have comparable outcomes in high-risk CLM patients. Consideration should be given to maternal risk in delivery decision-making and further study is warranted to better define a subset of patients who might benefit from delivery modification.

Abbreviations: CLM – Congenital lung malformation
EXIT – Ex utero intrapartum treatment
STR – Cesarean section-to-immediate resection
ER – Emergent early resection (within 24 hours of birth)
DOL0 – Day of life 0
CPAM – Congenital pulmonary airway malformation
ECMO – Extracorporeal membrane oxygenation
IQR – Interquartile range

Table 1. Prenatal characteristics of patients undergoing perinatal intervention for CLM

Category	EXIT	STR	ER
Median EGA [IQR]; (n)	37.6 [36.5-38.3]; (15)	38.2 [37.9-38.5]; (4)	36.1 [33.8-36.4]; (6)
Median Birthweight [IQR]; (n)	3350 [3220-3550]; (15)	3580 [3391-3760]; (4)	2900 [2365-3775]; (6)
Median Peak CVR [IQR]; (n)	4.215 [3.4-4.8]; (14)	3.3 [2.3-4.2]; (4)	2.75 [2.24-3.56]; (6)
Median CVR at Intervention [IQR]; (n)	2.405 [1.64-3.11]; (14)	2.20 [1.93-2.76]; (4)	1.90 [0.89-3.38]; (6)
Mediastinal Shift %; (n)	93.333 (15)	66.7 (3)	100 (6)
Hydrops %; (n)	33.33 (15)	0 (4)	16.7 (6)
Polyhydramnios %; (n)	86.667 (15)	33.3 (3)	50.0 (6)
Maternal Steroids %; (n)	93.33 (15)	100 (4)	66.6 (6)
Median Number of Steroid Courses [IQR]; (n)	2 [2.0 - 3.0]; (14)	2 [2-2]; (4)	3 [2-3]; (3)

Values are presented as median [IQR]; (n) or % (n). NR = not reportable due to small sample size.

S26

FETOSCOPIC VERSUS OPEN APPROACHES TO FETAL MYELOMENINGOCELE CLOSURE, A SINGLE INSTITUTION EXPERIENCE

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Abstract: Purpose: Myelomeningocele (MMC) is a congenital malformation resulting from aberrant neutral tube closure. After results of the Management of Myelomeningocele Study demonstrated that fetal MMC closure reduces the need for a shunt, fetal MMC closure has gained widespread acceptance. Select centers have transitioned from open to fetoscopic techniques given the potential for vaginal deliveries following closure, which was prohibited in open closures due to risk of uterine rupture. The purpose of this analysis was to compare outcomes of open and fetoscopic MMC closures at a single fetal care center.

Methods: We conducted a retrospective review of maternal-fetal dyads who underwent fetal MMC closure between October 2021-July 2025. The most recent open MMC closures (n=22) were compared to all fetoscopic closures (n=22). Demographic, operative, and outcomes data were compared between groups using appropriate statistical methods.

Results: We analyzed a total of 44 fetal MMC closures, 50% of which were performed fetoscopically. Maternal comorbidities were similar between groups, except higher BMI (28 vs 31, p=0.03) in the open repair cohort. Fetoscopic MMC closures were performed at a later gestational age (25.6 vs 23.9 weeks, p< 0.01, Table) and had longer operative times (5.0 vs 3.3 hours, p< 0.01). Improvement in hindbrain herniation was observed in more than 90% of cases in both cohorts on two-week post-operative MRI. While there were no vaginal deliveries in the open group, 53% of those in the fetoscopic group delivered vaginally (p < 0.01). Although the latency period between surgery and delivery was not significantly different between cohorts, those who underwent a fetoscopic closure delivered at a later gestational age (36.1 vs 32.9 weeks, p=0.01). In addition, the fetoscopic group was less likely to develop preterm premature rupture of membranes (PPROM) (44% vs 81%, p=0.02). Among those with data available, shunt placement was not significantly different between the open and fetoscopic cohorts (25% vs 6%, p=0.14), though was lower in the fetosocpic group.

Conclusion: Fetoscopic MMC closure was associated with favorable maternal outcomes including over half delivering vaginally and fewer having PPROM. Further prospective studies are required to better understand long-term outcomes particularly regarding the need for shunt placement.

Abbreviations: MMC, Myelomeningocele, PPROM, Preterm premature rupture of membranes

Characteristics and Outcomes Compared by MMC Closure Technique

	Combined Cohort (n = 44)	Open (n = 22)	Fetoscopic (n = 22)	p-value
GA at MMC Closure (weeks)	**25.0 [23.9, 25.6]**	**23.9 [23.6, 24.8]**	**25.6 [25.0, 26.0]**	**<0.0001****
Surgery Duration (hours)	**4.1 [3.3, 4.9]**	**3.3 [2.7, 4.0]**	**5.0 [4.4, 5.6]**	**<0.0001****
Maternal Hospital LOS (days)	4 [4, 4]	4 [4, 4]	4 [3, 4]	0.4047
Hindbrain Herniation Improvement	39/43 (90.7)	19/21 (91)	20/22 (91)	0.1310
Vaginal Delivery	**10/40 (25)**	**0/21 (0)**	**10 /19 (53)**	**0.0001****
GA at Delivery (weeks)	**33.9 [31.2, 36.2]**	**32.9 [30.6, 34.4]**	**36.1 [31.3, 38.3]**	**0.0132***
Latency Period (days)	66.5 [45.5, 79.0]	61.0 [45.0, 71.0]	71.0 [46.0, 91.0]	0.1292
Complications				
Uterine bleeding	0	0	0	----
Fetal bradycardia	0	0	0	----
Abruption	0	0	0	----
Pulmonary edema	1/44 (2.3)	1/22 (4.6)	0	0.5000
Maternal wound Infection	0	0	0	----
Chorioamnionitis	0	0	0	----
PPROM	25/39 (64)	17 (81)	8 (44)	**0.0178***
VP Shunt	5/28 (18)	4/16 (25)	1/16 (6.3)	0.1442
Median Time to Follow Up (years)	**1.9 [1.1, 2.5]**	**2.5 [2.2, 3.2]**	**1.2 [0.8, 1.6]**	**<0.0001****

GA, gestational age; MMC, myelomeningocele, PPROM, preterm premature rupture of membranes, VP, ventriculoperitoneal. Data reported as n (percentage) or median [interquartile units]. Statistical significance was determined using Fisher's exact tests and Mann–Whitney U tests between groups where appropriate, * indicates $p < 0.05$ and ** $p < 0.01$.

S27

INCIDENCE OF HISTOLOGIC CHORIOAMNIONITIS FOLLOWING FETOSCOPIC ENDOLUMINAL TRACHEAL OCCLUSION FOR CONGENITAL DIAPHRAGMATIC HERNIA

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Abstract: Purpose: Histologic chorioamnionitis (HCA) is an inflammatory placental condition associated with preterm birth, neonatal infection, and long-term morbidity. Risks of prematurity and surgical complications are higher among Congenital Diaphragmatic Hernia (CDH) patients after Fetoscopic Endoluminal Tracheal Occlusion (FETO), but the incidence and consequences of HCA remain unclear. This study aimed to determine the incidence of HCA among CDH patients undergoing FETO compared with those managed expectantly.

Methods: Retrospective cohort study of maternal-child dyads with isolated left-sided CDH who underwent comprehensive evaluation (fetal ultrasound, MRI, echocardiogram) between September 2016 and January 2023 and subsequently received either FETO or expectant management at a high-volume fetal care center. Inclusion required eligibility for fetal surgery: singleton pregnancy, normal karyotype, and delivery within a dedicated perinatal unit. Placental pathology was reviewed for maternal and fetal inflammatory responses, classified using the Amsterdam Consensus Criteria, which provide standardized definitions for maternal (MIR) and fetal (FIR) response. HCA was defined as acute inflammatory cell infiltration of the chorion, amnion, or both. These variables were selected given their links to adverse neonatal outcomes and use as markers of placental inflammation. Categorical outcomes were compared between FETO and non-FETO groups using Fisher's exact test, and fetal weight was analyzed with the Wilcoxon test ($p < 0.05$).

Results: Forty-seven dyads were included (FETO n=12, non-FETO n=35). HCA was present in 38.3% overall (33.3% FETO vs 40.0% non-FETO, p=0.744). Fetal inflammatory response was absent in two thirds overall, with similar distribution between FETO (75.0% no inflammation) and non-FETO (65.7%). Maternal inflammatory response showed a similar pattern (66.0% no inflammation overall). Higher-stage inflammation (stage 2 FIR and stage 2 MIR) occurred more frequently in the FETO group (25.0%) than in non-FETO (11.4%). Median placental weight was lower in FETO (379 [318–407] g) than non-FETO (423 [367–485] g) (p=0.102).

Conclusion: HCA was common in CDH pregnancies but did not differ significantly between FETO and non-FETO groups. Both fetal and maternal stage 2 inflammation appeared more frequent after FETO, though limited sample size prevents firm conclusions. These findings suggest that while FETO does not clearly increase HCA risk, the trend toward more severe inflammation warrants investigation in larger cohorts.

Table 1. Placental pathology results for the overall cohort and stratified by FETO and non-FETO groups.

	Overall (N=47)	FETO (N=12)	Non-FETO (N=35)	p-value
HCA Present	18 (38.3%)	4 (33.3%)	14 (40.0%)	0.744
Fetal inflammatory response - stage 1	8 (17.0%)	0 (0%)	8 (22.9%)	0.093
Fetal inflammatory response - stage 2	7 (14.9%)	3 (25.0%)	4 (11.4%)	0.349
Fetal inflammatory response - grade 1	15 (31.9%)	3 (25.0%)	12 (34.3%)	0.725
Maternal inflammatory response - stage 1	9 (19.1%)	1 (8.3%)	8 (22.9%)	0.412
Maternal inflammatory response - stage 2	7 (14.9%)	3 (25.0%)	4 (11.4%)	0.349
Maternal inflammatory response - grade 1	15 (31.9%)	3 (25.0%)	12 (34.3%)	0.725
Maternal inflammatory response - grade 2	1 (2.1%)	1 (8.3%)	0 (0%)	0.255

Footnote: The stage of inflammatory response indicates the anatomic progression of inflammation, reflecting the depth and extent of involvement. The grade represents the severity of the inflammatory infiltration within affected tissues. For each inflammatory response category, the undocumented remaining cumulative percentage represents patients with no acute inflammation (grade or stage 0).

S28

MAMMALIAN-OPTIMIZED PLASMID DNA (PDNA) AS A NOVEL AGENT OF TRANSAMNIOTIC NUCLEIC ACID THERAPY (TRANAT): PHARMACOKINETICS IN A MURINE MODEL

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Abstract: Purpose: Current FDA approved gene therapies utilize either viral vectors or single stranded DNA, both of which carry risks. Mammalian-optimized plasmid DNA (pDNA) may minimize or avoid these risks but require plasmid entry into the nucleus. Lipid-based encapsulation of pDNA enables plasmid nuclear entry via passive low frequency uptake, by nuclear localization sequences using transcription factors with microtubule trafficking, and by consolidation during mitosis when nuclear membrane reconstruction occurs. These processes are continuously happening during fetal development, conceivably facilitating pDNA nuclear entry. Thus, we sought to determine whether encapsulated pDNA could be delivered to the fetus via the minimally invasive transamniotic route while comparing two established lipid-based encapsulation methods.

Methods: Seven Sprague-Dawley dams were divided into four groups depending on the content of volume-matched intra-amniotic injections performed in all their fetuses (n=92) on gestational day 17 (E17; term=E21-E22). Two groups received pDNA containing a firefly luciferase gene (figure) either encapsulated within a lipid nanoparticle (LNP; n=28) or within a semi-synthetic lipid-cationic composite (lipopolyplex; n=24). Two groups received either the same LNP (n=28) or the same lipopolyplex (n=12) but devoid of pDNA to serve as corresponding controls. Animals were euthanized at term, when 15 fetal anatomical sites and annexes were screened for luciferase activity via microplate luminometry as surrogate for host translation of functioning protein from the firefly luciferase DNA. Statistical analyses included the Fisher's exact and Wilcoxon rank sum tests ($p < 0.05$).

Results: Overall fetal survival was 87% (80/92) with no significant differences across the groups. When controlled by the corresponding group without pDNA, positive luminescence was detected in the LNP-pDNA group at most fetal anatomical sites (heart, intestines, kidney, liver, lungs, spleen, thymus, and bone marrow $p< 0.001$-$p=0.034$) and at all fetal annexes (placenta, umbilical cord, and gestational membranes; all $p< 0.001$) (table – abbreviated). When controlled by the corresponding group without pDNA, positive luminescence was detected in the lipopolyplex-pDNA group only in the umbilical cord ($p=0.002$).

Conclusions: pDNA is a viable novel agent of transamniotic nucleic acid therapy (TRANAT). Gene translation from pDNA can be optimized by lipid nanoparticle encapsulation. pDNA-based TRANAT may become a practical alternative for fetal gene therapies.

Abbreviations: pDNA = plasmid DNA; LNP = lipid nanoparticle; LNP-pDNA = LNP encapsulated plasmid DNA; TRANAT = transamniotic nucleic acid therapy

S29

IN UTERO BASE EDITING MITIGATES THE DISEASE PHENOTYPE OF MUCOPOLYSACCHARIDOSIS TYPE 1 IN A HUMANIZED MURINE MODEL

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Abstract: Purpose:
Mucopolysaccharidosis Type 1 (MPS-I) is a multiorgan lysosomal storage disease resulting from mutations in the IDUA gene associated with IDUA deficiency and glycosaminoglycan (GAG) accumulation. A G>A (W402X) mutation accounts for severe disease in 40% of patients and is amenable to correction via adenine base editing (ABE). In the current study, we develop and characterize a humanized murine model containing the human W402X sequence and assess phenotype correction following systemic delivery of ABE8.8 mRNA and a W402X-targeting gRNA in ionizable lipid nanoparticles (LNP_ABE_W402X) to fetal and adult recipients.
Methods:
The orthologous mouse IDUA sequence was replaced with the human IDUA W402X mutation to create W402X mice. At 6 months age, IDUA activity and musculoskeletal, neurodevelopmental, and cardiac phenotypes were assessed. W402X mice were injected intravenously at gestational day 16 (n=10) or 4-6 weeks of age (n=7) with LNP_ABE_W402X. Serum IDUA activity, liver editing, and phenotypic parameters noted above were assessed. Uninjected W402X (n=10) and B6 (n=8) mice served as age-matched controls. Data is compared via T-test with a significance level of $p< 0.05$.
Results:
W402X mice have significantly lower serum and liver IDUA activity compared to healthy controls (serum: 0.23 vs. 2.1 nmol/hr/mL, $p< 0.001$; liver: 0.37 vs. 12.8 nmol/hr/mg, $p< 0.001$). W402X mice also demonstrate decreased grip strength (3.0 vs. 4.4 GFU/g, $p=0.003$), hypoactivity on open field testing (47.9 vs. 64.6m, $p=0.03$), abnormal femur cortical bone deposition (0.39 vs. 0.44mm, $p< 0.001$), and dilated ascending aortas (2.4 vs. 1.5mm, $p< 0.001$). After adult injection of LNP_ABE_W402X, mean A>G liver editing was 21.3% and was associated with improvement in liver IDUA activity (4.4 vs. 0.37 nmol/hr/mg, $p< 0.001$) and mobility (49.0 vs. 35.6m distance traveled, $p=0.035$) compared to W402X controls. The in utero edited cohort also demonstrated improved serum IDUA activity at 2 months (0.24 vs. 0.08, $p=0.049$) and 4 months age (0.66 vs. 0.06, $p< 0.001$).
Conclusion:
Humanized W402X mice recapitulate much of human MPS-I disease phenotype. In vivo adenine base editing to correct the W402X variant improves IDUA enzyme activity leading to a less severe phenotype in this model.

Abbreviations: Mucopolysaccharidosis Type 1 (MPS-I)
Alpha-L-Iduronidase (IDUA)
Glycosaminoglycan (GAG)
Adenine base editing (ABE)
Ionizable lipid nanoparticle (LNP)
Messenger RNA (mRNA)
Guide RNA (gRNA)

S30

THE HIPPO/YAP/TAZ PATHWAY IS INVOLVED IN STRETCH-INDUCED ESOPHAGEAL GROWTH IN A FETAL LAMB MODEL OF LONG-GAP ESOPHAGEAL ATRESIA

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Abstract: Purpose: To characterize the effectors of mechanotransduction signaling in stretch-induced esophageal growth.

Methods: Following IACUC approval, time-dated fetal lambs (108 to 120 days of gestation) underwent thoracic esophagectomy. Both esophageal ends were ligated and sutured together to create an internal pexy under high tension. Lambs were delivered on postoperative day 2 (POD2) (n=7), POD6 (n=9) or term (n=5). The native esophagus collected at model creation served as control tissue. Specimens were bluntly separated into two layers: inner layer (IL) (epithelium, lamina propria, muscularis mucosa, submucosa) and outer layer (OL) (submucosa, muscle layer, adventitia). RNA sequencing (RNAseq), proteomics, immunohistochemistry, western blotting and real-time qRT-PCR were performed on the specimens. Mann-Whitney's or unpaired t-test were used for statistical analyses.

Results: RNAseq analysis and Ki67 immunostaining revealed that tension-induced esophageal growth occurred through cell proliferation in the IL and through muscle hypertrophy in the OL. In the OL, a significant increase in Yap1 activity (Yap1/pYap1) and Tead1 level was observed on POD2 and POD6 by western blotting and proteomics ($p < 0.05$). Immunostaining of esophageal specimens showed similar trends for nuclear localization of Yap1 at all timepoints. Mechanical signaling was transduced in part through focal adhesions, as evidenced by increased levels of Endoglin at POD2/POD6 ($p < 0.01$) and increased expression of Talin1 at POD2 ($p < 0.001$). Additional findings from RNAseq and confirmatory western blot analysis demonstrated upregulation of the Ankrd2 pathway and MrtfB/Srf axis in stretch-induced muscle hypertrophy in the OL (Figure 1A). In the IL, mechanical stimulus was transmitted through Zyxin (increased protein levels at every timepoint, $p< 0.05$), which is known to induce actin-stress-fiber polymerization and which conferred significantly decreased □-Actin levels at POD2 and POD6 ($p < 0.01$). Although Yap1 activity significantly decreased at POD6 ($p < 0.05$), the expression of two Yap1 target genes involved in cell proliferation (CTGF, TP73) was increased from POD2 ($p < 0.001$) (Figure 1B).

Conclusion: The application of mechanical tension in the fetal lamb esophagus induces distinct responses in the IL and the OL, with Hippo pathway signaling conferring proliferative and hypertrophic responses in the epithelial and muscular cell populations respectively. Confirmatory studies on key pathway targets in clinical esophageal atresia patient specimens are ongoing.

Abbreviations: POD: Postoperative day

IL: Inner layer
OL: Outer layer
RNAseq: RNA sequencing

S31

TRANSCRIPTOMIC SIGNATURES OF INTESTINAL DYSFUNCTION IN A FETAL LAMB MODEL OF COMPLEX GASTROSCHISIS

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Abstract: Purpose:
Complex gastroschisis (cGS) is characterized by intestinal dysmotility, malabsorption, and feeding intolerance. These complications are hypothesized to result from chronic ischemia and inflammation of the extruded bowel. We aimed to define the transcriptomic profile of fetal ovine cGS intestine to elucidate pathways linking inflammation, extracellular matrix (ECM) remodeling, and intestinal dysfunction.
Methods:
Using an established fetal sheep model, cGS was created by lymphovascular constriction of the intestine at the abdominal defect at mid-gestation (75 days). Proximal intestinal segments were harvested three weeks post-induction from cGS fetuses (n=4) and littermate controls (n=5). Bulk RNA sequencing identified differentially expressed genes (DEGs) analyzed by Gene Ontology (GO) and KEGG pathway enrichment (P <.05). Results were integrated with cytokine profiling (IL-8 and MIP-1α) from amniotic fluid (AF) samples and histologic evaluation of villous architecture and epithelial proliferation (Ki67).
Results:
Hierarchical clustering distinctly separated cGS from controls, identifying 761 DEGs. GO enrichment demonstrated predominant alterations in ECM binding, integrin signaling, and receptor interaction, indicating disrupted epithelial-stromal communication. KEGG analysis identified ~300 pathways, with 20 significantly enriched, including ECM-receptor interaction, cytokine-cytokine receptor signaling, IL-17 signaling, complement/coagulation cascades, and PI3K-Akt signaling. Genes associated with IL-8 (CXCL8) and MIP-1α (CCL3) were upregulated, corresponding with elevated AF cytokine levels and confirming activation of neutrophil- and macrophage-mediated inflammatory networks. Together, these findings support a unifying ischemia-inflammation-fibrosis model, corroborated by histologic analysis that revealing flattened villi, submucosal edema, and reduced epithelial Ki67 staining, consistent with decreased epithelial proliferation and loss of mucosal architecture (Figure). Mid-bowel (extruded) segments demonstrated greater enrichment of inflammatory and coagulation pathways than intra-abdominal loops, reflecting heightened ischemic stress in the exposed bowel.
Conclusions:
In the fetal ovine model of cGS, transcriptomic profiling defines an ischemia-driven molecular signature dominated by ECM dysregulation, cytokine signaling, and impaired epithelial recovery. Integration of transcriptomic, cytokine, and histologic findings highlights IL-8 and MIP-1α as central mediators of microvascular compromise and tissue injury. Disruption of PI3K-Akt and ECM-integrin signaling suggests impaired reparative and angiogenic responses that will be evaluated as pathways potentially modulated by in-utero repair to mitigate ischemic injury and improve postnatal outcomes.

Abbreviations: cGS - complex gastroschisis
ECM - extracellular matrix
DEGs - differentially expressed genes
GO - gene ontology
IL-8 - interleukin 8
AF - amniotic fluid

S32

LOSS OF PROMININ-1 LEADS TO IMPAIRED CILIOGENESIS ASSOCIATED WITH BILIARY ATRESIA

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Abstract: Background/Purpose:
Biliary atresia (BA) is the most common cause of end-stage liver failure in children and the leading indication for pediatric liver transplantation. Multiple gene variants encoding primary cilia proteins in BA patients have been identified, suggesting that BA is a ciliopathy. We previously reported that Prominin-1 (Prom1, aka CD133), a known ciliary body protein expressed in biliary progenitor cells along the extrahepatic bile duct, is essential for biliary epithelial regeneration. Prom1 loss-of-function disrupts primary cilia formation, biliary progenitor cell differentiation and migration, and impairs bile duct regeneration. Biliatresone, an environmental toxin known to cause BA in sheep, similarly disrupts primary cilia formation and impairs biliary development. We hypothesize that Biliatresone impairs primary cilia formation and function to produce BA through Prom1.

Methods:
Mouse-derived wildtype (WT) extrahepatic biliary organoids (n=5 each) were isolated and grown in Matrigel ± Biliatresone for four days for growth analysis (5ug/ml) and immunofluorescence and qPCR (2ug/ml). WT and Prom1 KO biliary organoids (n=3 each) were analyzed by RNA-sequencing to identify the cellular processes or signalling pathways that are differentially enriched in either group.

Results:
Biliatresone-treated WT organoids demonstrated smaller, more irregular organoids compared to control in a dose-dependent fashion (0.0029±0.0013mm2 vs. 0.020±0.013mm2, p=0.0189). Biliatresone-treated organoids also induced loss of biliary epithelial cell polarity (decreased apical localization of cytoskeletal protein phosphorylated EZRIN), fewer primary cilia (decreased acetylated-TUBULIN) ($p < 0.005$), and decreased PROM1 expression on primary cilia ($p < 0.01$) (two-sided, unpaired t-test), all notably consistent with biliary organoids derived from Prom1 KO mice and as previously reported from infants with BA. These observations are consistent with the bulk RNA-sequencing data, which showed that Prom1 KO biliary organoids exhibited downregulation of cilia and cytoskeleton structure/function and growth/differentiation compared to WT organoids. Notably, Sonic Hedgehog signalling, which has been previously described to promote biliary epithelial repair, was differentially downregulated in KO organoids.

Conclusion:
BA-causing toxin Biliatresone decreases biliary organoid growth and Prom1 expression. Loss of Prom1 expression is associated with downstream ciliogenesis pathways and vice versa. Given these findings and its role in biliary epithelial regeneration, Prom1 loss-of-function is likely a critical step in the pathogenesis of BA.

Abbreviations: Biliary Atresia - BA

Scientific Session 4: Global

3:00 PM – 4:30 PM

S33

THE JAMES A. O'NEILL, JR. GLOBAL PEDIATRIC SURGERY RESEARCH GRANT: LESSONS LEARNED AND RESEARCH THEMES IN APSA FUNDED GLOBAL PEDIATRIC SURGERY RESEARCH

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Abstract: The American Pediatric Surgical Association (APSA) James A. O'Neill, Jr. Global Pediatric Surgery Research grant was established in 2022 to foster and encourage pediatric surgery research in resource-constrained environments. This grant was designed by the APSA Foundation and the Global Surgery Committee to support pediatric surgeons and trainees in low- and middle-income countries in sustainable, translational, high-impact research endeavors.

Applications are accepted yearly, reviewed by the grant committee, and awarded a combined total of twenty-five thousand dollars per year. The first three years of grant cycle applications were reviewed and analyzed in terms of applicant and country characteristics, research topics, and methodology.

A total of 83 applications were submitted over three years, with a median of 28 per year (range 27 to 29). Applications were received from 34 countries including World Health Organization (WHO) African Region (35%), Eastern Mediterranean Region (9%), European Region (18%), Region of Americas (18%), and South-Eastern Asian Region (18%). Income levels consisted of 2 low, 18 low-middle, 13 upper-middle, 1 high. Most applicants (57%) in 2023 and 2024 were early career surgeon scientists, while most 2025 applicants (59%) were middle to late career surgeon scientists. Across all application years, general pediatric surgery was the most common research topic followed by urology (79% vs 15 %). General pediatric surgery topics included congenital anomalies (38%), oncologic (6%), minimally invasive surgery (3%), and infectious disease (2%). Methodology varied with highest frequency overall seen in implementation studies (21%), capacity building (19%), and cross-sectional studies (12%) as well as basic science (7%). Two applicants have been awarded grant funds each application year to support their research. Awardees are from South Africa, Tanzania, Uganda, Ethiopia (x2), and Nigeria. Their research involves fecal incontinence, gastroschisis, ostomy care, intussusception, and lower urinary tract disorders.

Interest and diversity of applicant location, experience, topics, and investigative approach have been robust for the first three years of the James A. O'Neill, Jr. Global Pediatric Surgery Research grant. APSA's innovative effort to support LMIC pediatric surgery research warrants ongoing commitment and funding, especially given international interest and the paucity of similar funding opportunities.

Abbreviations: American Pediatric Surgical Association (APSA)
World Health Organization (WHO)

Low and Middle Income Countries (LMIC)

Grant Applicant and Proposal Characteristics by Year	2023 (n=29)	2024 (n=27)	2025 (n=27)*	Total (n=83)
Career Level				
Current trainee	6	4	4	14
Early (< 5 years)	11	11	7	29
Mid (5-10 years)	5	6	9	20
Late (>10 years)	7	6	7	20
Country Income Level*				
Low Income Country	3	1	0	4
Low-Middle Income Country	19	20	19	58
Upper-Middle Income Country	7	6	9	22
High Income Country	0	0	1	1
Country WHO Region*				
African Region	18	12	12	42
Eastern Mediterranean Region	2	3	3	8
European Region	3	3	4	10
Region of Americas	3	3	4	10
South-East Asian Region	2	6	6	14
Western Pacific Region	0	0	0	0
Topic of Research				
General Pediatric Surgery	24	21	21	66
Urology	4	3	5	12
Anethesia/Pain	1	3	0	4
Gynecology	0	0	1	1
Methodology				
Basic Science	1	1	4	6
Randomized Control Trial	2	3	0	5
Implementation	6	6	5	17
Capacity Building	5	4	7	16
Quality Improvement	2	2	1	5
Mixed Methods	2	2	1	5
Cross Sectional	3	4	3	10
Retrospective Review	4	0	1	5
Other	4	5	5	14

* Larger total n than applicants as one project includes 3 countries.

S34

CRITICAL SHORTAGES IN PEDIATRIC SURGICAL CARE ACROSS WEST AFRICA: A WORKFORCE DENSITY PROJECTION

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Abstract: Background:
West Africa faces critical shortages in pediatric surgical care amid a rapidly expanding pediatric population and a high burden of surgical disease. Persistent workforce gaps are compounded by migration, limited training capacity, and infrastructure constraints. While recommendations call for one pediatric surgeon (PS) per 100,000 children, comprehensive data on surgeon distribution and projected requirements remain scarce. Assessing and modeling the pediatric surgeon workforce density (PSWD) is vital for guiding national and regional training expansion.
Methods:
We performed a cross-sectional analysis of PSWD per 100,000 children using 2023 UNICEF pediatric population data, country-specific pediatric growth rates, and 2024 PS workforce records. PSWD was calculated for 13 West African College of Surgeons (WACS) member countries. Population-based modeling was used to project the additional PS needed to achieve target density over 5, 10, and 20 years, with comparisons between Anglophone and Francophone countries.
Results:
No country achieved the target PSWD. Most countries had a PSWD below 0.2 per 100,000 children. Nigeria had 132 PS for 110 million children (PSWD: 0.11), requiring 970 surgeons more. Ghana (14 PS, PSWD: 0.10) requires 129 additional PS; Niger (13 PS, PSWD: 0.09) requires 128 and Mali (16 PS, PSWD: 0.13) requires 111. Senegal had the highest density (PSWD: 0.63), but still fell short. Gambia and Liberia had none. Francophone countries averaged 0.25 PS per 100,000 children, compared to 0.05 in Anglophone countries. Across the entire region, the PSWD was 0.16 per 100,000 children, with 341 pediatric surgeons available for 212 million children. To meet the 1 per 100,000 benchmark, approximately 2,117 surgeons are needed, leaving a shortfall of 1,776. Achieving this within five years would require training and retaining 406 PS annually.
Conclusion:
Significant gaps exist in the PSWD across West Africa as no country currently meets the recommended target. Francophone countries currently outpace Anglophone neighbors, yet all remain below benchmark levels. Without coordinated national and regional action, most countries will likely remain unable to provide adequate pediatric surgical care. Further evaluation of PS fellowship training and retention strategies will be essential to building sustainable capacity.

Abbreviations: PS: Pediatric surgeon
PSWD: Pediatric surgeon workforce density
WACS: West African College of Surgeons

Table 1. Pediatric Surgeon Workforce Density and Projected Needs in West Africa (2024)

Country	Pediatric Population (2023)	Pediatric Growth Rate (%)	# PS (2024)	Additional # PS Needed	PSWD/100k (2024)	Additional PS Needed/Yr (5y)
Benin	6,831,547	2.51	12	56	0.18	13.1
Burkina Faso	11,384,930	2.26	20	94	0.18	21.5
Côte d'Ivoire	14,912,540	2.45	61	88	0.41	21.5
Ghana	14,333,980	1.90	14	129	0.10	28.7
Guinea	6,904,812	2.45	13	56	0.19	13.0
Mali	12,716,690	2.97	16	111	0.13	26.2
Niger	14,129,420	3.31	13	128	0.09	30.7
Nigeria	110,236,400	2.10	132	970	0.12	218.2
Senegal	8,217,670	2.33	52	30	0.63	8.0
Region Total	211,720,564	2.20*	341	1,776	0.16	406

*Average pediatric population growth rate.

Pediatric population, workforce density, current surgeon counts, and additional pediatric surgeons required to meet the target density of 1 per 100,000 children by country, with annual training needs projected over five years. The table presents data for 9 of the 13 West African countries with the largest pediatric populations.

S35

FROM VOICES TO ACTION: A MIXED-METHODS NEEDS ASSESSMENT OF BARRIERS TO NEONATAL SURGICAL CARE IN A LOW-RESOURCE SETTING

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Abstract: Introduction: Neonatal surgical patients in low-resource settings face high mortality due to systemic, cultural, and organizational barriers. We aimed to identify barriers and facilitators to high-quality neonatal surgical care and generate context-specific solutions through a multi-level needs assessment.

Methods: From March to June 2025, we conducted the qualitative arm of a prospective mixed-methods study in a tertiary neonatal surgical unit. In the first arm, direct observations using WHO best-practice metrics revealed gaps in neonatal care. These findings were then summarized and presented during semi-structured interviews with purposively sampled clinicians and nurses to elicit feedback. Transcripts and field notes were thematically analyzed using iterative coding within a socio-ecological model (SEM) – individual, interpersonal, organizational, community, and policy levels. Findings were member-checked at a consultative meeting, attended by 16 nurses, clinicians, administrators, and Ministry of Health representatives, to develop actionable steps and short- and long-term goals.

Results: twenty-two interviews were performed to reach thematic saturation. We identified 25 subthemes across five SEM levels. Individual barriers included low confidence among new staff, poor documentation, burnout, and low morale. Interpersonal challenges included limited nurse–doctor communication, unclear roles, and suboptimal family engagement. Organizational barriers included overcrowding, broken equipment, insufficient night coverage, and unstructured handovers. Community-level issues involved mistrust of hospitals and reliance on traditional healers; policy gaps included outdated guidelines, inconsistent training, and staffing shortages.

Solutions were proposed across levels. Individual recommendations included strengthening orientation, chart reviews, mental health support for staff, and improved recognition. Interpersonal strategies included inclusive rounds, closed-loop communication, and role clarification. Organizational changes focused on formalized ward rounds, structured handovers, and the establishment of quality improvement teams. Community-level approaches emphasized family education and engagement with traditional healers. Policy-level strategies included context-specific guidelines, equipment funding, and alignment with national standards. Three cross-cutting areas – training and orientation, interdisciplinary communication, and night shift support – were prioritized for immediate action.

Conclusion: This multi-level mixed-methods study revealed critical gaps in neonatal surgical care. Collaborative engagement generated practical, context-specific strategies to strengthen orientation, teamwork, infrastructure, and family partnerships. Such strategy generation can inform national surgical planning and have a positive impact on neonatal surgical outcomes.

Abbreviations: WHO - World Health Organization
SEM - socio-ecological model

S36

STRUCTURED PEDIATRIC SURGICAL OUTREACH FOR REFUGEE CHILDREN: EARLY OUTCOMES FROM AN OUTREACH PROGRAM IN SOUTHWESTERN UGANDA

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Abstract: Purpose: Refugee populations face barriers to accessing healthcare facilities and increased risks of injury and untreated disease, including surgical conditions that may progress due to lack of timely access to surgical services. Given the growing number of displaced persons in Uganda, we aimed to examine the efficacy of structured pediatric surgical outreach to a refugee settlement in addressing surgical backlogs.

Methods: We piloted a structured clinical outreach program led by regional referral hospital providers in collaboration with refugee settlement stakeholders. Patients presenting to refugee settlement clinics during the week-long outreach were evaluated by providers from five surgical specialties (pediatric general surgery, urology, otolaryngology, orthopedics, and neurosurgery). Pediatric general surgeons, anesthesiologists, nurses and theatre assistants then collaborated with local operating room staff to perform select low-risk ambulatory procedures (hernia repair, soft tissue mass excision, etc.) at the settlement operating room. Patients requiring higher-risk or subspecialty procedures were referred to the regional referral hospital. Descriptive statistics were calculated as percentages, medians and interquartile ranges.

Results: A total of 119 surgical patients were evaluated. Of these, 66.4% were male (n=79) and 84.9% were refugees (n=101), while 15.1% (n=18) were Ugandan nationals receiving care at settlement facilities. Most patients presenting to the clinic had general surgery conditions (n=81, 68.1%), followed by orthopedic (n=12, 10.1%) and otolaryngology (n=11, 9.2%) conditions. The median age was 7 years (IQR 3-11). Seventy-five children underwent a surgical procedure at the refugee settlement operating room, which predominantly included inguinal (60%) and umbilical (14.7%) hernia repairs. No immediate peri-operative complications occurred. Of the referred patients, 46.2% (n=18) had not yet received referral hospital services at three months post-outreach. Stakeholder meetings revealed challenges actualizing referrals due to transport fuel restrictions and limited funding for imaging and surgical implants in light of recent funding cuts.

Conclusion: Pediatric surgical outreach to a refugee settlement, including on-site low-risk operations, is feasible with favorable early outcomes. Integration with a structured referral program has proven challenging with only around 50% of referrals actualized within three months. Referral process mapping will be critical for optimization of referral patterns and resource allocation to expand access to pediatric surgical services.

Abbreviations:

S37

POSTERIOR URETHRAL VALVES IN CHILDREN: ACHIEVING RENAL PRESERVATION THROUGH INTEGRATED MULTIDISCIPLINARY CARE IN A RESOURCE-LIMITED REGION

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Abstract: Purpose

Posterior urethral valves (PUV) remain a leading cause of end-stage renal disease (ESRD) in children, with rates of 10–25% reported in the literature. The purpose of this study is to evaluate the effectiveness of systematic multidisciplinary management on renal preservation in a resource-constrained pediatric center.

Methods

A retrospective analysis was conducted of 120 consecutive PUV patients at a children's hospital in Sri Lanka (2018–2024) with diagnosis confirmed by voiding cystourethrography. Standardized protocols included early endoscopic ablation and surveillance, aggressive management of vesicoureteral reflux and urinary tract infections, selective temporary urinary diversion, and comprehensive nephroprotection. Primary outcomes were preservation of renal function and development of ESRD. Subgroup analysis compared antenatal versus postnatal detection using chi-square tests and multivariable logistic regression.

Results

Mean follow-up was 6.8 years. Antenatal detection occurred in 58 patients (48.3%). Overall, renal function was preserved in 99 patients (82.5%), with 77 (64.2%) maintaining normal function. ESRD developed in 7 patients (5.8%), with 3 (2.5%) requiring dialysis. A total of 401 procedures were performed (average 3.3 per patient), with a 97% surgical success rate. Re-ablation was required in 62 patients (51.7%). Urinary diversion was necessary in 17 patients (14.2%). Advanced reconstructive procedures included ureteral reimplantation (8 patients, 87.5% success), bladder neck reconstruction (2 patients), and bladder augmentation (2 patients). Antenatal detection paradoxically predicted worse outcomes: normal renal function in 31/58 (53.4%) versus 46/62 postnatally diagnosed patients (74.2%, $p< 0.01$), a higher procedural burden (3.1 vs 2.1 procedures per patient, $p< 0.001$), and increased diversion rates (24.1% vs 4.8%, $p< 0.001$). Multivariable analysis identified oligohydramnios (OR 4.2, $p< 0.01$), dense occluding valves (OR 3.1, $p< 0.01$), and grade V vesicoureteral reflux (OR 2.8, $p< 0.05$) as independent predictors of poor outcomes.

Conclusions

Systematic multidisciplinary management achieves exceptional renal preservation (64% normal function, 5.8% ESRD), significantly superior to international standards. Integrated care combining early intervention, aggressive surveillance, selective diversion, and comprehensive nephroprotection optimizes outcomes. The antenatal detection paradox reflects underlying disease severity rather than management failure, with critical implications for prognostic counseling.

Abbreviations: Posterior urethral valves (PUV)

end-stage renal disease (ESRD)

S38

PEDIATRIC ABDOMINAL TUBERCULOSIS: EXPERIENCE FROM A RESOURCE CONSTRAINED ENDEMIC SETTING

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Abstract: Purpose: Abdominal tuberculosis (AbTB) is an extrapulmonary form of TB which presents diagnostic challenges due to nonspecific symptoms that overlap with other gastrointestinal conditions. This study aimed to describe the clinical presentation, diagnostic evaluation, and treatment outcomes of pediatric AbTB in tertiary care setting in a lower-middle-income country (LMIC).

Methods: We conducted a retrospective review of children under 18 years of age diagnosed with AbTB between January 2014 and December 2024 at two high-volume tertiary care hospitals in Pakistan. Patients were categorized into medical (n=56) and surgical (n=39) groups based on their management. We used the Chi-square or Fisher's exact test to compare categorical variables and the Mann-Whitney U test for continuous variables. A p-value of ≤ 0.05 was considered statistically significant.

Results: A total of 95 children were included, out of which 24 (25.3%) were males. The median age and weight were 13 years (IQR: 10-15 years) and 24 kg (IQR: 18.5- 33 kg), respectively. Abdominal pain (81%), fever (56.8%), anorexia (50.5%), weight loss (40.8%), and altered bowel habits (37.8%) were the most frequent presenting symptoms. A positive family history was reported in 10 patients (10.5%). The median hemoglobin level was 10 g/dL (IQR: 8.9- 11.2), and the median erythrocyte sedimentation rate (ESR) was 28 mm/hr (IQR: 12.25-49.5). Abdominal CT was the most commonly used imaging modality (78.9%), followed by ultrasound (68.4%) and abdominal X-ray (46.3%). All patients received standard anti-tuberculosis therapy (ATT), and 10.5% required second-line treatment. Surgical intervention was needed in 41.1% of cases due to bowel obstruction. Median hospital length of stay was significantly longer among those undergoing surgery [11 days (IQR: 7-19) vs 6 days (IQR: 4-10), $p < 0.05$]. Although mortality was higher in the surgical group, the difference was not statistically significant (10.3% vs 3.6%, $p = 0.2$).

Conclusion: Most children with AbTB were managed successfully with medical therapy. However, bowel obstruction was an indication for surgery and was associated with poorer outcomes. Earlier recognition and intervention are critical to reduce surgical burden and improve outcomes in LMICs.

Abbreviations: AbTB: Abdominal tuberculosis
TB: Tuberculosis
LMICs: Lower-middle-income countries
ATT: Anti-tuberculosis therapy

S39

PSYCHOSOCIAL CHALLENGES AND COPING MECHANISMS AMONG CAREGIVERS OF CHILDREN LIVING WITH STOMAS IN SOUTHWESTERN UGANDA

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Abstract: Purpose

Children living with stomas in low-resource settings face complex psychosocial challenges, yet caregiver experiences and effective interventions remain poorly explored. This study investigated the lived experiences, coping strategies, and community perceptions of caregivers of children with stomas in southwestern Uganda.

Methods

We conducted a qualitative study at a tertiary center in Southwestern Uganda serving over ten districts. Participants included 20 caregivers, primarily mothers, of children aged 8 months to 10 years with stomas (age range 20–41 years, mean 29.1). Data were collected through semi-structured interviews and focus group discussions (3–5 participants per group). Sessions were conducted with translation and supported by a counselor and a nurse. All discussions were audio-recorded, transcribed, and analyzed thematically. Counseling and educational components were incorporated to aid families' psychosocial well-being and preparation for community reintegration after stoma reversal.

Results

Children commonly presented with severe abdominal symptoms such as pain, distension, or vomiting following delayed diagnoses at peripheral facilities, often necessitating emergency stoma creation. While caregivers generally understood these conditions as medical, communities frequently attributed them to witchcraft, curses, family planning, or "bad medicine," fueling stigma, ridicule, and social isolation. Many families concealed the condition and withdrew from community life to avoid discrimination. Mothers, almost always the primary caregivers, left work or farming to provide improvised stoma care, resulting in financial strain, exhaustion, and emotional distress. Fathers typically offered financial rather than hands-on support, and siblings were reluctant to help for fear of causing harm. Despite these challenges, caregivers demonstrated resilience, drawing strength from faith, extended family, and healthcare providers. Participation in counseling and educational sessions enhanced confidence, reframed negative community beliefs, and supported coping and preparation for reintegration.

Conclusion

Caregivers of children with stomas in low-resource settings face significant psychosocial and

financial burdens, intensified by stigma, cultural misconceptions, and limited community support. Our integrated counseling and education intervention showed early success in improving coping, promoting mutual support, and reducing internalized stigma. Scalable interventions combining caregiver education, psychosocial counseling, and provider training are urgently needed to sustain reintegration and strengthen family well-being.

Abbreviations:

S40

DEVELOPMENT OF A GASTROSCHISIS TEACHING MODEL TO ENABLE TASK SHARING IN UGANDA

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Abstract: Purpose: Gastroschisis mortality is less than 5% in high-income countries, but remains 60-95% in Africa, partly due to lack of prenatal diagnosis and delayed presentation. Midwives are often the first point of contact; with training they may be able to start initial resuscitation, apply silos and direct babies to surgical care.
Methods: We developed a low-cost, non-perishable gastroschisis model that is durable and suitable for hands-on training. The model was piloted with nurses, midwives and pediatric surgeons in Uganda and Rwanda.
Results: The model was created using Mainland's Educational 15.75" teaching doll, which replicates newborn anatomy and contains a hollow torso, necessary for securing the simulated intestines. A 3cm defect was created on the anterior abdominal wall of the doll, to the right of the umbilicus. Glue, borax, paint, poly tubing, and mesh fabric were used to create a model of eviscerated intestines. Feedback was obtained from two pediatric surgeons (in the U.S. and Uganda). Adjustments were implemented into the final model, with a final cost of $45 USD. A hands-on training program was conducted in three regions of Uganda and Rwanda where 160 nurses, midwives and residents learned to place silos for gastroschisis. Users expressed satisfaction with the model and highlighted its effectiveness in facilitating learning. Babies have subsequently presented to a referral hospital in Uganda with silos already placed.
Conclusion: We describe a training model for gastroschisis silo placement that can be made from readily available materials. Further research and follow up is underway to assess clinical impact.

Abbreviations:

Scientific Session 5: Basic Science

4:50 PM – 6:20 PM

S41

CYP7A1 IS A PROMISING THERAPEUTIC TARGET FOR SUSTAINED LIVER INJURY OF BILIARY ATRESIA; A NOVEL PIGLET MODEL RECAPITULATING BILIARY ATRESIA AND HEPATOPORTOENTEROSTOMY

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Abstract: Purpose: Biliary atresia (BA) is a major cause of obstructive neonatal cholestatic disease. Although persistent hepatic dysfunction is common after successful hepatoportoenterostomy (HPE), the underlying mechanism remains unclear. We recently established the experimental piglet BA model termed “BATTED: Biliary Atresia Through Targeted Endothelial Destruction.” This study aimed to elucidate changes in the expression of bile acid metabolism related genes before and after BATTED and HPE, with the goal of contributing to the development of novel therapeutic strategies.
Methods: BATTED consists of cholecystectomy, 95% ethanol injection into common bile duct and hepatic duct, and a retainer suture for ethanol retention (U.S. provisional patent No. 63/603,995). Six 7- to10-day old piglets were randomized to three groups: 1) sham surgery, 2) BATTED, 3) BATTED+HPE, which was performed 6 weeks after BATTED. Liver biopsy and blood sampling were obtained at 0, 6, and 8 weeks from initial surgery (IS). Serum conjugated bilirubin, AST, ALT, and GGT concentration were measured. Total mRNA was extracted from liver biopsy samples, and the expression level of CYP7A1, FXR, BSEP, SHP, and CAR were analyzed using RT-qPCR. Animal protocols were approved by the IACUC (Protocols 3004).
Results: In the BATTED+HPE group, there was significant reduction in conjugated bilirubin level (Δ 2.11mg/dL to 4.89mg/dL), whereas ALT, ALP, and GGT showed no significant differences between the BATTED and BATTED+HPE group. These findings suggest that liver injury persisted despite resolution of jaundice. At 8 weeks after IS, expression levels of CYP7A1 and FXR remained elevated in the BATTED+HPE group even after HPE, whereas BSEP, SHP and CAR decreased to levels comparable to those in the sham group.
Conclusion: We concluded that bile acid metabolism related genes can be categorized into two groups based on their response to cholestasis and its resolution. Some rapidly return to baseline after HPE, whereas others, including FXR and CYP7A1, remain persistently dysregulated. Abnormal upregulation of CYP7A1 may lead to hepatocellular injury through increased bile acid production and intracellular accumulation. Persistent activation of the FXR–CYP7A1 pathway can contribute to postoperative liver dysfunction and represent a potential therapeutic target.

Abbreviations: CYP7A1: Cytochrome P450 Family 7 Subfamily A Member 1
FXR: Farnesoid X Receptor

BSEP: Bile Salt Export Pump
SHP: Small Heterodimer Partner
CAR: Constitutive Androstane Receptor

S42

DISSECTING THE HEPATIC IMMUNE ENVIRONMENT AFTER MASSIVE, SMALL BOWEL RESECTION

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Abstract: Background
Intestinal failure associated liver disease (IFALD) is a morbid condition that can occur after massive-small bowel resection (SBR). Treatment is preventative in nature with limited options to reverse injury once it occurs. Using a murine model of IFALD, we seek to understand the changes in hepatic immune cell populations after SBR.

Methods
Eight-week-old male and female mice underwent sham (n=7(m), n=6(f)) or SBR (n=11(m), n=7(f)) operations then fed a liquid enteral diet for 10 weeks. Histology, flow cytometry (male and female), and single nuclear sequencing (male) analyses were performed on liver tissue. Two flow cytometry panels were designed to provide overall immune cell populations and macrophage-specific populations. Confirmatory immunofluorescent staining was performed. Studies were conducted in accordance with IACUC protocol #23-0421.

Results
SBR mice exhibited increased liver injury compared to sham counterparts demonstrated by steatohepatitis and collagen deposition (Figure 1A). Single nuclear sequencing of male livers at 10 weeks revealed 19 sub-clusters of immune cells. Compared to sham, SBR was associated with a relative decrease in hepatic VSIG4+ CLEC4F+ macrophages with a concomitant increase in various pro-inflammatory monocyte subpopulations (Figure 1B-C). Liver flow cytometry was then employed to confirm results (females presented, males were similar). In the overall panel, SBR livers exhibited an increase in total CD45+ cells (leukocytes). UMAP dimensional reduction demonstrated distinct clusters that were annotated based on marker expression (Figure 1D). Density plots and significance analysis of microarrays (SAM) demonstrated SBR had a relative decrease in F480+ macrophages and CD19+ B cells with a relative increase in Ly6G+ neutrophils and CD11b+, CD11c+, SIRPα+ monocytes. A second panel dedicated to macrophage markers and gated on Cd11b+ and/or F480+ immune cells found VSIG4+ CLEC2+ macrophages were decreased in SBR with relative increases in CD11b+ MHCII+ monocytes (Figure 1E). Immunofluorescent staining confirmed the relative loss of VSIG4+ CLEC4F+ macrophages that appear to outline hepatic nodules (Figure1F).

Conclusion
Liver injury correlated with a decrease in VSIG4+ CLEC4F+ macrophages (Kupffer cells) and an increase in antigen-presenting, pro-inflammatory monocytes and neutrophils. Next steps are to investigate spatial sequencing to understand how these cells may interact within the fibrotic milieu of the liver.

Abbreviations: Small bowel resection - SBR; Intestinal failure associated liver disease - IFALD; male - m; female - f.

S43

TRAP2–BASED MAPPING OF ENTERIC NEURONAL ACTIVATION IN A CONSTIPATION MODEL

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Abstract: Purpose

The enteric nervous system (ENS) coordinates gastrointestinal function; however, how it senses and responds to intestinal distension caused by enteropathologies, such as constipation, remains unclear. The TRAP2 (Targeted Recombination in Active Populations 2) mouse model enables permanent labeling of neurons that express c-Fos, an immediate early gene that is upregulated in response to neuronal activation. Using this model, we investigated enteric neurons activated by constipation.

Methods

Adult TRAP2 mice (Fos2A-iCreERT2 × Ai14 tdTomato) underwent surgical creation of a distal colonic stricture to induce constipation. Sham-operated mice underwent identical handling without stricture. Tamoxifen (75–100 mg/kg) was administered intraperitoneally to induce tdTomato expression in activated neurons. After 10–14 days, mice were euthanized and colons collected for whole-mount immunohistochemistry of the longitudinal muscle and myenteric plexus using anti-HuC/D (pan-neuronal marker), anti-nNOS (inhibitory neuronal marker), and anti-Calretinin (excitatory neuronal marker). Neuronal activation was quantified by counting tdTomato-labeled ($TRAP^+$) neurons. A Student's t-test was performed, and statistical significance was set at $p < 0.05$. Our study was IACUC approved.

Results

Total HuC/D^+ neuronal density per high-power field (HPF) was similar between the constipated (194.3 ± 26.4, n=3) and sham (240.7 ± 22.2, n=4, p=0.136) mice. Colonic distension due to constipation markedly increased neuronal activation (46.8 ± 4.4% vs. 8.6 ± 1.9%, $p < 0.001$; Figure 1). The overall percentage of nitrergic (nNOS+) and calretinin (CR+) neurons among HuC/D+ neurons was similar (34.2 ± 3.7% vs. 28.0 ± 11.0%, p=0.407) and (29.3 ± 9.8% vs. 29.5 ± 9.0%, p=0.984) in the constipated and sham mice. Constipated mice had significantly more activated neurons (58.1 ± 14.9% vs. 14.1 ± 8.2%, p=0.004), while CR+ neurons did not change significantly in constipation (45.1 ± 22% vs. 16.6 ± 9%, p=0.207). The percentage of tdTomato+ neurons co-expressing nNOS (41.9 ± 7.3% vs. 38.7 ± 10.9%, p=0.687) and CR (33.7 ± 10.7% vs 48.7 ± 1.79%, p=0.159) was comparable between groups.

Conclusion

Colonic distension from constipation robustly activated enteric neurons, with preferential activation among inhibitory (nNOS+) neurons. TRAP2 offers a platform for neuronal mapping of ENS activity in enteropathies.

Abbreviations: TRAP2- Targeted Recombination in Active Populations 2
ENS-Enteric Nervous System
TRAP-tdTomato-labeled
CR-calretinin
HPF- high-power field
nNOS-nitrergic

S44

PERSISTENT INTESTINAL STEM CELL ALTERATIONS IN GANGLIONIC SEGMENTS OF HIRSCHSPRUNG DISEASE

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Abstract: Introduction:
Hirschsprung-associated enterocolitis affects 30-50% of patients postoperatively despite uncomplicated pullthrough procedure. The risk of postoperative enterocolitis and bowel dysfunction appears to be independent of ganglion cells and raises questions regarding intestinal epithelial dysfunction in the residual ganglionic segment. The purpose of this study is to evaluate alterations in the intestinal epithelial stem cells in a patient-derived organoid model independent of the influence of the underlying enteric nervous system.

Methods:
A prospective biorepository was established to collect surgical specimens from patients with Hirschsprung disease (HD) or anorectal malformation (ARM, controls). Intestinal epithelial stem cells were isolated, and organoids were generated. Organoids were propagated in vitro without underlying neuronal influence. Bulk RNA sequencing of undifferentiated organoids was performed, and transcriptomic relationships among samples were assessed using principal component analysis (PCA) and hierarchical clustering of Pearson correlation coefficients. Differential gene expression analysis was performed followed by pre-ranked gene set enrichment analysis (GSEA).

Results:
Intestinal epithelial organoids were generated from surgical specimens of aganglionic and ganglionic segments from HD (n=5), and ARM (n=4) patients. Principal component and hierarchical clustering analyses showed that HD-derived organoids clustered together and were distinct from controls. Transcriptomic profiling of the organoids revealed pathway-level differences in both aganglionic and ganglionic HD segments relative to controls, with downregulation of DNA repair pathways such as kinetochore organization (NES –1.8, $p < 0.01$, FDR $q=0.03$). Further, multiple stem cell factors, including OLFM4, ISX, and HOXB9, showed increased expression in HD-derived organoids, suggesting decreased differentiation capacity. No significant differences in gene expression were seen between ganglionic and aganglionic segments.

Conclusion:
Our findings suggest that intestinal epithelial stem cell alterations in HD extend beyond the aganglionic segment to the ganglionic bowel. Organoids derived from ganglionic HD surgical specimens retained a distinct phenotype resembling the aganglionic segment and diverging from healthy controls, even when expanded in vitro independent of the neuronal environment. These results raise the possibility that persistent intestinal epithelial stem cell dysfunction contributes to the pathology of postoperative enterocolitis and bowel dysfunction.

Abbreviations: Hirschsprung disease (HD), anorectal malformation (ARM), principal component analysis (PCA), gene set enrichment analysis (GSEA)

S45

FSP1 REGULATION OF FERROPTOSIS IN NECROTIZING ENTEROCOLITIS

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Abstract: Introduction:
Necrotizing Enterocolitis (NEC) is a devastating disease affecting preterm infants associated with hyperinflammation, increased intestinal permeability, and cell death. Ferroptosis has been identified as an important pathway of cell death in NEC pathogenesis. A novel protein, the Ferroptosis Suppressor Protein 1 (FSP1) is a newly discovered component of this pathway. Upstream regulators of FSP1 include P62, Keap1 and NRF2. Downstream components include CoQ10, a coenzyme involved in the reduction of oxidative stress and Dihydroorotate Dehydrogenase (DHODH), the primary enzyme that reduces CoQ10. We hypothesize FSP1 as well as its upstream (P62, NRF2, Keap1) and downstream (CoQ10, DHODH) components will have decreased expression in necrotizing enterocolitis leading to decreased inhibition of ferroptosis.
Methods:
Following IRB consent, discarded human intestinal tissue was obtained from infants undergoing bowel resection. Enteroids were then derived from the intestinal crypts. Once mature, the enteroids were then subjected to experimental NEC with lipopolysaccharide and 24 hours of hypoxia. RNA was then extracted from control and NEC enteroids. The RNA was then converted to cDNA for RT-qPCR analysis of FSP1, NRF2, KEAP1, p62, CoQ10, and DHODH expressions.
Results:
FSP1 expression is significantly lower in human enteroids following experimental NEC treatment compared to control ($p=0.0049$). Upstream and downstream components of the FSP1 pathway were all found to be downregulated. P62 was found to be significantly downregulated ($p < 0.0447$). NRF2 expression was also found to be significantly lower in human enteroids following experimental NEC compared to control ($p=0.0194$). Keap1 expression was also downregulated in experimental NEC compared to control ($p=0.0142$). CoQ10 was also downregulated ($p < 0.022$). Finally, DHODH was also significantly downregulated in the NEC group ($p < 0.036$).
Conclusion:
Decreased FSP1, p62, NRF2, and Keap1, as well as CoQ10 and DHODH expression in experimental NEC expands on our lab's previous work demonstrating upregulation of the ferroptosis pathway of cell death in NEC. This provides the foundation for further investigation into FSP1 and other ferroptosis pathway inhibitors as possible therapeutic targets in NEC.

Abbreviations: FSP1 - Ferroptosis Suppressor Protein 1
DHODH - Dihydroorotate Dehydrogenase
NEC - Necrotizing Enterocolitis
IRB - Institutional Review Board
RNA - ribonucleic acid
cDNA - complementary deoxyribonucleic acid
RT-qPCR - reverse transcriptase quantitative polymerase chain reaction
NRF2 - nuclear factor erythyroid 2-related factor 2
p62 - also known as Sequestosome-1
Keap1 - Kelch-like ECH-associated protein 1

CoQ10 - coenzyme Q 10

S46

INDUCED EPIGENETIC MODIFICATIONS AS A MECHANISM FOR PERSISTENT HYPERINFLAMMATION IN NECROTIZING ENTEROCOLITIS

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Abstract: Background

Necrotizing enterocolitis (NEC) is a disease of premature neonates that is associated with a hyperinflammatory response which persists following recovery, and the mechanism of this aberrant response is not fully understood. We hypothesize the persistent hyperinflammatory response seen in NEC is secondary to induced epigenetic modifications. Therefore, we aim to expand on our previous findings of differential methylation in the promoter region of IL-8 by investigating additional inflammatory markers and experimentally inducing DNA methylation.

Methods

Intestinal tissue resected from patients with active NEC, following NEC recovery, or without NEC was utilized to make enteroids or snap frozen. DNA was extracted from tissue for methylation analysis of the promoter regions of TNF-α and TLR-4. Bisulfite conversion of the DNA was performed followed by PCR amplification of the promoter region of interest. Once amplified and purified, samples were sent for next-generation sequencing. Sequences were analyzed manually, and relative peak heights were measured to quantify site-specific methylation percentage. Control enteroids were then subjected to experimental NEC treatment with lipopolysaccharide and 24 hours of hypoxia, and DNA was extracted for site-specific methylation analysis of the IL-8 promoter.

Results

The TNF-α promoter region was found to have high methylation percentage at three sites (means: 75.8%, 61.6%, 75.5%) but no difference across cohorts. The TLR-4 promoter region had 2 sites with low percentage methylation (means: 23.9%, 27.8%) and no difference between cohorts. Methylation of the IL-8 promoter region was induced in enteroids following experimental NEC treatment with methylation percentage increasing from 2.3% to 39.5%, 1.3% to 33.8%, and 1.7% to 40.6% at sites 1-3, respectively.

Conclusion

Our investigation into the promoter regions of TNF-α and TLR-4 identified multiple sites of DNA methylation, however, neither had differing methylation patterns in NEC and recovered NEC tissue compared to control as seen in IL-8. Additionally, methylation of the IL-8 promoter region was induced in enteroids subjected to experimental NEC. Suggesting induced epigenetic modifications of the IL-8 promoter region may contribute to the aberrant inflammatory response observed following recovery from NEC.

Abbreviations:

S47

REMOTE ISCHEMIC CONDITIONING PRESERVES PERICYTES AND RESTORES INTESTINAL VASCULAR INTEGRITY IN NECROTIZING ENTEROCOLITIS

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Abstract: Purpose: Necrotizing enterocolitis (NEC) is characterized by intestinal microcirculatory failure and vascular barrier disruption. Pericytes are critical regulators of vascular stability and permeability. Remote ischemic conditioning (RIC) improves intestinal microcirculation, but the underlying mechanism remains unclear. This study aims to evaluate the mechanism of action of RIC during NEC, exploring its effects on pericytes and vascular integrity.
Methods: Human NEC: analysis of small intestine from NEC (n=4) and congenital obstruction (controls n=5). Experimental NEC: this was induced in C57BL/6 neonatal mice (postnatal days 5–9) by hypoxia, hyperosmolar formula, and lipopolysaccharide feeding. RIC was applied on days 6 and 8 by four cycles of hindlimb ischemia (5 min) and reperfusion (5 min). Measurements include single-cell RNA sequencing for pericyte clusters and serum angiogenic markers. In vitro, pericyte-to-myofibroblast transition (PMT) was induced by TGF-β1 as a positive control. Pericyte migration was assessed using scratch assays ± SDF-1α (10 nM). RFP-labeled HUVECs were co-cultured with GFP-labeled pericytes ± SDF-1α to evaluate pericyte recruitment and tube formation.
Results: Human NEC: compared to controls, pericytes were reduced during NEC (Figure A). Experimental NEC: NEC mice exhibited reduced pericyte numbers and compromised vascular integrity. RIC significantly increased the proportion and number of pericyte clusters compared with untreated NEC mice (Figure B). Serum analysis revealed elevated SDF-1 expression following RIC treatment (Figure C). In vitro, SDF-1α enhanced pericyte marker NG2 expression while reducing α-SMA and fibronectin, both established markers of myofibroblasts, thereby indicating suppression of PMT. Scratch assays demonstrated enhanced pericyte migration following pretreatment with SDF-1α (Figure D). In co-culture, nearly all SDF-1α–treated pericytes migrated toward HUVECs and participated in tube formation, while a subset of untreated pericytes remained at their original positions and failed to integrate into vascular structures (Figure E).
Conclusion: Pericyte loss and vascular barrier disruption are hallmarks of NEC. RIC rescues pericyte numbers and elevates SDF-1, which suppresses PMT, enhances pericyte migration, and promotes endothelial recruitment. These results deepen the understanding of RIC as a novel therapeutic strategy for NEC by revealing the SDF-1–dependent pericyte repair mechanism that maintains vascular integrity.

Abbreviations:

S48

NOVEL VISUALIZATION OF METASTATIC OSTEOSARCOMA USING THE FLUORESCENT-LABELED TRACER DINUTUXIMAB-IRDYE800 IN A MOUSE MODEL

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Abstract: Purpose: Osteosarcoma is one of the most common pediatric malignancies, often diagnosed at late stages with pulmonary metastases. Complete surgical resection including attainment of adequate margins in resecting the primary tumor and pulmonary metastasectomy has been shown to confer a survival benefit. However, poor sensitivity of preoperative imaging and difficulty locating metastases intraoperatively complicate metastasectomy. GD2 is a glycolipid overexpressed in osteosarcoma and limited in normal tissue. As such, we sought to utilize Dinutuximab, a chimeric antibody targeting GD2, conjugated to a fluorophore, IRDye800, to enhance intraoperative imaging in a murine model of metastatic osteosarcoma.

Methods: Human 143B cells were injected subcutaneously (n=5) or intratibially (n=5) in 13-week-old NSG mice to generate metastatic osteosarcomas. Tumors were grown for five weeks, then Dinutuximab-IRDye800 administered via tail vein injection. After four days, mice were euthanized and fluorescent biodistribution studies performed. Fluorescent images of resected tumor and organs were acquired with the SPY-PHI camera, quantified using ImageJ, and analyzed using one-way ANOVA.

Results: Orthotopic osteosarcoma xenografts grew in 9/10 mice, with pulmonary metastases in 9/9 and hepatic metastases in 6/9, confirmed by histopathology. Four days after tracer injection, fluorescent biodistribution studies in 3/9 mice demonstrated significantly increased uptake in tumor (52.6 ± 2.9 AU/p2) compared to other organs, including blood (6.1 ± 1.3 AU/p2, $p<.0001$) and ipsilateral muscle (23.5 ± 3.6 AU/p2, $p<.01$). The average tumor-to-blood ratio was 8.6 and tumor-to-ipsilateral muscle ratio 2.4. Though only one hepatic metastasis was analyzed, both pulmonary and hepatic metastases were grossly fluorescent (Figure 1), and suggested higher tumor-to-background signal (38.04 AU/p2 vs 16.85 AU/p2, lesion-to-liver ratio 2.3).

Conclusion: In this study, we evaluate a Dinutuximab-fluorescent conjugate in a murine model of osteosarcoma. We demonstrate increased accumulation of the tracer in primary osteosarcoma with clear visualization of tracer in primary and metastatic sites. This suggests a GD2-targeted tracer could be utilized in the surgical management of osteosarcoma and potentially assist in the identification of metastatic disease and tumor margins. Future studies will evaluate the effect of further labeling our tracer with a radioisotope and determine depth and tumor size limits.

Abbreviations: AU/p^2: Arbitrary Units per pixel^2

S49

INTERFERON REGULATORY FACTOR 5 (IRF5) GOVERNS OSTEOSARCOMA METASTASIS AND MACROPHAGE REPROGRAMMING: A NOVEL LNP-MEDIATED THERAPEUTIC STRATEGY

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Abstract: Purpose: Osteosarcoma (OS) is the most common primary malignant bone tumor in children and adolescents, with poor survival driven by pulmonary metastasis. Tumor-derived extracellular vesicles (EVs) promote metastasis by establishing a pre-metastatic niche. Interferon Regulatory Factor 5 (IRF5) inversely correlates with OS metastatic potential. This study investigated IRF5's role in EV secretion and composition, evaluating lung-targeted IRF5 LNP delivery to mitigate OS.

Methods: IRF5 knockout (KO) K12 OS cells and IRF5-overexpressing K7M2 cells were generated via CRISPR/Cas9 and nucleofection, respectively. EVs were isolated (ultracentrifugation) and characterized (NTA, Simple Western for Alix/CD63). Western blot/qRT-PCR validated gene/protein expression. OS proliferation, migration, and invasion were assessed using Incucyte® SX5. Bone marrow–derived macrophages (BMDMs) were polarized (M0, M1, M2) and treated with tumor EVs or IRF5 mRNA LNPs; polarization was analyzed (flow cytometry, ELISA). LNPs, formulated using selective organ targeting (SORT) with DOTAP, were characterized for size, PDI, zeta potential, and encapsulation. Systemic LNP delivery confirmed in vivo IRF5 protein translation in wild-type BALB/c mice. Data are mean ± SEM. Non-parametric data were analyzed with two-tailed Mann–Whitney U tests; parametric data with t-tests and ANOVA (Tukey's post hoc). Adjusted $p < 0.05$ was significant.

Results: IRF5 loss in K12 cells increased migration, invasion, and EV secretion compared to parental K12 cells, phenocopying metastatic K7M2 cells. K7M2 EVs upregulated VEGFR/EGFR transcripts compared to K12 EVs, while K12 IRF5 KO EVs displayed divergent cargo, including downregulation of these transcripts, indicating IRF5 is not the sole EV cargo regulator. Lung-targeted LNP-IRF5 (90–106 nm, PDI 0.27, 98% encapsulation) repolarized M2 macrophages toward M1. In vivo, robust IRF5 protein expression occurred in lung/spleen; however, quantifying a distinct increase in total mRNA was challenging due to endogenous expression.

Conclusions: We conclude that IRF5 restricts OS metastasis by limiting EV secretion and modulating macrophage polarization. EV cargo discrepancies between K12 IRF5 KO and K7M2 suggest additional non-IRF5 regulatory factors. Lung-targeted IRF5 mRNA LNPs offer a novel, translatable approach to reprogram tumor macrophages from M2 to M1, impeding metastatic progression. This underscores mRNA-based intervention potential for improving pediatric OS outcomes.

Abbreviations: BMDMs: Bone Marrow–Derived Macrophages

CRISPR/Cas9: Clustered Regularly Interspaced Short Palindromic Repeats/CRISPR-associated protein 9
DOTAP: 1,2-Dioleoyl-3-trimethylammonium-propane
EGFR: Epidermal Growth Factor Receptor
ELISA: Enzyme-Linked Immunosorbent Assay
EVs: Extracellular Vesicles
IRF5: Interferon Regulatory Factor 5
KO: Knockout
LNP: Lipid Nanoparticle
M0: Unpolarized Macrophages
M1: Pro-inflammatory Macrophages
M2: Anti-inflammatory/Pro-tumor Macrophages
mRNA: Messenger Ribonucleic Acid
NTA: Nanoparticle Tracking Analysis
OS: Osteosarcoma
PDI: Polydispersity Index
qRT-PCR: Quantitative Reverse Transcription Polymerase Chain Reaction
SORT: Selective Organ Targeting
VEGFR: Vascular Endothelial Growth Factor Receptor

Scientific Session 6: CDH/ECMO

4:50 PM – 6:20 PM

S50

OPTIMIZING TIMING OF RESECTION FOR ASYMPTOMATIC CONGENITAL PULMONARY AIRWAY MALFORMATION (CPAM) PATIENTS: A PHIS DATABASE ANALYSIS (PHASE 2)

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Abstract: Background: There is debate as to whether resection should occur electively ("proactive resection," or "PR") or only after complications ("reactive resection," or "RR") for asymptomatic CPAM patients. This is the second in a series of five planned studies designed to address this question.

Our phase 1 study described post-operative outcomes stratified by age at resection. Phase 2 contrasts patients undergoing PR versus RR, aiming to discern differences in risk profile and clinical outcomes.

Methods: A retrospective cohort study was conducted using the Pediatric Health Information System (2013-2023). Patients < 18 years who underwent CPAM resection were classified as elective or non-elective using admission source, emergency-department charges, and pre-operative diagnoses. Outcomes included mortality risk and severity at presentation, operative approach, index and post-operative length of stay (LOS), complications, ICU and ventilator use, blood transfusions, readmission and 1-year post-operative hospital costs. Group characteristics and outcomes were compared using descriptive and inferential statistics.

Results: 2,588 CPAM patients met criteria (1,294 elective, 1,294 non-elective). RR patients were older at resection (median 7 months vs 6 months, $p< 0.0001$) and more frequently presented with high severity (22.6% vs 6.1%, $p< 0.0001$) and mortality risk (10.1% vs 1.2%, $p< 0.0001$). RR patients required more blood transfusions (4.9% vs 1.0%, $p< 0.0001$), experienced more surgical complications (17.6% vs 11.6%, $p< 0.0001$), and had longer LOS (median 3 vs 2 days, $p< 0.0001$). RR patients had more all-cause readmissions 12 months post-operatively (15.7% vs 8.8%, $p< 0.0001$), greater ICU use (4.5% vs 1.8%, $p< 0.0001$), and higher hospital costs (median $27,600 vs $17,400, $p=0.01$). Though rare, mortality at 12 months post-operatively only occurred in the RR group (0.8%, $p=0.0015$).

Conclusion: We observe meaningful differences in outcomes after CPAM resection when stratified by elective versus non-elective intervention. Non-elective patients present with higher risk, have worse post-operative outcomes, and incur higher costs. The planned next phases of this project will provide additional insight into the optimal management of asymptomatic CPAM patients.

Abbreviations: PR: proactive resection

RR: reactive resection
CPAM: congenital pulmonary airway malformation
PHIS: pediatric health information system
LOS: length of stay
ICU: intensive care unit

Outcomes after PR vs. RR for Asymptomatic CPAM

Characteristic	Elective (N=1,294)	Non-elective (N=1,294)	p-value
Post-op total cost ($K; 365d)	1.74, 0.50–8.47	2.76, 0.56–13.87	0.01
Number of post-op ED visits (365d)			0.0004
0	1,002 (77.43%)	931 (71.95%)	
1	185 (14.30%)	198 (15.30%)	
Post-op all-cause readmission			
30d	64 (4.95%)	94 (7.26%)	0.01
180d	90 (6.96%)	164 (12.67%)	<0.0001
365d	114 (8.81%)	203 (15.69%)	<0.0001
Post-op mortality			
30d	0 (0.00%)	9 (0.70%)	0.0039
180d	0 (0.00%)	9 (0.70%)	0.0039
365d	0 (0.00%)	10 (0.77%)	0.0015
Post-op ICU use			
30d	11 (0.85%)	25 (1.93%)	0.02
180d	15 (1.16%)	48 (3.71%)	<0.0001
365d	23 (1.78%)	58 (4.48%)	<0.0001

S51

UNDERSTANDING DIFFERENCES IN PEDIATRIC CARDIOPULMONARY RESUSCITATION INDICATIONS AND OUTCOMES: A SINGLE-CENTER EXPERIENCE

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Abstract: Purpose: Pediatric extracorporeal cardiopulmonary resuscitation (ECPR) utilization has increased over the past decade, though outcomes, indications for its use, and hospital practice patterns remain heterogeneous. The Extracorporeal Life Support Organization (ELSO) registry is useful, but lacks some granularity, containing limited details about hospital event sequences and its diagnoses are defined by billing codes. This study aims to further understand ECPR utilization and outcomes at a single quaternary pediatric care center with a robust extracorporeal membrane oxygenation (ECMO) program to provide contemporary data and a model for ECPR evaluation using electronic health record (EHR) data.

Methods: A data informatics EHR generated code was developed to automatically extract 420 data elements (nearly 200 more than the ESLO registry) for children < 21 years of age who received ECMO or ECPR cannulation from January 2010 to December 2024. ECPR patients were characterized as having cardiac* or non-cardiac† immediately precipitating etiology of arrest. Cardiac and non-cardiac cohorts were compared using Student's t-test and chi-squared tests.

Results: There were 653 ECMO runs performed for 643 patients, 161 of which were ECPR cannulations (24.7%). Annual ECPR cannulations increased by 260% during the course of the study period. Among ECPR runs, 107 had cardiac inciting events (66.5%) and 54 had non-cardiac inciting events (33.5%). The median age at time of ECPR was 3.28 years (range: 0.00-20.86 years). Pre-cannulation arterial blood pH was higher in cardiac patients than non-cardiac (7.26 versus 7.07 respectively, p=0.001). There was no difference in post-cannulation pH or lactate, and patients had similar number of ECMO days and post-cannulation hospital length of stay (LOS). The overall ECPR survival to hospital discharge was 40.4%, with patients with cardiac etiologies of arrest having improved survival compared to the non-cardiac cohort (45.8% versus 29.6% respectively, p=0.048).

Conclusion: Pediatric ECPR is more frequently performed for patients with a cardiac etiology of arrest. Survival to hospital discharge is higher for the cardiac cohort, compared to the non-cardiac cohort. Further review of patient-specific characteristics is warranted to help inform ECPR indications and streamline complex decision-making. Additional study should focus on multi-center evaluations using matching EHR data extracts.

Abbreviations: ECPR- extracorporeal cardiopulmonary resuscitation
ELSO- Extracorporeal Life Support Organization
ECMO- extracorporeal membrane oxygenation
EHR- electronic health record
LOS- length of stay

Table 1. Comparison of patient factors and outcomes for pediatric patients who require extracorporeal cardiopulmonary resuscitation due to a cardiac or non-cardiac etiology of arrest.

	Cardiac ECPR* (n=107)	Non-Cardiac ECPR† (n=54)	All ECPR (N=161)	p-value
Age at ECMO cannulation (years), mean (SD)	2.74 (5.20)	4.33 (5.51)	3.28 (5.34)	0.075
Pre-cannulation arterial blood pH, mean (SD)	7.26 (0.19)	7.07 (0.23)	7.20 (0.23)	***0.001***
Pre-cannulation lactate (mg/dl), mean (SD)	7.05 (5.768)	9.61 (5.52)	7.90 (5.72)	0.056
Time on ECMO (days), mean (SD)	5.31 (6.32)	5.14 (6.72)	5.26 (6.44)	0.876
Post-cannulation LOS (days), mean (SD)	34.26 (46.67)	27.39 (51.91)	31.84 (48.53)	0.404
Survival to hospital discharge, n (%)	49 (45.8%)	16 (29.6%)	65 (40.4%)	***0.048***

(ECPR- extracorporeal cardiopulmonary resuscitation; ECMO- extracorporeal membrane oxygenation; SD- standard deviation; LOS- length of stay)

*Cardiac etiologies of arrest included: coronary thrombosis, cardiac failure, arrhythmia, cardiomyopathy, cardiac tamponade, myocarditis, valve dysfunction, and cardiac surgery related hemorrhage.

†Non-cardiac etiologies of arrest included: respiratory failure, pulmonary embolism, acidosis, sepsis, trauma, toxic ingestions, and non-cardiac surgery related hemorrhage.

S52

CONGENITAL DIAPHRAGMATIC HERNIA GUIDELINES COMPLIANCE AND OUTCOMES IN CANADA

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Abstract: Background: Perinatal CDH care in Canada has been supported by comprehensive management guidelines published in 2018, with variable implementation/uptake across sites. We evaluated institutional compliance across 8 Key Performance Indicators (KPIs) and assessed differences in clinical outcomes.
Methodology: The prospective CAPSNet patient database was interrogated. Patients pre- (2013-17) and post-guideline (2019-2023) publication were compared with a 2-year intervening washout. Neonates admitted to sites reporting >10 cases over each study epoch were included (8/16). The 8 KPI's addressed (1) prenatal diagnosis and risk stratification; (2) prenatal echocardiography; (3) prenatal genetic testing; (4) preoperative echocardiography; (5) use of GORE-tex or muscle flaps for non-primary repair; (6) pre-discharge echocardiography; (7) diagnosis and management of pulmonary hypertension; and (8) structured, long-term interdisciplinary follow-up. KPI compliance was dichotomized and defined as >70% of neonates exposed to the specific KPI. An institution was deemed "guidelines compliant" if 6 or more of the 8 KPIs were achieved. Standard statistical analyses were performed, including regression analyses to calculate adjusted odds ratios (aOR).
Results: The study cohort included 213 and 166 patients pre- and post-guideline publication, respectively. Overall network mortality was similar pre- (36/213;16.9%) and post-guideline (22/166;13.3%) publication. There was inter-site variability in individual KPI responsiveness to guidelines publication in both guidelines compliant (n=2) and non-compliant (n=6) sites (Figure 1). However, the two sites that achieved overall guidelines compliance (n=114 comprising both pre- and post-guideline epochs) demonstrated a 3-fold pre- to post-implementation decrease in overall mortality (11.5% v 3.8%, aOR 0.36, [CI 0.06, 2.06]). Furthermore, compared to sites that remained non-compliant after guidelines publication, compliant sites demonstrated a lower mortality rate (3.8% v 17.7% aOR 5.51 [CI 1.2 – 25.38[) after adjustment using the CDH Study Group Mortality Prediction Score. Secondary outcomes (length of stay, aggregate complications, oxygen supplementation, enteral access) between compliant and non-compliant sites did not demonstrate a difference.
Conclusions: Adherence to guidelines-driven KPIs is associated with improved survival in Canadian CDH patients. Dissemination and implementation of existing guidelines recommendations, and understanding both barriers and enablers of site-specific adoption can meaningfully impact patient outcomes.

Abbreviations: CAPSNet = Canadian Pediatric Surgery Network
KPI - Key Performance Indicators

aOR - adjusted odds ratio
PHTN - pulmonary hypertension

S53

CEREBRAL HYPOXIA, MICROGLIAL ACTIVATION AND ALTERED BRAIN DEVELOPMENT IN LAMB FETUSES WITH LEFT CONGENITAL DIAPHRAGMATIC HERNIA

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Abstract: Purpose: To explore regional neuroinflammatory and hypoxia-induced responses, and neuronal maturation in an ovine model of left congenital diaphragmatic hernia (L-CDH).

Methods: Following IACUC approval, L-CDH was created in time-dated fetal lambs (n=8) at 70-81 days of gestation. Healthy lamb fetuses were used as controls (n=8). Lambs were delivered near term (135-145 days), euthanized, and their brains harvested. Right cerebrum and cerebellum were flushed, formalin-fixed and sectioned in a standardized manner (Figure) for immunohistochemistry (CD34 for vascular density, IBA1 for microglial activation, GFAP for astrocyte density, NeuN for neuronal maturation) and RNA scope (HIF1A) studies. Signal quantification was performed using ImageScope™. Statistical analyses were performed using Mann-Whitney's or unpaired t-test following distribution assessment (Shapiro-Wilk's test). RNA was extracted from the left frontal lobe and thalamus for bulk sequencing and gene set enrichment analysis (GSEA).

Results: On necropsy, L-CDH lambs had a significantly lower lung-to-body-weight ratio (1.3% [IQR 1.1-1.5] vs 3.0% [IQR 2.6-3.1], p=0.005), while the brain-to-body-weight ratio was similar between groups (p=0.87). Hippocampal HIF1A expression was significantly increased in L-CDH lambs (p=0.017), with increased vascular density (2.603%±1.293 vs 0.948%±0.348, p=0.055). Increased vascular density was also found in the cerebral cortex (CCX), cerebellum and brain stem (BS) ($p < 0.001$, $p< 0.001$, p=0.001 respectively) of L-CDH lambs. GSEA yielded a positive enrichment of genes involved in angiogenesis ($p < 0.001$) in the thalamus of L-CDH lambs, and genes involved in cellular response to starvation in the frontal lobe ($p < 0.001$) and thalamus ($p < 0.001$) of L-CDH lambs. Significant microglial activation was found in the corpus callosum (CC), cerebellum, CCX and BS of L-CDH lambs (p=0.03, p=0.02, $p< 0.001$, p=0.02 respectively). GSEA showed a significant enrichment of immune response genes in the frontal lobe and thalamus of L-CDH lambs. Astrocyte depletion was found in the cerebellum (p=0.03) and CC (p=0.04) of L-CDH lambs, with a significant reduction in mature neurons in the CCX (p=0.04). GSEA showed a negative enrichment of gene sets involved in neuronal processes, synaptic transmission and synaptogenesis in the frontal lobe and thalamus of L-CDH lambs.

Conclusion: Compared to controls, brains of L-CDH lambs show signs of hypoxia/neoangiogenesis with metabolic changes, microglial activation and abnormal neuronal maturation.

Abbreviations: L-CDH: Left congenital diaphragmatic hernia
GSEA: Gene set enrichment analysis
CCX: Cerebral cortex
BS: Brain stem
CC: Corpus callosum

S54

LIVES LIVED AND LOST: THE BURDEN OF DISEASE IN ADULT SURVIVORS OF CONGENITAL DIAPHRAGMATIC HERNIA

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Abstract: Purpose: To describe the disease-specific and non-specific morbidity and mortality in adult survivors of neonatal congenital diaphragmatic hernia (CDH) compared to adults without CDH, using a large, real-world U.S. dataset.
Methods: Using the Epic Cosmos database, we performed a cross-sectional analysis of adults with a recorded history of neonatal CDH (n=7,659) versus adults without CDH (n=159,167,144), examining postulated CDH-specific morbidity, CDH non-specific morbidity, and mortality. Demographics and diagnoses were summarized as n (%); group differences were compared using Pearson χ^2; and a nonparametric test compared median age. Lastly, the prevalence of a composite variable “any chronic condition” was calculated.
Results: CDH survivors were older (median 68 [IQR 58–78] vs 52 [35–68] years) and more often female (65% vs 55%; both p< 0.0001). Postulated CDH-related complications were more common in CDH survivors: small-bowel obstruction 4.53% vs 1.02%, ventral hernia 10.55% vs 1.40%, pulmonary hypertension 8.34% vs 2.42%, pulmonary fibrosis 6.20% vs 1.30%, GERD 59.39% vs 20.17%, and esophagitis (17.05% vs 3.96%) (all p< 0.0001). Chronic cardiometabolic and pulmonary conditions were also higher: hypertension 66.30% vs 35.62%, hyperlipidemia 70.94% vs 34.01%, overweight/obesity 43.41% vs 23.65%, COPD 27.47% vs 6.34%, atrial fibrillation 14.74% vs 6.39%, heart failure 15.63% vs 6.28%, and myocardial infarction 10.69% vs 4.53% (all p< 0.0001). Among decedents, respiratory failure appeared more often as a listed cause in adult survivors of neonatal CDH (3.06% vs 1.78%; p≈0.049), with no clear differences for several other causes. For “any chronic condition,” prevalence estimates ranged from ~71% in CDH survivors vs ~36% in the adult non-CDH population (lower bound) (p < 0.0001).
Conclusion: Adult survivors of neonatal CDH exhibit higher rates of gastrointestinal, pulmonary, and cardiometabolic conditions than the general adult population, as well as CDH-related long-term complications, highlighting the need for awareness and improved surveillance. Future work using patient-level data should quantify adjusted risks and identify modifiable targets across age, sex, and sociodemographic groups.

Abbreviations: (CDH) congenital diaphragmatic hernia

Table. Demographics and Comorbidities in Adult Survivors of Congenital Diaphragmatic Hernia Compared with the General Population.

Characteristic	CDH (n=7,659)	Non-CDH (n=159,167,144)	*p*-value
Median age, years (IQR)	68 (58–78)	52 (35–68)	<0.0001
Female sex	4,949 (65%)	87,248,959 (55%)	<0.0001
Hypertension	5,078 (66.3%)	56,702,508 (35.6%)	<0.0001
Hyperlipidemia	5,433 (70.9%)	54,134,014 (34.0%)	<0.0001
Overweight/Obesity	3,325 (43.4%)	37,640,817 (23.7%)	<0.0001
COPD	2,104 (27.5%)	10,089,266 (6.3%)	<0.0001
Pulmonary Hypertension	639 (8.3%)	3,857,072 (2.4%)	<0.0001
GERD	4,549 (59.4%)	32,097,759 (20.2%)	<0.0001
Ventral Hernia	808 (10.6%)	2,224,187 (1.4%)	<0.0001
Any Chronic Condition	5,433 (70.9%)	56,702,508 (35.6%)	<0.0001

Values are n (%). Comparisons by Pearson χ^2 or Wilcoxon rank-sum. Data from Epic Cosmos limited dataset (Base Patient registry definition).

S55

DECREASING THE POST SURGICAL OOZE: UTILIZING A PERIOPERATIVE GUIDELINE TO DECREASE TRANSFUSION NEEDS FOLLOWING CONGENITAL DIAPHRAGMATIC HERNIA REPAIR ON ECMO

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Abstract: Purpose: To evaluate changes in post-operative transfusion requirements of infants undergoing congenital diaphragmatic hernia (CDH) repair on ECMO following implementation of a quality improvement guideline for procedures on ECMO.
Methods: In 2021, a multidisciplinary group created a guideline for perioperative management of CDH repair on ECMO. It included guidance on pre-operative lab values, dosing of tranexamic acid, pre- and peri-operative transfusion recommendations, and anti-coagulation titration. Before the guideline, aminocaproic acid use varied in timing and dosing. CDH repairs on ECMO from 2010 – 2024 were divided into a Pre and Post Guideline groups. Data was collected retrospectively and analyzed using Fischer Exact Tests and Mann Whitney U tests.
Results: There were 27 infants with CDH repairs on ECMO within the study period: 16 Pre and 11 Post. Gestational age at birth, weight, and day of life at cannulation did not differ, Table 1. The Post group had higher Vasoactive Illness Scores (Pre: 10.5 versus Post:17.5, p=0.01). 81% of patients Pre and 100% of patients Post had Type C or D defects. Patients in the Post group were repaired sooner after ECMO cannulation (Pre: 3 [1,8] versus Post: 1 [1,2] days, p=0.02). 24 hours after surgery, pRBC transfusions were lower in the Post group (Pre: 121 [51, 210] versus Post: 60 [31,90] mL, p=0.03) as were platelet transfusions (Pre: 93 [60, 133] versus Post: 50 [30, 81] mL, p=0.004). There was no difference in plasma transfusions within the first 24 hours after surgery. Fewer infants required re-operation for bleeding Post although this did not reach statistical significance (Pre: 19% versus Post: 9%, p=0.62). Rate of interventricular hemorrhage trended lower in the Post group, 9% versus 44%, p=0.09. There was no difference in incidence of ECMO cannula clotting requiring intervention (Pre: 38% versus Post: 36%, p=1.00). 63% of infants Pre and 91% of infants Post survived to ECMO decannulation, p=0.18. 13% of infants Pre and 55% of infants Post survived to hospital discharge, p=0.03.
Conclusion: Implementation of a perioperative guideline for procedures on ECMO contributed to reduced post operative transfusion requirement and was associated with improved survival of these high-risk patients.

Abbreviations: ECMO: Extracorporeal Life Support
CDH: congenital diaphragmatic hernia
mL: milliliters
Pre: Pre-Guideline
Post: Post-Guideline

Table 1: Pre-operative patient characteristics and post operative outcomes including transfusion requirements and survival.

	Pre-Guideline, n=16	Post-Guideline, n=11	p-value
Prenatally Diagnosed	75% (12)	100% (11)	0.12
Post-Birth Evaluation			
Gestational Age at Birth (weeks)	39 [37, 39]	38 [38, 39]	0.90
Snappe II Score[¥]	48 [32, 53]	46 [39, 62]	0.55
APGAR <7	75% (12)	100% (11)	0.12
Weight (kg)	3.2 [2.9, 3.6]	3.0 [2.4, 3.3]	0.27
VIS prior to ECMO	10.5 [7.0, 16.5]	17.5 [12.5, 27.5]	0.01
Pre-CDH Repair			
Day of Life at Repair (days)	5 [2, 12]	2 [2, 4]	0.06
Days on ECMO Prior to Repair (days)	3 [1, 8]	1 [1, 2]	0.02
pH Prior to Repair	7.42 [7.39, 7.48]	7.36 [7.33, 7.43]	0.09
Platelet Level Prior to Repair	96 [83-127]	131 [110, 145]	0.03
24 Hour Post Operative Transfusions			
pRBC (mL)	121 [51, 210]	60 [31, 90]	0.03
Platelet (mL)	93 [60,133]	50 [30, 81]	0.004
Plasma (mL)	57 [0, 95]	57 [0, 95]	0.90
Chest Tube Output 24 hours Post Repair (mL)[¥]	43 [24, 123]	50 [24, 60]	0.84
Reoperation for Bleeding	19% (3)	9% (1)	0.62
ECMO Cannula Clot requiring Treatment	38% (6)	36% (4)	1.00
Survival to Decannulation	63% (10)	9% (10)	0.18
Survival to Hospital Discharge	13% (2)	55% (6)	0.03

[¥]Pre group was missing 6 values and Post group was missing 2 values

[¥]8 patients in the pre-protocol group did not have a chest tube.

S56

THE EFFECT OF CRITICAL CONGENITAL HEART DEFECTS ON MORTALITY AND ECMO UTILIZATION IN CONGENITAL DIAPHRAGMATIC HERNIA: AN ANALYSIS OF A CONTEMPORARY COHORT OF CHILDREN'S HOSPITALS

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Abstract: Purpose:
The detrimental effect of congenital heart disease (CHD) on congenital diaphragmatic hernia (CDH) survival is well known. However, estimates of survival and of extracorporeal membrane oxygenation (ECMO) utilization in CDH associated with the twelve severe cardiac anomalies known specifically as critical congenital heart defects (CCHDs) have not been described. Accurate data will enable prognostication for prenatal counseling, and possibly expansion of the indications for fetal intervention.

Methods:
The Pediatric Health Information System (PHIS) was queried for all infants born with CDH between 2017-2023 using ICD-10 diagnostic codes for CDH. ICD-10 codes were also used to identify the presence of CHD and the subset of patients specifically with CCHDs. Pearson chi-square test and logistic regression were used to assess relationships between diagnostic codes and use of ECMO or mortality.

Results:
There were 4,691 NICU admissions for CDH in PHIS. Of these, 3,580 (76.3%) were also diagnosed with any CHD and 488 (10.4%) with one of the twelve severe CCHDs. 18.24% of CDH infants with CCHD required ECMO cannulation, compared to 19.41% without CCHD ($p=0.53$). Of infants cannulated for ECMO, 13.4% with CCHD died prior to repair versus 11.15% without CCHD who died prior to repair ($p=0.041$). Infants repaired on ECMO were more likely to die following repair regardless of whether they had CCHD (OR 4.35,95% CI: 3.65-5.18, $p< 0.0001$). Overall, there was an increased likelihood of death in infants with co-existing CDH/CCHD compared to patients with an isolated CDH (OR 4.37,95% CI: 3.58-5.34, $p< 0.0001$). Even after undergoing CDH repair, infants with co-existing CDH/CCHD had a higher likelihood of death (OR 4.03,95% CI:3.11-5.23, $p< 0.0001$).

Conclusion:
CCHD complicates 10% of births of newborns with CDH. Despite similar rates of ECMO utilization, mortality in the CDH/CCHD cohort is 50%; nearly three times the rate of the non-CCHD cohort. 75% of deaths in infants with CDH and CCHD occurred without ECMO suggesting that in some of these cases ECMO may have been considered futile. These data have important ramifications for prenatal consultation and perhaps on the role of fetal intervention in this cohort with few other therapeutic options.

Abbreviations: CHD, CDH, ECMO, CCHD, PHIS

S57

EXTRACORPOREAL MEMBRANE OXYGENATION IN PEDIATRIC HEMATOLOGIC MALIGNANCIES

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Abstract: Introduction
Venovenous (VV) extracorporeal membrane oxygenation (ECMO) is an established rescue therapy for respiratory failure in pediatric patients with active malignancies. Patients with hematologic malignancies are a unique subset of this population due to their associated immunodeficiencies, coagulopathy, and, in many cases, poor prognosis at the time of cannulation. We aim to evaluate outcomes and complications of pediatric patients with hematologic malignancies who underwent VV ECMO cannulation to better inform patient counseling and care.

Methods
A retrospective review of the extracorporeal life support organization (ELSO) registry was conducted from 2008 to 2023 of patients 1 to 18 years old with hematologic malignancies cannulated for VV ECMO using International Classification of Diseases (ICD) codes. Fisher's exact and t-tests were utilized with significance at $p< 0.05$.

Results
We identified 365 patients who met inclusion criteria with leukemia (n=299), lymphoma (n=51), or unspecified hematologic malignancies (n=15) with an overall survival of 39.2%. At decannulation, 184 patients had a poor prognosis with none surviving to discharge, while 181 had a favorable prognosis with 77% (n=143) surviving to discharge. Poor prognosis at decannulation was associated with hemorrhagic ($p=0.003$), hematologic ($p=0.010$), and CNS ($p < 0.001$) complications during the ECMO run. Patients with lymphoma were more likely to have a poor prognosis at decannulation compared to those with leukemia or unspecified malignancies (66.7% vs 52.5% vs 53.3%, $p=0.001$). However, among patients with expected recovery, patients with lymphoma were more likely to survive to discharge ($p=0.004$). Lymphoma patients also had higher rates of circuit-related and hemorrhagic complications, while leukemia patients were more likely to have intracranial or renal complications.

Conclusion
Pediatric patients with hematologic malignancies are a unique population for which VV ECMO is utilized as a rescue therapy. As expected, poor prognosis at time of decannulation was associated with major complications and mortality. While leukemia was the most common diagnosis, patients with lymphoma demonstrated better outcomes when recovery was expected. Overall, these outcomes and associated complications will further inform family counseling prior to cannulation as well as clinical care during ECMO runs in this patient population.

Abbreviations: VV: Venovenous
ECMO: extracorporeal membrane oxygenation
ICD: International Classification of Diseases

Complications and Outcomes by Malignancy Type				
	Leukemia N=299	Lymphoma N=51	Not Specified N=15	p-value
Complications				
Circuit	104 (34.8)	21 (41.2)	4 (26.7)	0.015
Hemorrhagic	98 (32.8)	19 (37.2)	7 (46.67)	0.013
Hematologic	53 (17.7)	8 (15.7)	1 (6.7)	0.028
CNS	46 (15.4)	5 (9.8)	1 (6.7)	0.027
Cardiovascular	18 (6.0)	3 (5.9)	-	0.101
Renal	166 (55.5)	19 (37.2)	8 (53.3)	0.001
Decannulation Prognosis				0.001
Expected Recovery	142 (47.5)	17 (33.3))	7 (46.7)	
Poor	157 (52.5)	34 (66.7)	8 (53.3)	
Discharged Alive	111 (37.1)	26 (51.0)	5 (33.3)	0.004

Scientific Session 7: Obesity/General

4:50 PM – 6:20 PM

S58

RISK OF AND TIME TO FAILURE AMONG CHILDREN WHO INITIATE NON-OPERATIVE MANAGEMENT OF UNCOMPLICATED APPENDICITIS

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Abstract: Purpose

Non-operative management (NOM) has been increasingly utilized for acute uncomplicated appendicitis in children based upon several recent clinical trials. This study assessed outcomes of NOM after its incorporation into a new post-trial standard of care at a large children's hospital.

Methods

A single-institution retrospective review was performed for children 7-17 years of age with suspected uncomplicated appendicitis who were offered (based upon standardized criteria) and selected NOM between January 2021 and June 2023. Failure of NOM was defined as undergoing appendectomy; outcomes were assessed at one- and two-year chart review. Time to failure was assessed using Kaplan-Meier survival analysis. For comparative analyses, $p < 0.05$ was considered significant.

Results

Of 1,177 children treated for acute appendicitis, 263 (22.3%) met criteria for NOM of uncomplicated appendicitis, and 126 (10.7%) chose NOM. All patients with NOM had imaging-confirmed appendicitis (77.8% ultrasound, 22.2% CT). Within two years, 59 patients (46.8%) failed NOM. Those with successful NOM had a longer duration of pain before presentation (24 [IQR 12-24] vs 13 [IQR 8-24] hours, p=0.009) and less frequently had secondary signs of appendicitis on imaging (80.6% vs 94.9%, p=0.016) compared to those who failed. Of patients who attempted NOM, 32 patients (25.4%) failed within their index admission. Among those successfully discharged (N = 94), 23 (24.5%) failed within one year and an additional four (5.6%) failed before two years after discharge (Figure 1). Median time to failure was 81 days [IQR 22-228] among those who failed after hospital discharge with NOM. Pathology confirmed uncomplicated appendicitis in 53 patients (89.8%) who failed NOM, two of whom had an incidental carcinoid tumor identified. Complex appendicitis was found (intraoperatively and by pathology) in one early failure (1.7%), and normal pathology (negative appendectomy) was found in five patients (8.5%).

Conclusions

In a real-world clinical setting, NOM of uncomplicated appendicitis was successful in over half of patients at two years follow-up. Most failures occurred early, with over half occurring within the initial hospital admission. Additional failures were uncommon after one year. No patients with successful initial discharge after NOM had complex appendicitis at recurrence.

Abbreviations: NOM = Non-operative Management

S59

NUTRITIONAL DEFICITS AND PRESSURE INJURY RISK IN PEDIATRIC AND ADOLESCENT SPINAL CORD INJURY: A DUAL-CENTER STUDY

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Abstract: Purpose: Spinal cord injury (SCI) in youth is a profound condition with lifelong consequences. Post-injury immobility places these patients at high risk for pressure injuries. Although nutrition is recognized as important in pressure injury prevention, strategies in pediatric and adolescent SCI remain understudied. This study sought to evaluate nutritional practices and their association with pressure injury in youth with acute SCI.

Methods: A retrospective, dual-center study was conducted at Level I adult (ATC) and pediatric trauma centers (PTC) of patients aged 0–19 years with radiographic and clinical SCI between 2019-2024. Patients who died during initial resuscitation or lacked neurologic deficits were excluded. Demographics, injury characteristics, treatment variables, and nutritional data (daily caloric and protein goals vs. intake) were analyzed, comparing ATC and PTC practices. Outcomes included pressure injury development, with multivariable logistic regression used to identify predictors. A high-risk subgroup of immobile patients (ASIA A/B) dependent on enteral or parenteral nutrition in the first 2 weeks was analyzed separately.

Results: Ninety patients met inclusion (median age 17 years, interquartile range [IQR] 15–18); 74% were male, 57% had blunt mechanisms, and median Injury Severity Score was 26 (IQR 19-34). All patients had persistent deficits; 58% ASIA A. Among14-18-year-olds, ATC caloric (31.5 vs. 26 kcal/kg/day, p=0.001) and protein goals (2.3 vs. 1.5 g/kg/day, p< 0.001) were higher than PTC. Over 14 days, patients achieved only 41.8% of caloric and 40.1% of protein goals. Pressure injuries occurred in 15 patients (17%). Lower mean daily caloric intake trended toward association with pressure injury (odds ratio 0.87, 95% CI 0.74–1.02, p=0.084). In the high-risk immobile subgroup (n=27), pressure injuries (n=8) correlated with lower caloric intake (7.1 vs. 15.9 kcal/kg/day, p=0.044) and lower prescribed protein goal requirements (median 2.2 [IQR 1.4–2.3] vs. 2.3 [IQR 2.3–2.4] g/kg/day, p=0.009).

Conclusions: Pediatric and adolescent SCI patients fail to meet nutritional requirements, with significant center-level differences in goals. Inadequate caloric and protein intake predicts pressure injury, highlighting the need for targeted nutrition strategies to support recovery. Future studies should examine the impact of timing and calorie-to-protein ratios on pressure injury risk.

Abbreviations: SCI, Spinal Cord Injury; ATC, Adult Trauma Center; PTC, Pediatric Trauma Center; ASIA, American Spinal Injury Association; IQR, Interquartile Range; kcal, kilocalories; kg, kilogram; g, grams.

S60

TO WRAP OR NOT TO WRAP: DOES CONCOMITANT FUNDOPLICATION AT THE TIME OF GASTROSTOMY TUBE PLACEMENT REMAIN A QUESTION?

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Abstract: Purpose

Gastrostomy tube (GT) placement is commonly performed in infants with oral aversion and/or oropharyngeal dysphagia. Historically, GT placement for these indications was frequently combined with a fundoplication due to concern for tube feeds worsening gastroesophageal reflux disease (GERD) and aspiration. The aim of this study was to determine if concomitant fundoplication impacted the rate of pulmonary complications or need for post-pyloric feeds in these infants undergoing GT placement.

Methods

A single institution review was performed on patients < 6 months of age undergoing GT placement for oral aversion and/or oropharyngeal dysphagia, from January 2011 to June 2025. Patients with medically-refractory GERD were excluded. Pulmonary complications were defined as postoperative admissions for aspiration or bacterial pneumonia. Univariate and multivariate analyses were performed, with $p< 0.05$ considered statistically significant.

Results

A total of 649 infants underwent GT placement, with 56% undergoing concomitant fundoplication. The two groups were demographically similar, with no differences in gestational age, age at operation, or incidence of neurologic or craniofacial disorders. Concomitant fundoplication was associated with increased pulmonary complications compared to those undergoing GT placement alone (18% vs. 11%, p=0.01, Figure). Subset analysis demonstrated more pulmonary complications in infants undergoing fundoplication with neurologic (26% vs. 12%, $p< 0.01$) or craniofacial disorders (26% vs 14%, p=0.04). Fundoplication was not associated with a reduction in pulmonary complications in those with aspiration on a preoperative dysphagia study. Multivariate analysis demonstrated that concomitant fundoplication (OR 1.75, 95%CI 1.12-2.82), craniofacial disorder (OR 1.76, 95%CI 1.11-2.79), and neurologic disorder (OR 1.87, 95%CI 1.20-2.90) were independently associated with postoperative pulmonary complications. Three infants (1%) underwent metachronous fundoplication following an initial GT placement, and both groups had similar rates of refractory postoperative GERD necessitating conversion to a gastrojejunostomy tube (7% GT alone vs 6% concomitant fundoplication, p=0.52).

Conclusion

Concomitant fundoplication is independently associated with an increased risk of pulmonary complications in infants undergoing GT placement for oral aversion and/or oropharyngeal dysphagia. Concomitant fundoplication does not reduce the need for postoperative conversion to post-pyloric feeds, and the need for future fundoplication in those undergoing GT alone is

rare.

Abbreviations: GERD = gastroesophageal reflux disease
GT = gastrostomy tube

S61

WHAT DO WE FEEL AND WHAT DO WE KNOWN ABOUT CHILDHOOD OBESITY? A SURVEY OF PROVIDERS AND STAFF AT A QUATERNARY CHILDREN'S HOSPITAL.

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Abstract: Purpose

Care for children with obesity faces barriers despite well published guidelines and professional recommendations. We sought to assess healthcare personnel (HCPs) attitudes and knowledge towards childhood obesity at a quaternary children's hospital.

Methods

A cross-sectional survey was administered to HCPs assessing knowledge of obesity definitions, perceived prevalence, modifiable and non-modifiable contributors, clinical practices, barriers, and management strategies.

Results

Of 537 respondents, 79.4% were female and 68.5% between 20-40 years old. Physicians (23.8%), RNs (28.1%), residents (14.5%) and staff (10.4%) were the largest group responding, with 58.3% managing surgical patients. Although most respondents (70.0%) knew that obesity in children is measured differently than adults, only 60.5% correctly identified the BMI thresholds. Most (85%) understood the wide prevalence of obesity and that HCPs underrecognized it (73%). Most (>90%) felt that modifiable factors such as sweetened foods, large portions and lack of physical activity were the main influencing factors, while fewer than 25% attributed obesity to non-modifiable factors such as genetics and socioeconomic status. Despite nearly all respondents (94.6%) encountering obesity in their practice, few always screened (19.7%) or addressed it during their interactions (7.7%) due to time constraints and stigmatization. Compared to other HCPs, physicians were less likely to perform routine screening (30.1% vs. 43.2%) or address obesity when unrelated to the presenting complaint (35.5% vs. 49.2%) (all $p < 0.01$). Common strategies used to address obesity, and barriers are identified in Table 1 with more recommending lifestyle changes, rather than anti-obesity medications (AOMs) or bariatric surgery (MBS). However, more recommended MBS than AOMs ($p < 0.05$). There were no differences identified in knowledge or attitudes between surgical specialists and non-surgical specialists, genders, faculty or trainees, or between younger and older personnel.

Conclusions

HCPs in a quaternary children's hospital recognized the high prevalence of childhood obesity, primarily attributing it to diet and physical activity. HCPs also provided inconsistent screening and limited use of evidence-based treatment strategies. Most recommended lifestyle modification and dietitian referral rather than pharmacologic or surgical interventions. This survey shows that there is still a large gap between published guidelines and internalization of recommendations by HCPs at a major children's hospital.

Abbreviations: healthcare personnel (HCPs), Anti-Obesity Medications (AOMs),

Metabolic/Bariatric Surgery (MBS)

Management Strategies		Barriers To Use			
Lifestyle Changes	74.8% (n=317)	Anti-Obesity Medications (AOMs)		Metabolic/Bariatric Surgery (MBS)	
Dietitian Referral	69.7% (n=296)	Insurance approval	68.1%	Insurance Approval	54.9%
Specialist Referral	45.2% (n=192)	Effectiveness	31.8%	Effectiveness	29.6%
AOMs	13.4% (n=57)	Rebound weight gain after discontinuation	66.9%	Potential long-term complications	62.9%
MBS	20.1% (n=85)	Safety profile	62.4%	Surgical risks	61.0%

S62

SECULAR TRENDS IN METABOLIC AND BARIATRIC SURGERY AMONG ADOLESCENTS, 2015-2024

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Abstract: Purpose

Longitudinal studies document the safety and efficacy of metabolic and bariatric surgery (MBS) in adolescents with severe obesity. Despite increasing need for effective treatment, use remains low. To better describe this gap, we evaluated 10-year trends in adolescent MBS volume, procedural patterns, and postoperative complications.

Methods

We conducted a retrospective analysis using Epic Cosmos, a national electronic health record dataset containing de-identified patient data from participating U.S. health systems. Adolescents aged 12 to < 20 years who underwent MBS between 2015 and 2024 were identified using billed procedure codes. Annual case volume, procedure type, and complications within 30 days and up to 5 years were analyzed. Trends were assessed using generalized linear models (α=0.05).

Results

A total of 4,066 adolescents underwent MBS between 2015 and 2024, with sleeve gastrectomy (SG) comprising 89.3% (n=3,630) of cases. Among adolescents with class III obesity (body mass index [BMI] ≥ 40 kg/m²), the overall rate of MBS remained low, though increased significantly from 32 per 100,000 in 2015 to 268 per 100,000 in 2024 ($p < 0.001$). Adolescents were predominantly female (72.4%; n=2,944), White (59.7%; n=2,429), and non-Hispanic (63.0%; n=2,563). The most common comorbidities were obstructive sleep apnea (39.9%; n=1624), dyslipidemia (27.4%; n=1115), and metabolic-associated fatty liver disease (26.7%; n=1084). Among adolescents undergoing SG between 2015 and 2024 (n=3,393), several utilization metrics improved over time. Median length of stay declined from 1.9 to 1.6 days ($p=0.004$), and 30-day emergency department visits decreased from 8.3% to 6.4% ($p < 0.001$). The 1- to 12-month incidence of hemorrhagic, thrombotic, and infectious complications detected in the data were low (< 0.3%; n < 10 for each category). The most frequent postoperative complications coded were malabsorption (14.5%; n=492), nausea/vomiting (12.6%; n=426), and dehydration (8.4%; n=284). Among those who underwent SG from 2015–2019 (n=778), 8.7% (n=74) required cholecystectomy within 5 years.

Conclusion

Despite an increasing trend over the past decade, use of MBS remains low among adolescents with class III obesity. Low rates of serious complications and postoperative healthcare utilization support the safety of MBS in adolescents and highlight a critical need to improve access to surgery for pediatric patients with clinically severe obesity.

Abbreviations: MBS, metabolic and bariatric surgery; SG, sleeve gastrectomy; BMI, body mass index

S63

ADOLESCENTS UNDERGOING BARIATRIC SURGERY IN THE U.S.: CONTEMPORARY PATIENT PROFILES AND EARLY METABOLIC OUTCOMES FROM A MULTICENTER COLLABORATION (COSMIC)

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Abstract: Introduction:
Metabolic and bariatric surgery (MBS) is increasingly used for adolescents with severe obesity, with sleeve gastrectomy (SG) overtaking Roux-en-Y gastric bypass (RYGB) as the most common procedure choice for younger patients. Contemporary data on demographics and early postoperative outcomes remain limited beyond quality/safety databases. Our multicenter collaborative characterized current demographic profiles, time to surgery, and early post operative outcomes among adolescents undergoing SG across seven U.S. pediatric centers in the largest recent US cohort to date.
Methods:
We performed a retrospective analysis of adolescents undergoing SG across seven adolescent centers in the U.S. Primary outcomes included prevalence of obesity related comorbidities and time from first clinic evaluation to surgery; secondary outcomes included six-month vitamin and serum chemistry values. Baseline vs six-month labs were compared using paired t-tests or Wilcoxon signed-rank tests.
Results:
Our initial cohort included 120 patients undergoing SG between 2023-2025. Mean age at surgery was 17.2±1.8 years. Preoperative mean BMI was 46.3±7.9 kg/m² with BMI >50 reaching 27.1%. Time from first clinic visit to surgery averaged 13.5±9.7 months; 8.5% waited between 2 and 3 years and 5.1% ≥3 years. Common comorbidities included dyslipidemia (60%), obstructive sleep apnea (41%), insulin resistance or prediabetes (43%), and vitamin D deficiency (62.5%). All patients had at least one and 93.3% had >1 obesity related comorbidity. Psychiatric recorded diagnoses were prevalent: 35.9% had anxiety and 41.3% had depression. At six months, paired comparisons (N>5 per measure) showed improvements in glucose (−12.8 mg/dL, p< 0.001, n=27), hemoglobin A1c (−0.5%, p=0.014, n=13), triglycerides (−33.1 mg/dL, p=0.012, n=21), and liver enzymes (AST −3.4 U/L, ALT −11.8 U/L; both p< 0.02, n=27). HDL increased (+3.0 mg/dL, p=0.019, n=21) as did vitamin D (+8.6 ng/mL, p< 0.001, n=25). Iron values also improved (+20.6 µg/dL, p=0.026, n=20).
Conclusions:

Adolescents currently undergoing MBS in the U.S. are predominantly late teens with severe obesity suffering from multiple metabolic and psychiatric comorbidities, and a typical duration in program exceeding one year from first evaluation to surgery. Early 6-month outcomes demonstrate significant metabolic improvement highlighting the importance of access to safe, effective surgical interventions and avoiding a “last resort” approach to adolescent bariatrics.

Abbreviations: Metabolic and bariatric surgery (MBS)
sleeve gastrectomy (SG)
Roux-en-Y gastric bypass (RYGB)

S64

PREOPERATIVE CHARACTERISTICS AND SURGICAL SAFETY PROFILES OF GASTRECTOMY VERSUS ROUX-EN-Y GASTRIC BYPASS IN ADOLESCENTS AND YOUNG ADULTS: AN MBSAQIP ANALYSIS

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Abstract: Background: Sleeve gastrectomy (SG) is the predominant bariatric operation in youth; Roux-en-Y gastric bypass (RYGB) is less common and may be selected for greater metabolic burden. We assessed factors associated with RYGB use and compared 30-day outcomes of SG versus RYGB.

Methods: MBSAQIP was analyzed in two cohorts. Selection cohort: 2021 to 2023 patients aged 18 years or less undergoing SG or RYGB; multivariable logistic regression estimated odds of RYGB (vs SG) using age, sex, BMI, comorbidity count, and year. Safety cohort: 2015 to 2023 patients aged 21 years or less undergoing SG or RYGB; grouped outcomes were infectious, pulmonary, thromboembolic, surgical, 30-day readmission, and overall complications. Logistic regression produced adjusted odds ratios (aORs) with 95% confidence intervals (CIs), adjusting for age, sex, BMI, and obesity-related medical problems.

Results: In adolescents (n=2,465), 184 (7.4%) underwent RYGB and 2,281 (92.6%) SG. RYGB patients were older (17.41 vs 16.94 years), more often female (79% vs 68%), and had more obesity-related disease, including GERD (17% vs 8.8%) and insulin-treated diabetes (8.2% vs 2.0%), while BMI was similar. Adjusted odds of RYGB increased with age (OR 1.53 per year, CI 1.30 to 1.82) and comorbidity count (OR 1.38, CI 1.18 to 1.59) and were lower in males (OR 0.52, CI 0.35 to 0.75); BMI was not associated.

In patients aged 21 years or less (n=23,227; SG 19,268; RYGB 3,959), RYGB had higher unadjusted infectious (0.78% vs 0.26%), surgical (1.74% vs 0.62%), readmission (5.30% vs 2.54%), and overall complication rates (6.69% vs 3.15%), $p<0.001$ for each. After adjustment, RYGB remained associated with higher odds of infectious (aOR 2.91, CI 1.82 to 4.57), surgical (aOR 2.79, CI 2.05 to 3.77), readmission (aOR 2.06, CI 1.73 to 2.44), and overall complications (aOR 2.11, CI 1.81 to 2.45); pulmonary and thromboembolic events were rare and not significantly different.

Conclusions: RYGB is infrequently performed in adolescents and is preferentially used in older, predominantly female patients with greater metabolic burden despite similar BMI. In youth aged 21 years or less, RYGB has higher adjusted 30-day morbidity and readmission versus SG, supporting SG as the more favorable early safety option when clinically appropriate.

Abbreviations: SG, sleeve gastrectomy;
RYGB, Roux-en-Y gastric bypass;
MBSAQIP, Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program;
BMI, body mass index; GERD, gastroesophageal reflux disease.

S65

10-YEAR KIDNEY OUTCOMES FOLLOWING METABOLIC AND BARIATRIC SURGERY IN ADOLESCENTS WITH SEVERE OBESITY

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Abstract: Purpose

Obesity in adolescence is an established risk factor for chronic kidney disease in adulthood. While metabolic and bariatric surgery (MBS) is associated with short-term improvements in kidney function, the durability of these effects is unclear. This study aimed to characterize 10-year trajectories of kidney function following MBS in adolescents with severe obesity.

Methods

Data from the Teen-Longitudinal Assessment of Bariatric Surgery (Teen-LABS) study, a multicenter cohort of 260 adolescents who underwent gastric bypass (n=161) or sleeve gastrectomy (n=99) between 2007 and 2012, were analyzed. Urine albumin-to-creatinine ratio (ACR) and cystatin C-based estimated glomerular filtration rate (eGFR) were evaluated from baseline (pre-op) to 10 years post-surgery using mixed-effects models (α=0.05). Values are reported as mean ± SD or median [IQR].

Results

Participants (age 17.0 years [15.0–18.0]; BMI 50.4 kg/m2 [45.1–57.7]; 75.8% female; 70.8% White) demonstrated significant improvements in kidney function following MBS. Among those with baseline eGFR < 90 mL/min per 1.73m2 (8.5%, n=22), median eGFR improved from 82 [75–87] to 93 [85–101] mL/min per 1.73m2 (p < 0.001). Greater postoperative BMI reduction was associated with higher odds of recovery to normal eGFR (adjusted odds ratio [aOR], 2.01; 95% confidence interval [CI], 1.13–3.55), while non-White race and baseline type 2 diabetes were associated with lower odds of recovery (aOR, 0.25; 95% CI 0.08–0.85; aOR, 0.20; 95% CI 0.05–0.74, respectively). Among those with baseline albuminuria (ACR>30 mg/g, 8.5%, n=22), median ACR declined from 113 [68–189] to 16 [7–35] mg/g (p < 0.001) with greater BMI loss corresponding to 65% higher odds of a healthier change in ACR (aOR, 1.65; 95% CI 1.27–2.14). Among those with baseline hyperfiltration (eGFR≥135 mL/min per 1.73m2, 11.2%, n=29), mean eGFR was attenuated from 150 ± 26 to 129 ± 26 mL/min per 1.73m2 (p=0.005). There was no association between BMI reduction and resolution of hyperfiltration (p=0.635). eGFR remained stable over 10 years in those with normal baseline values.

Conclusion

MBS in youth with severe obesity is associated with improvements in low eGFR and attenuation of albuminuria and hyperfiltration over 10 years, highlighting its potential role in

reducing chronic kidney disease risk.

Abbreviations: MBS, metabolic and bariatric surgery; Teen-LABS, Teen–Longitudinal Assessment of Bariatric Surgery; ACR, urine albumin-to-creatinine ratio; eGFR, estimated glomerular filtration rate; BMI, body mass index; aOR, adjusted odds ratio; CI, confidence interval

S66

EVALUATING THE IMPACT OF GLP-1 AGONISTS ON BARIATRIC SURGERY OUTCOMES IN AN ADOLESCENT COHORT: A DESCRIPTIVE STUDY

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Abstract: Introduction:
Bariatric surgery is the most effective treatment option for adolescents with severe obesity. Glucagon-like peptide-1 receptor agonists (GLP-1 RA) have shown promise in enhancing preoperative weight loss with inconsistent weight loss results postoperatively. Evidence regarding their role as adjuncts to bariatric surgery in adolescents is limited. This study aims to describe and compare bariatric outcomes between adolescent patients who received preoperative GLP-1 RA therapy and those who did not.
Methods:
A retrospective descriptive study of 150 adolescents who underwent robotic or laparoscopic sleeve gastrectomy between February 2015 and December 2023 at a free-standing pediatric hospital was conducted. Patients were grouped based on whether they received preoperative GLP-1 RA therapy or not. Primary outcomes included anthropometric measures (weight and body mass index (BMI)) at baseline and postoperative intervals (1, 3, 6, and 12 months). Secondary outcomes included co-morbidities and laboratory values. Statistical analysis included descriptive statistics and unpaired t-tests for comparison.
Results:
A total of 150 patients underwent a robotic or laparoscopic sleeve gastrectomy: 110 (73.3%) female, 39 (26.0%) male, and 1 (0.7%) other. Mean enrollment weight was 136.4 + 28.3 kg with a BMI of 48.7 + 8.2 kg/m2. Thirty-seven (24.7%) patients used GLP-1 RAs preoperatively for an average of 21.7 + 11.4 weeks. There was no observable difference in postoperative weight loss, changes in BMI, and percent average weight loss in those who took preoperative GLP-1 RA in this cohort (all p values > 0.05; Figure 1). High density lipoprotein (HDL) was lower postoperatively in those who received preoperative GLP-1 RA therapy ($p = 0.036$), while preoperative and postoperative cholesterol levels appeared to be unaffected (GLP-1 RA: $p = 0.805$, non-GLP-1 RA: $p = 0.082$).
Conclusion:
Use of GLP-1 RAs before bariatric surgery is gaining popularity and the impact on weight loss following bariatric surgery is not well characterized in adolescents. In this study, 24% of adolescents were prescribed preoperative GLP-1 RA with no trend towards a difference in postoperative percent weight loss 1-year after surgery. Larger multicenter studies with longer follow-up periods are warranted to assess potential interactions between GLP-1 RA use and surgical weight loss outcomes.

Abbreviations: GLP-1 RA- Glucagon-like peptide-1 receptor agonists; BMI - Body Mass Index; kg - kilograms; m2 - meters squared; HDL - high density lipoprotein

S67

GLP-1 RECEPTOR AGONISTS AND BILIARY EVENTS IN ADOLESCENTS AND YOUNG ADULTS

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Abstract: Introduction
Use of GLP-1 receptor agonists (GLP-1 RAs) is rising among adolescents and young adults with obesity. While effective for weight loss and metabolic control, their biliary repercussions in youth is uncertain. Adult studies suggest increased gallbladder risk, potentially via rapid weight loss and altered gallbladder motility, but pediatric evidence is scarce. We evaluated associations between GLP-1 RA therapy and biliary outcomes in this population.
Methods
We performed a retrospective cohort study using the TriNetX Research Network (109 sites, >156M patients), including adolescents and young adults (12–21 years) with overweight or obesity from 2022–2025. Patients prescribed GLP-1 receptor agonists were compared with matched controls. Outcomes were cholecystitis, biliary colic, and cholecystectomy, assessed after 1:1 propensity score matching. Risk ratios (RR) and odds ratios (OR) quantified overall incidence, while Kaplan–Meier analyses estimated hazard ratios (HR). Subgroup analyses were stratified by obesity class (Overweight: BMI 25–29.9/85–95th percentile; Class I/II: BMI 30–39.9/95–140%; Class III: BMI ≥40/≥140%).
Results
In the full matched cohort (n=20,306 per group), GLP-1 use was associated with increased risks of cholecystitis (RR 2.31, p=0.001), biliary colic (RR 2.08, p< 0.001), and cholecystectomy (RR 1.87, p< 0.001). In overweight, no cholecystectomies occurred, however biliary outcomes could not be analyzed. In Class I/II (n=9,117 per group), risk analyses showed a non-significant trend toward increased incidence of cholecystitis (RR 1.40, p=0.31) and biliary colic (RR 1.41, p=0.067), with significant rise in cholecystectomy (RR 1.71, p=0.040). Kaplan–Meier analyses, however, demonstrated significantly higher event rates over time with GLP-1 therapy: cholecystitis HR 2.02 (log-rank p=0.029), biliary colic HR 2.09 (log-rank p< 0.001), and cholecystectomy HR 2.58 (log-rank p< 0.001). In Class III, event counts were insufficient for meaningful analysis.
Conclusion
In this cohort, GLP-1 RA therapy was associated with higher risks of cholecystitis, biliary colic, and cholecystectomy. These findings extend adult observations to younger patients and support vigilance for biliary complications when prescribing GLP-1 RAs. Prospective studies should clarify mechanisms, refine risk stratification, and inform prevention.

Abbreviations: GLP-1 receptor agonists (GLP-1 RAs)

Table 1. Associations Between GLP-1 Receptor Agonist Use and Biliary Outcomes

Group	Outcome	Risk Difference	Risk Ratio (RR)	RR p-value	Hazard Ratio (HR)	Log-Rank p-value
Full Cohort	Cholecystitis	0.2% (95% CI 0.1–0.3)	2.31 (95% CI 1.42–3.77)	0.001*	3.85 (95% CI 2.37–6.27)	<0.001*
	Biliary Colic	0.5% (95% CI 0.3–0.6)	2.08 (95% CI 1.61–2.69)	<0.001*	3.27 (95% CI 2.52–4.24)	<0.001*
	Cholecystectomy	0.2% (95% CI 0.1–0.3)	1.87 (95% CI 1.34–2.61)	<0.001*	2.96 (95% CI 2.11–4.15	<0.001*
Overweight	All outcomes	-	-	-	-	-
Class I/II (Obesity)	Cholecystitis	0.1% (95% CI –0.1–0.2)	1.40 (95% CI 0.72–2.72)	0.314	2.02 (95% CI 1.06–3.85)	0.029*
	Biliary Colic	0.2% (95% CI 0.0–0.4)	1.41 (95% CI 0.97–2.05)	0.067	2.09 (95% CI 1.43–3.05)	<0.001*
	Cholecystectomy	0.2% (95% CI 0.0–0.3)	1.71 (95% CI 1.02–2.85)	0.04*	2.58 (95% CI 1.53–4.36)	<0.001*
Class III (Severe Obesity)	All outcomes	-	-	-	-	-

S68

IMPACT OF PEDIATRIC OBESITY ON OPERATIVE DURATION AND POSTOPERATIVE COMPLICATIONS IN COMMON LAPAROSCOPIC SURGERY

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Abstract: Background: Pediatric obesity is public health crisis in the United States and increasingly impacts the care in other routine pediatric surgical diagnoses. The effect of obesity on operative efficiency and complications remains uncertain among children. We evaluated the association between body mass index (BMI), surgical and anesthesia time, and postoperative complications in children undergoing common laparoscopic procedures.
Methods: We analyzed 174,577 patients (mean age 11.6 ± 4.0 years) from a national clinical registry (NSQIP-P) who underwent laparoscopic appendectomy (n = 134,183), cholecystectomy (n = 28,659), or gastrostomy (n = 11,735). BMI was categorized as underweight, normal weight, overweight, class I obesity, class II obesity, or class III obesity. Multivariable models adjusted for demographics and comorbidities estimated relative differences in operative and anesthesia times across BMI groups. Random-effects meta-analysis pooled associations between case duration (per 10-minute increase) and major complications.
Results: Relative to normal weight, class III obesity was consistently associated with longer procedures. In appendectomy, operative time increased by 19.3% (+7.7 minutes) and anesthesia time by 13.6% (+11.0 minutes). In cholecystectomy, operative time increased by 18.4% (+11.8 minutes) and anesthesia time by 13.5% (+14.6 minutes). For gastrostomy, class II obesity increased anesthesia time by 16.6% (+15.0 minutes; 95% CI 8.8–21.5), with wider confidence intervals reflecting smaller sample size. Underweight children generally had similar or slightly shorter times.
Longer procedures were associated with higher odds of several complications. Each additional 10 minutes of operative time was linked to greater risk of ventilation >48 hours (OR 1.09, 95% CI 1.07–1.11), systemic sepsis (OR 1.07, 95% CI 1.05–1.09), organ/space surgical site infection (OR 1.07, 95% CI 1.06–1.08), reoperation (OR 1.06, 95% CI 1.04–1.07), and readmission (OR 1.03, 95% CI 1.01–1.05). Similar, though slightly smaller, associations were observed for anesthesia time. Mortality was not significantly associated with duration after pooling.
Conclusions: Among children undergoing laparoscopic appendectomy, cholecystectomy, and gastrostomy, class III obesity prolongs operative and anesthesia times by 8–15 minutes. Longer case duration independently predicts higher risks of pulmonary and infectious complications and reoperation. These data may inform preoperative counseling and operative access strategies to mitigate risks in common pediatric surgical procedures.

Abbreviations: Body Mass Index (BMI)
National Surgical Quality Improvement Program - Pediatric (NSQIP-P)

Scientific Session 8: Trauma

4:50 PM – 6:20 PM

S69

PEDIATRIC INJURY SURVIVORSHIP AND THE PEDIATRIC TRAUMA QUALITY OF LIFE CLINIC: A YEAR IN REVIEW

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Abstract: Purpose: Survivorship, optimization of physical, mental, and emotional health, and quality of life after injury, is critical. Few post injury clinic models exist for children and youth. We developed the first ever Pediatric Trauma Quality of Life Clinic (TQOL), focused on pediatric firearm injury. Our goal was to review the first-year experience of this clinic using mixed methods.

Methods: All patient demographic and injury characteristics were captured for the first 12 months of the clinic from the institutional trauma registry. Additional data from chart review included rates of appointment completion, services seen, new referrals, scheduled surgeries, and hospital-based violence intervention program (HVIP) involvement. Reflections on TQOL experience and opportunities for improvement were elicited from TQOL team members.

Results: A total of 126 TQOL encounters were scheduled for 86 patients. Among those, 57 (45%) were completed by 49 patients, with variation by month between 20% and 71%. The median age at injury was 16.39 years (IQR 14.81, 17.29) with a range of 3.07 to 17.98 years. Most patients were male (33, 67.3%). By design, the clinic saw mostly firearm injured youth (43, 87.7%). Services seen among completed encounters were General Surgery (57, 100%), Psychology (43, 75%), Physical Therapy (28, 49%), Social Work (44, 77%), HVIPs (27, 47%), and Orthopedic Surgery (1, 2%). Bulletectomies were scheduled for 4 patients (8.2%). TQOL visits led to 52 new referrals for 29 patients in a variety of specialties (Table 1). Among the outpatient Mental Health referrals placed, 9 of 14 (64.29%) were for patients who either did not see psychology as an inpatient or a recommendation for outpatient psychology was not documented during the index admission. Overall, TQOL team members reported high levels of satisfaction with TQOL participation and identified opportunities for improvement.

Conclusion: The first ever pediatric TQOL clinic was successful in its first year. TQOL provided an opportunity for patients to engage with multiple services in one appointment, including Social Work and Psychology, which are often limited in the post discharge setting, and led to numerous new referrals. Additional process improvements are underway in response to variable appointment completion rates and identified challenges.

Abbreviations: TQOL - Trauma Quality of Life Clinic
HVIP - hospital-based violence intervention program

Table 1: Patient level referrals placed after TQOL clinic visits.

Referrals Placed After TQOL	Number of Referrals (%)
Mental Health services	14 (28.6%)
Outpatient Physical Therapy or Occupational Therapy	10 (20.4%)
Pain Medicine	8 (16.3%)
Adult HVIP	7 (14.3%)
Adult TQOL	2 (4.1%)
Neuromuscular/Brachial Plexus Clinic	2 (4.1%)
Orthopedic Surgery	2 (4.1%)
Dermatology	2 (4.1%)
Other[1]	5 (10.2%)

[1]*Care Navigation, Primary Care, Physical Medicine and Rehabilitation, Dentist, Out of State General Surgery*

S70

TIME TO TRAUMA CENTER FOR HEMODYNAMICALLY UNSTABLE PEDIATRIC TRAUMA PATIENTS: WHERE DO WE NEED TO BE "PEDIATRIC READY"

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Abstract: Purpose: Hemodynamically unstable (HDU) pediatric trauma patients require expedient, balanced resuscitation and rapid transportation to definitive care decreasing the time of prehospital phase of care. We hypothesize that the trauma setting affects time to definitive care which remains an important question to evaluate with increasing emphasis on "pediatric readiness" both in the trauma bay and in the prehospital phase of care. The aim of this project is to understand the time HDU children spend in the prehospital phase during transportation based on the trauma setting.

Methods: HDU patients ≤14 years after trauma included in the National Emergency Medical Services Information System (NEMSIS) from 2020-2023. HDU was based on age-defined systolic blood pressure and heart rate parameters. Demographics were compared amongst the age groups. Median (IQR) total prehospital time was assessed as the summation of system response time, Emergency Medical Services (EMS) scene time, and EMS transport time, metrics which were all analyzed by rurality.

Results: There were 5281 HDU children included with greater than 50% over age 10 years. Approximately 50% were males with a median (IQR) age of 11 years (6-13). Median (IQR) total prehospital time was highest for patients who experienced trauma in the rural areas (89min [60-127) and lowest for those in urban areas (72min [52-95], $p < 0.001$, Figure). System response time was double (14min [7-24]) in rural areas compared to urban areas (7min [5-11], $p < 0.001$). Median (IQR) EMS scene time was significantly higher for children in rural areas (18min [11-25]) compared to urban areas (14min [10-21], $p < 0.001$). Children in rural areas had higher median (IQR) EMS transport times (23min [11-36]) compared to those in urban areas (17min [11-27], $p < 0.001$).

Conclusion: This study found that HDU pediatric trauma patients in rural areas have significantly longer prehospital times compared to those in urban settings, mostly due to EMS system response and transport times. With longer transportation time for HDU patients, we must continue to evaluate proximity to definitive care. Potential ways to improve this prehospital time include ensuring efficient prehospital resuscitation strategies, improved pediatric education of EMS, and facilitating rural hospitals to become "pediatric ready."

Abbreviations: HDU: hemodynamically unstable
IQR: interquartile range
EMS: Emergency Medical Services
min: minutes

S71

A MULTICENTER REVIEW OF IMAGING GUIDELINES AND NEGATIVE CT RATES IN PEDIATRIC BLUNT TRAUMA

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Abstract: Introduction: Several pediatric blunt trauma imaging guidelines exist, each with varying sensitivity and predictive value. While their intent is to reduce unnecessary imaging and radiation exposure without missing injuries, data on adoption by trauma centers and associated over imaging of children remain limited. This study aimed to evaluate guideline utilization and negative CT rates for head, cervical spine, and abdominal imaging across pediatric trauma centers (PTCs) in the A+ Pediatric Trauma Research Network (A+PTRN).

Methods: A survey on patients evaluated following trauma activations from January-December 2024 was distributed to participating PTCs. Centers reported number of trauma activations, imaging guidelines used, number of CTs by body region, and negative CT rates. Exclusions included penetrating mechanisms and outside CT imaging performed before transfer. Negative CT rate was defined as the number of negative scans divided by total number of trauma activations.

Results: 13 PTCs from the A+PTRN provided complete data on imaging and negative CT rates for 2024. 5,461 trauma activations were reported, with 481 excluded for penetrating injury and 1,152 excluded for outside imaging. Among the 3,828 eligible patients, 2,032 (53%) underwent a head CT, 877 (23%) cervical spine CT, and 787 (21%) abdominal CT. Mean negative CT rates were: head 40.2 ± 14.3%, cervical spine 27.0 ± 23.3%, and abdomen 16.4 ± 9.7%. Guideline use varied: all centers (14/14, 100%) reported using the PECARN head CT rule; for cervical spine, 7/14 (50%) used institution-specific guidelines, 4/14 (29%) used PECARN, and 3/14 (21%) used NEXUS; for abdominal imaging, 6/14 (43%) used the Streck rule, 6/14 (43%) institution-specific guidelines, and 2/14 (14%) the PECARN rule.

Conclusion: In this multi-institutional cohort, the negative CT rates were highest for head imaging, followed by cervical spine and abdominal CT. While PECARN was universally adopted for head CT, guideline choice for cervical spine and abdominal imaging was highly variable. The relatively low rate of negative abdominal CTs may reflect reliance on adjunctive data (laboratory tests and radiographs) available in the trauma bay to guide decision making. These findings highlight opportunities for standardization and refinement of pediatric trauma imaging

practices to balance diagnostic accuracy with radiation stewardship.

Abbreviations: Pediatric trauma center (PTC)
A+ Pediatric Trauma Research Network (A+PTRN)

S72

BEYOND THE ADDENDUM: CLINICAL IMPACT OF RADIOLOGY REPORT DISCREPANCIES IN PEDIATRIC TRAUMA CARE

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Abstract: Background: Radiology interpretation is critical in pediatric trauma care, yet the emergency setting—particularly after hours—introduces challenges that may compromise diagnostic accuracy. Discrepancies are typically documented as addenda to finalized reports. While many reflect minor clarifications, others have the potential to alter patient management. This study evaluated the frequency, characteristics, and clinical impact of radiology report addenda in pediatric trauma patients.
Methods: We conducted a retrospective review at a Level I pediatric trauma center. All patients younger than 18 years who underwent imaging during trauma evaluation between January 2022 and December 2023 were included. Discrepancies were defined as addenda modifying an initial radiology report and were categorized by severity (Tier 1: minor, Tier 2: moderate, Tier 3: major). Outcomes included error type, management impact, and association with delay between resident preliminary and attending final interpretation.
Results: Of 1,682 pediatric trauma patients who underwent imaging, 484 (28.8%) had at least one report discrepancy. Nearly half were Tier 1 (48.1%), 44.2% were Tier 2, and 7.6% were Tier 3. Most discrepancies had no clinical consequence (75.0%), while 13.8% were associated with possible management changes and 9.5% with definite management changes. An additional 1.4% resulted in delayed care or prolonged hospitalization, and 0.2% were associated with morbidity. The predominant error type was false negative interpretation (75.2%), followed by false positives and incidental findings. The mean delay from resident to attending review was 3.8 hours (SD 4.1), and delay duration was not significantly associated with discrepancy severity (p=0.218).
Conclusions: Radiology report discrepancies in pediatric trauma were common but usually minor and without clinical consequence. Although nearly one in four discrepancies had potential or definite management implications, morbidity was exceedingly rare. These findings suggest that while most misreads do not adversely affect outcomes, structured reporting, timely attending review, and clear communication remain essential to minimize the small subset of errors that can influence patient care.

Abbreviations: SD – Standard Deviation
p – p-value

Table 1. Radiology Misreads in Pediatric Trauma

Category	Subgroup	n (%)
Cohort Summary		
	Total imaged patients	1,682
	Patients with misreads	484 (28.8)
Discrepancy Severity		
	Tier 1 (Minor)[a]	233 (48.1)
	Tier 2 (Moderate)[a]	214 (44.2)
	Tier 3 (Major)[a]	37 (7.6)
Clinical Outcomes		
	No consequence	363 (75.0)
	Possible change	67 (13.8)
	Definite change	46 (9.5)
	Delay in care/LOS[b]	7 (1.4)
	Morbidity	1 (0.2)
Error Type		
	False negative	364 (75.2)
	False positive	60 (12.4)
	Incidental/other	60 (12.4)
Imaging Modality		
	Radiograph	329 (68.0)
	CT	148 (30.6)
	MRI/US	7 (1.4)
Mean Delay		
	Resident → Attending	3.8 h (SD 4.1)[c]

[a] Tier 1 = minor discrepancy without clinical impact; Tier 2 = moderate discrepancy with potential to affect management; Tier 3 = major discrepancy with definite impact on management.
[b] LOS = length of stay.
[c] SD = standard deviation.

S73

UTILIZATION OF DIGITAL IMAGING AND ARTIFICIAL INTELLIGENCE TO QUICKLY AND ACCURATELY CALCULATE TOTAL BODY SURFACE AREA OF BURNS IN PEDIATRIC PATIENTS

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Abstract: Purpose: Initial total body surface area(TBSA) estimates for burns are often imprecise with significant disparity between pre-hospital and post-hospital assessment. These disparities can have a significant impact on initial resuscitation. In this study, our goal was to investigate the feasibility of utilizing computer vision(CV) machine learning(ML) and artificial intelligence(AI) analysis to calculate percentage TBSA in a simulated pediatric patient.

Method: Laerdal Medical's SimJunior® was used as a standardized model. Using the model's manufacturing height and idealized weight for age in a 6 year old, the Mosteller equation calculated a total TBSA of 1344 in2. Felt patches were cut to simulate burns measuring 3%(40.3in2), 5%(67.2in2), 7%(94.1in2), and 10%(134.4in2) with varying shade representing partial thickness and full thickness burns. The burns were placed in 10-12 different configurations per percentage level utilizing both the front and back of the model. Utilizing Roboflow[Version 1], 3.0 Instance Segmentation (Fast) model was used to perform segmentation training. In our initial work, we had a total of 41 partial thickness patches and 15 full thickness patches.

Results: We performed 200 epochs with 8 training images, 2 validation images, and 3 test images. Post-training, the Roboflow model returned probability assessments for the patches that exceeded a confidence threshold. For the felt patch test case using the cloud-based deployment, Roboflow was able to accurately detect all burn areas in < 15 seconds per image analysis. Most burns were identified with confidence more than 75%. One facial burn patch was identified correctly but with a 44% confidence level. With the initial data set, at the completion of the model's epochs, the model precision was 92% with 100% recall(Fig1). Because the training set was less then 30 images, this result is a preliminary finding to show promise in the approach.

Conclusion: Artificial intelligence, once trained, is capable of quickly and accurately determining percentage TBSA in a simulated pediatric setting. Future work will extend training to a variety of skin and body types as well as excluding non-burn items from the calculation such as EKG leads and intravenous catheter dressings before beginning the clinical application of this technology.

Abbreviations: TBSA: total body surface area
CV: computer vision
ML: machine learning
AI: artificial intelligence

S74

INVASIVE INTRACRANIAL PRESSURE MONITORING IN SEVERE PEDIATRIC TRAUMATIC BRAIN INJURY: DOES INSTITUTIONAL RATE OF USE IMPACT OUTCOMES?

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Abstract: Purpose:
While invasive intracranial pressure (ICP) monitoring and targeted therapies to reduce ICP in traumatic brain injury (TBI) have demonstrated efficacy in adults, the utility of ICP monitoring in pediatric patients is less clear. The American College of Surgeons (ACS) Trauma Quality Improvement Program (TQIP) tracks institutional utilization of ICP monitoring in pediatric TBI. This study aimed to evaluate whether centers with higher rates of ICP monitoring, in accordance with TQIP benchmarking standards, have improved patient outcomes.

Methods:
The ACS TQIP Participant Use Files of patients between 2 and 18 years of age with severe TBI admitted to an ACS-verified or state-designated Level I or II trauma center were evaluated for calendar years 2013 to 2023. Exclusion criteria included being deceased on arrival, withdrawal of life-sustaining care, concomitant burns, and length of stay greater than 30 days. Data were aggregated based on admission year and center. Binomial generalized linear mixed models were constructed to evaluate the adjusted association between rates of ICP monitor use and mortality across different institutions over time.

Results:
Of the 15,805 patients identified, 3,084 (19.5%) underwent ICP monitor placement. The mean age for both groups across the study period was 13 years (SD without monitor: 7-16; with monitor: 8-16). Median Injury Severity Score was greater in the monitor group (27 vs. 22, $p< 0.001$). Patients with ICP monitors had a greater median number of ICU days (10 vs. 3, $p< 0.001$) and ventilator days (7 vs. 2, $p< 0.001$). Despite those with ICP monitor use having more severe injuries and requiring more intensive care, the difference in in-hospital mortality for patients with versus without ICP monitoring was similar (18% vs. 20%, $p=0.083$). However, after adjusting for relevant factors, higher rates of ICP monitor use were associated with lower rates of mortality (OR 0.96, 95% CI 0.93-0.99, $p=0.016$). This model demonstrated that for every 10% increase in ICP usage rate at a given center, there is an associated 4% decrease in mortality rate.

Conclusion:
In our nationwide evaluation of rates of ICP monitoring practices in pediatric patients with severe TBI, invasive ICP monitoring was associated with decreased mortality rates.

Abbreviations: ACS = American College of Surgeons
ICP = intracranial pressure
TBI = traumatic brain injury

TQIP = Trauma Quality Improvement Program

S75

AN OPPORTUNITY FOR CONTINUED IMPROVEMENT: EVALUATING THE USE OF ANGIOGRAPHY FOR PEDIATRIC BLUNT LIVER/SPEEN INJURIES POST-2019 APSA GUIDELINES

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Abstract: Purpose: To evaluate the use of angiography in pediatric blunt abdominal trauma with hepatic and/or splenic injuries following the 2019 Updated APSA Blunt Liver/Spleen Injury Guidelines.
Methods: The National Trauma Data Bank (2020–2023) was queried for patients < 18-years-old who sustained blunt abdominal trauma resulting in hepatic and/or splenic injury. Patients with concomitant penetrating trauma were excluded.
Results: A total of 14,085 pediatric patients with blunt hepatic and/or splenic injuries met inclusion criteria, of whom 301 (2.2%) underwent interventional radiology (IR) procedures. Compared to prior literature assessing patients from 2010-2015, the use of angiography and angioembolization has decreased from 3.1% in 2014 to 2.1% in 2023. Patients in the IR intervention group had a higher median injury severity scores (ISS: 30 vs 17, $p < 0.001$) compared to those without IR intervention. The proportion of patients with age-adjusted positive shock index was significantly higher in the IR group (48% vs 30%, $p < 0.001$). Of note, the patients in the IR group also had higher transfusion requirements (58% vs 19%, $p < 0.001$). Surprisingly, 42% of patients who underwent an IR procedure never required a transfusion, an indication highlighted in the 2019 Updated APSA Blunt Liver/Spleen Injury Guidelines.
Conclusions: Since the 2019 Updated APSA Blunt Liver/Spleen Injury Guidelines, the use of angiography in pediatric blunt hepatic and splenic trauma has declined. While IR interventions remain more common in patients with markers of severe injury, such as shock index and injury severity score, a significant proportion of patients underwent IR intervention without ever requiring a transfusion. This suggests angiography may be overutilized and highlights an opportunity for continued education to further reduce unnecessary angiographic intervention.

Abbreviations: IR - interventional radiology
ISS - injury severity score

S76

MANAGEMENT OF PEDIATRIC RECTAL TRAUMA: A FOUR-YEAR ACS-TQIP DATABASE REVIEW

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Abstract: Introduction:
Adult rectal trauma management has undergone a paradigm shift away from fecal diversion, distal rectal washout (DRW) and presacral drainage (PSD) towards primary repair alone. There is a paucity of data on pediatric rectal trauma and its management. This study aims to assess the nationwide management of pediatric rectal trauma, its associated outcomes, and the impacts of the surgical techniques described.

Methods:
Retrospective review of the ACS-TQIP database 2017-2020 was performed. Children with full-thickness rectal injuries (rectal-AIS≥2) were included. Operative management options included transanal repair (TAnR), transabdominal repair (TAbR), diverting colostomy (DC), DRW, PSD, resection with anastomosis (LAR), and endoscopy (Endo). Outcomes included infectious complications (superficial, deep, or organ space SSI or sepsis), unplanned return to OR, unplanned ICU admission, mortality, and survivor-only length-of-stay (LOS). Multivariate binary logistic regression analyses were performed to identify independent predictors of DC, and the effect of surgical techniques on outcomes.

Results:
641 children were included (AIS-II 70%;AIS-III 20%;AIS-IV 8%;AIS-V 1%). Mean age was 11±5 years and 62% were male, 65% were blunt injuries, ISS was 8[4-16], 5% hypotensive, 11% received blood transfusion, and 35% managed at Pediatric Level I centers. Concomitant injuries included pelvic fracture(21%), small bowel(15%), colon(15%), bladder(12%), and uterovaginal(6%). Overall, 40% of patients underwent operative intervention (Figure). Among 234 patients who underwent repair/resection, 6% also underwent DC, 4% PSD, and 2% DRW. Overall outcomes were: 2% infectious complications; 3% unplanned return to OR; 1% unplanned ICU admission; 3% mortality was 3%; 4[2-8] days survivor-only LOS. Higher rectal AIS was the only predictor of DC (aOR 1.83). Age 6-12 years (aOR 0.17) and higher rectal AIS (aOR 1.79) were independently associated with composite outcome measure. No significant associations were found between the different surgical techniques and outcomes.

Conclusion:
This is the largest series of pediatric rectal trauma to date. Majority of patients were managed non-operatively, suggesting a shift towards selective operative management. When surgery was pursued, primary repair was much more common than fecal diversion, DRW or PSD. The surgical technique did not appear to affect outcomes after adjusting for confounding. Further large-scale granular studies are warranted to help create pediatric-specific algorithms.

Abbreviations: ACS-TQIP=American College of Surgeons Trauma Quality Improvement

Program; Endo=endoscopy (anoscopy, proctoscopy, or sigmoidoscopy); DC=diverting colostomy; DRW=distal rectal washout; PSW=presacral drainage; TAnR=transanal repair; TAbR=transabdominal repair; LAR=low anterior resection and anastomosis; SSI=surgical site infection; OR=operating room; LOS=length of stay; AIS=abbreviated injury scale; ICU=intensive care unit; aOR=adjusted odds ratio

S77

IMPLEMENTATION OF A STANDARDIZED SEXUAL HEALTH SCREENING PROTOCOL FOR ADMITTED PEDIATRIC TRAUMA PATIENTS

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Abstract: Purpose

Adolescents admitted for traumatic injuries represent a vulnerable population at risk for unmet sexual and reproductive health (SRH) needs. ACS-Verified Level-1 Pediatric Trauma Centers screen admitted trauma patients for alcohol and drugs of abuse, but no standardized screening exists for SRH. We undertook quality improvement work to implement universal SRH screening for admitted trauma patients ≥12 years and offer appropriate resources to those who screened positive. We aimed to increase screening rates from 0% to 80% and sustain for 12 months.

Methods

A multidisciplinary team of trauma providers, gynecologists, and social workers used key drivers to develop a standardized SRH screening form (Figure) and process map to facilitate patient/family acceptability and interdepartmental communication. SRH screening was integrated into standard tertiary assessment for trauma alert patients or social work assessment of non-alert trauma patients. SRH screen results were documented using an EMR-based secure note template with integrated responses and built-in decision support for next steps. Patients disclosing risk behaviors or needs were offered testing and treatment for sexually transmitted infections (STIs), contraception (standard or emergency use), and/or referrals to Pediatric and Adolescent Gynecology services. Screening compliance was tracked prospectively and Plan-Do-Study-Act cycles were used to improve screening rates.

Results

Over the entire 12 month period of screening initiation, 57% (269/474) of eligible patients were offered SRH screening and 56% (268/474) of eligible patients completed SRH screening. However, screening completion rates improved from 33% (13/39) in the first month to 92% (49/53) in the twelfth month. At month 10, screening results and intervention delivery was evaluated; 9% (15/160) of patients indicated ≥1 SRH need. Among these, 53% (8/15) accepted further evaluation or resource(s) (condoms x9, STI testing x5, standard contraception x1, emergency contraception x1, gynecology consult x1). No adverse events related to screening were reported.

Conclusion

Implementation of a structured SRH screening process for pediatric trauma inpatients is both feasible and impactful. High patient engagement and provider adherence demonstrated acceptability and operational integration. This quality improvement initiative addresses a critical gap in adolescent trauma care. Sustained efforts are ongoing to evaluate long-term outcomes and expand the model to other inpatient populations.

Abbreviations: SRH: sexual and reproductive health
STI: sexually transmitted infections

S78

NON-ACCIDENTAL TRAUMA AFTER NEONATAL INTENSIVE CARE UNIT ADMISSION

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Abstract: Purpose:
Neonatal intensive care unit (NICU) admissions represent a unique constellation of medical and social challenges for neonates and their families, which have been shown to increase risk for future non-accidental trauma (NAT). This study describes the risk factors for and presentation of NAT in NICU graduates at a large children's hospital.

Methods:
Institutional NICU and Trauma registries were compared to identify NICU graduates who were later evaluated for a traumatic injury prior to age 5 from January 2010 to June 2024. Retrospective data was collected on clinical and social characteristics at the time of NICU and trauma encounters. Patients with concern for NAT at their index trauma evaluation were identified by a child abuse specialty consultation documenting concern for NAT and a child protective services (CPS) report placed at the same encounter. Patients without such documented concern served as the control group for comparative analyses, with $p < 0.05$ considered significant.

Results
Of 39,897 patients discharged from our institution's NICU during the study period, 375 were later evaluated for a traumatic injury before age 5 (0.94%). Concern for NAT at trauma presentation was identified in 115 patients (30.6%). Overall incidence of presentation concerning for NAT after NICU discharge was 0.29%. Patients in the NAT group were more likely to have public insurance (84.3% vs 66.0%, p=0.001) and a history of CPS involvement prior to their trauma encounter (42.1% vs 24.3%, p=0.001) compared to patients without NAT concern.

Patients with concern for NAT were significantly younger at time of their trauma encounter than those without—median age 1 (IQR 0.75,2.25) vs 3 (IQR 2,4) years, p=0.003. The NAT group was more likely to present with firearm injury and unexplained or unwitnessed mechanisms, whereas burns and falls were more commonly reported in the non-NAT group ($p < 0.01$ for all). Patients in the NAT group more frequently had intracranial, chest wall, oral, and intra-ocular injuries (Table 1).

Conclusion:
This study identifies important risk factors for NAT among NICU graduates, as well as differences in presentation after injury, that may help providers identify at-risk patients for intervention.

Abbreviations: NICU - Neonatal Intensive Care Unit; NAT - Non-accidental trauma; CPS -

Thursday, May 7, 2026

Plenary 2

7:30 AM – 9:15 AM

11

OPERATIVE TIMING OF ELECTIVE RESECTION IN CONGENITAL LUNG MALFORMATIONS AMONG MAJOR CHILDREN'S HOSPITALS IN THE UNITED STATES

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Abstract: Background:Optimal timing of elective resection of prenatally diagnosed congenital lung malformations (CLMs) remains controversial. Many centers advocate for early resection to prevent pneumonia and other complications; however, the natural history of symptom onset is not well defined. This study aimed to determine whether rates of postoperative complications and respiratory morbidity were different in children undergoing elective resection across different age groups.
Methods:A retrospective cohort study of patients with a prenatally diagnosed CLM was conducted within a consortium of 18 major children's hospitals in the United States (2016-2024). Neonatal resections and those managed non-operatively were excluded. Patients were stratified into five groups based on operative age. The primary outcome was postoperative complications. Secondary outcomes were perioperative course, pre-/post-operative pneumonia, and asthma. Statistical analyses were one-way ANOVA and chi-squared tests ($p < 0.05$).
Results:Of 1524 children, 949 (62.3%) met inclusion criteria. The median age at operation was 6.7 months (IQR:4.5-9.4) with marked variation in operative age at an institutional level (median range:3-9 mos, $p< 0.0001$). There were no significant differences in postoperative complications or operative duration across age groups. Patients undergoing resection at age 1-3 months had the longest hospital length of stay (IQR:2-5 days) and highest rates of open resection (22.9%) and conversions to open (9.8%). Pre-operative pneumonia incidence rose from 0.7% (7-9 months) to 5.2% (10-12 months) and 7.6% at 12+ months ($p < 0.0001$, Figure). Preoperative symptoms rose from 4.9% (7-9 months) to 10.4% (10-12 months) and 17.0% at 12+ months ($p < 0.0001$). Post-operative pneumonia rates did not differ significantly based on a median follow-up age of 23.4 months. There was a significant difference in a subsequent asthma diagnosis, with the lowest rate amongst those undergoing resection in months 4-6 (5.9%).
Conclusion:Age at elective resection was not associated with postoperative complication rates, suggesting resection can be performed safely across a range of ages in infants with CLMs. However, the rising incidence of preoperative pneumonia and other symptomatic disease after 10 months highlights the potential risks of delaying surgery until late infancy or beyond. These findings may help guide prenatal and preoperative counseling discussions with families regarding the optimal timing of surgery.

Abbreviations: CLM - Congenital Lung Malformation

12

PREDICTIVE MODELING OF NEONATAL OUTCOMES IN NON-HYDROPIC FETUSES WITH LUNG MALFORMATIONS: RESULTS FROM A NATIONAL COHORT OF MAJOR CHILDREN'S HOSPITALS

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Abstract: Purpose: Fetal congenital lung malformations (CLM) represent a heterogeneous spectrum of anomalies associated with variable perinatal outcomes. The prognostic value of most prenatal ultrasound findings in predicting neonatal disease severity remains controversial. In this study, we leveraged a national consortium database to develop and evaluate a simple prediction model of adverse neonatal outcomes in non-hydropic term fetuses diagnosed with a CLM.

Methods: We conducted a retrospective, multicenter cohort study of fetuses with an isolated

CLM across 18 United States children's hospitals between 2016 and 2024. Hydropic fetuses and those born < 37 weeks were excluded. Prenatal variables were correlated with the primary outcome, neonatal resection. Secondary outcomes included respiratory distress at birth, need for supplemental oxygen, and mechanical ventilation. Statistical analyses included Chi-Square and Kruskal-Wallis tests, receiver operating characteristic curves, and multivariable logistic regression, as appropriate.
Results: Among 1,251 fetuses meeting inclusion criteria, 36.5% had mediastinal shift, and 20.8% had a systemic feeder vessel. The congenital pulmonary airway malformation volume ratio (CVR) was recorded in 836 cases, with a mean maximum value of 1.01+/-0.9 at 27.4+/-4.9 weeks' gestation. At birth, 19.7% had respiratory symptoms, 16.6% required supplemental oxygen, 6.0% utilized mechanical ventilation, and 5.9% underwent neonatal resection. On multivariable analysis, maximum CVR (OR 2.48[95% CI 1.8-3.58], p< 0.001) and maternal steroids (OR 3.59[CI 1.51-9.15], p< 0.01) were significant predictors of neonatal resection (AIC 236, AUC 0.88[CI 0.83-0.94]), while mediastinal shift (OR 2.66[CI 1.01-8.36], p=0.06) did not reach significance. Maximum CVR was also an independent predictor of respiratory distress at birth (OR 2.15[CI 1.66-2.81], p< 0.001, AUC 0.72[CI 0.67-0.76]), supplemental oxygen (OR 2.08[CI 1.61-2.73], p< 0.001, AUC 0.72[CI 0.67-0.78), and mechanical ventilation (OR 1.95[CI 1.47-2.67], p< 0.001, AUC 0.74[CI 0.66-0.82]). Model performance with sample test data is shown in the Figure.
Conclusions: We have successfully developed a simple prediction tool to estimate risk of four distinct adverse neonatal outcomes in non-hydropic fetuses with CLMs. Maximum CVR, measured at ~27 weeks' gestation, emerged as an independent prenatal predictor of early postnatal outcomes. These findings may aid delivery planning and enhance prenatal counseling by providing patient-specific information on the anticipated postnatal hospital course.

Abbreviations: Congenital lung malformations (CLM); congenital pulmonary airway malformation volume ratio (CVR)

13

WEIGHING THE RISKS AND BENEFITS OF POST-OPERATIVE KETOROLAC IN CROHN'S PATIENTS AFTER ILEOCECECTOMY

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Abstract: Purpose:
Adult literature suggests that ketorolac use in Crohn's patients increases rates of flares. There is a paucity of pediatric literature on this topic. We investigate if post-operative ketorolac in children with Crohn's disease undergoing ileocecectomy effects rates of complications, specifically Crohn's flares within 2 years.
Methods:
Electronic medical record data of patients < 18 years with Crohn's disease undergoing ileocecectomy at a single institution from 1/1/2013-9/1/2023 were retrospectively reviewed. Demographics, operative course, 30-day complications, and Crohn's flares, small bowel obstructions (SBO), and strictures within two years were collected. 191 patients met inclusion criteria. Patients who received post-operative ketorolac (n=169) were compared to those who did not (n=22). Continuous variables were analyzed using the Mann-Whitney U test and categorical variables with Fisher's exact or chi-squared, as appropriate. Significance was defined as $p< 0.05$.
Results:
The median age was 15.9[14.2, 17.8] years with female predominance (101(59.8%)). Between ketorolac-exposed (169(88.5%)) and unexposed (22(11.5%)) patients, demographics including age (15.8[14.2, 17.8] vs. 16.4[10.8, 17.9], p=0.92) and sex (81(47.9%) male vs. 9(40.9%) p=0.39) were similar. Pre-operative steroid use (127(75.1%) vs. 15(68.2%), p=0.49), biologic use (124(73.4%) vs. 20(90.9%), p=0.07), and labs were also similar (Table 1). There were no differences in surgical approach (laparoscopic 167(98.8%) vs. 20(90.9%), p=0.07). Intra-operative transfusion rates (4(2.4%) vs. 1(4.5%), p=0.46) were similar. Post-operatively, ketorolac-exposed patients required significantly less opioids (17.0[3.9, 35.2] morphine milli-equivalents vs. 39.7[8.4, 58.7], p=0.048). Length of stay (4.5[3.6, 5.5] vs. 5.3[3.6, 6.7] days, p=0.12), days to flatus (2.0[0, 2.25] vs. 2.0[0, 2.25], p=0.93), and days to ambulation (1.0[0.0, 1.0] vs. 1.0[0.0, 2.0], p=0.06) were similar. There were 18(9.4%) 30-day complications, with no differences between groups. Within two years, there was no difference in the number of Crohn's flares (3(1.8%) vs. 1(4.5%), p=0.39), SBOs (8(4.7%) vs. 0(0%), p=0.6), or strictures (1(0.6%) vs. 0(0%), p>0.99).
Conclusion:
Ketorolac after ileocecectomy for Crohn's disease did not increase the rate of 30-day complications or flares within two years. Patients who received ketorolac used significantly less opioids in the post-operative period. The benefits of ketorolac may outweigh the risks in this setting.

Abbreviations: SBO: Small Bowel Obstruction
ESR: Erythrocyte Sedimentation Rate
CRP: C-Reactive Protein

Table 1: Pre-operative characteristics and outcomes of Crohn's patients undergoing ileocecectomy.

Variable	Overall (n=191)	Ketorolac Exposure* (n=169)	No Ketorolac Exposure* (n=22)	P-value
Age at surgery, years	15.9 [14.2,17.8]	15.8 [14.2, 17.8]	16.4 [10.8, 17.9]	0.88
Pre-operative Labs				
Elevated Erythrocyte Sedimentation Rate (ESR >13)	58 (30.4%)	50 (29.6%)	8 (36.4%)	0.42
Elevated C-Reactive Protein (CRP >0.5)	70 (36.6%)	60 (35.5%)	10 (45.5%)	0.83
Low Albumin (Albumin <3.5)	23 (12.0%)	23 (13.6%)	0 (0%)	0.08
Unplanned admission	65 (34.0%)	55 (32.5%)	10 (45.5%)	0.23
Approach				
Laparoscopic	187 (97.9%)	167 (98.8%)	20 (90.9%)	0.07
Open	4 (2.1%)	2 (1.2%)	2 (9.1%)	0.07
Post-Operative Pain Medications				
Opiates, Morphine Milli-Equivalents (MME)	18.0 [4.0, 38.5]	17.0 [3.9, 35.2]	39.7 [8.4, 58.7]	**0.048**
Tylenol	164 (85.9%)	144 (85.2%)	20 (90.9%)	0.47
30 Day Post-Operative Complications				
Deep surgical site infection	7 (3.7%)	7 (4.1%)	0 (0%)	>0.99
Leak	1 (0.5%)	1 (0.6%)	0 (0%)	>0.99
Small Bowel Obstruction	3 (1.6%)	3 (1.8%)	0 (0%)	>0.99
Bleed	3 (1.6%)	2 (1.2%)	1 (4.5%)	0.31
Acute Kidney Injury	2 (1.1%)	1 (0.6%)	1 (4.5%)	0.22
Superficial Wound Dehiscence	1 (0.5%)	1 (0.6%)	0 (0%)	>0.99
SMV Thrombosis	1 (0.5%)	0 (0%)	1 (4.5%)	0.12
2-Year Crohn's Complications				
Flare	4 (2.1%)	3 (1.8%)	1 (4.5%)	0.39
Small Bowel Obstruction	8 (4.2%)	8 (4.7%)	0 (0%)	0.60
Stricture	1 (0.52%)	1 (0.6%)	0 (0%)	>0.99

*Continuous variables listed as median [IQR] and categorical as n (%).

14

IMPACT OF PULLTHROUGH TIMING ON ENTEROCOLITIS, COMPLICATIONS, AND HEALTH CARE UTILIZATION IN HIRSCHSPRUNG DISEASE

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Abstract: Introduction:
Optimal timing of pullthrough (PT) for short-segment Hirschsprung disease (HD) remains controversial. Current data regarding risk of enterocolitis and complications are mixed and limited by single-center design and/or small sample size. We evaluate postoperative surgical outcomes following neonatal versus delayed PT across two datasets: 1) Eastern Pediatric Surgery Network (EPSN), a large, multicenter regional consortium, and 2) Pediatric Health Information System (PHIS), a national administrative dataset.

Methods:
PT timing was defined as neonatal when done during the birth admission at age <1 month and delayed when done during a separate admission at age ≥1 month. All PT were single-stage (no

stoma) with ≥2 years follow-up. EPSN outcomes from 2010-2020 included incidence of postoperative enterocolitis, reoperation. PHIS outcomes from 2016-2022 included inpatient resource utilization and costs analyzed with multivariable modeling.

Results:
1) Clinical outcomes (EPSN, n=313; neonatal n=229, delayed n=84): Postoperative enterocolitis rates were similar (45.4% vs 44.1%, p=0.83), regardless of inpatient (44.1% vs 40.5%, p=0.56) or outpatient management (4.4% vs 9.5%, p=0.10). There were no differences in rates of reoperation for anastomotic leak (0% vs 2.4%, p=0.074), stricture (10.8% vs 9.5%, p=0.837), or need for EUA/botox (21.2% vs 23.8%, p=0.643) between groups.

2) Resource utilization (PHIS, n=842; neonatal n=536, delayed n=306): Operative reintervention and 30-day readmission rates were similar between groups. Neonatal PT was associated with higher adjusted 2-year costs ($76,900 vs $57,300, p<0.001) driven by longer ICU/NICU stay (12 days [IQR 5–17] vs 5 days [IQR 0–10], p < 0.001) over the first 2 years of life. These differences persisted after adjusting for comorbid conditions and hospital-level effects.

Conclusion:
Across two large multicenter studies, neonatal and delayed PT had similar risk of complications, reoperation, and readmission, but neonatal PT was associated with greater ICU utilization and higher costs. These findings suggest that delayed PT may be a more resource-efficient approach without compromising surgical outcomes.

Table 1 Legend:
Comparison of clinical outcomes and healthcare utilization following neonatal versus delayed pullthrough for Hirschsprung disease using two complementary multicenter data sources. Clinical outcomes were derived from the Eastern Pediatric Surgery Network (EPSN), and resource utilization and costs from the Pediatric Health Information System (PHIS). Unadjusted cohort comparisons are shown. Multivariable mixed-effects models using PHIS data evaluated adjusted associations between timing of pullthrough and readmission, ICU/NICU days, and costs, adjusting for comorbidities and hospital-level effects. Continuous variables are reported as median (interquartile range) and categorical variables as n (%).

Variable	Neonatal Cohort	Delayed Cohort	P value
	n (%) or Median (IQR)	n (%) or Median (IQR)	
Demographics:			
Number of patients	229	84	
Sex			
Male	168 (73.4%)	66 (78.6%)	0.347
Female	61 (26.6%)	18 (21.4%)	
Gestational age (weeks)	39 (38, 40) n=223	39 (37.4, 39.4) n=82	0.165
Birth weight (kg)	3.32 (3.02, 3.7) n=219	3.24 (2.88, 3.57) n=81	0.103
Comorbidities			
Down syndrome	22 (9.6%)	4 (4.8%)	0.247
Heart disease	25 (10.9%)	12 (14.2%)	0.413
Genetic disorder associated with HD	11 (4.8%)	3 (3.6%)	0.766
Additional intestinal disorder	8 (3.5%)	5 (6%)	0.345
Duration of follow-up (years)	5.1 (2.9, 7.3)	4.8 (3.1, 7)	0.437
Surgical information			
Age at pullthrough (days)	10 (7, 15)	59 (34, 82)	**<0.001***
Weight at pullthrough (kg)	3.38 (3.03, 3.78)	4.69 (3.88, 5.45)	**<0.001***
American Society of Anesthesiologists-Physical Status (ASA)			
I	3/207 (1.5%)	3/80 (3.8%)	**<0.001***
II	88/207 (42.5%)	61/80 (76.3%)	
III	111/207 (53.6%)	16/80 (20%)	
IV	5/207 (2.4%)	0/80 (0%)	
Operative Approach			
Laparoscopy	198 (86.5%)	52 (61.9%)	**<0.001***
Laparotomy	16 (7%)	8 (9.5%)	
Transanal only	15 (6.6%)	24 (28.6%)	
Operation Technique			
Yancey-Soave	170 (74.2%)	38 (45.2%)	**<0.001***
Swenson	58 (24.5%)	44 (52.4%)	
Duhamel	1 (0.4%)	0 (0%)	
Length of aganglionosis (cm)	8 (4.5, 13.8) n=191	5.6 (4, 10.5) n=69	0.071
Length of ganglionated segment excised (cm)	6 (3, 8) n=187	5.2 (3.6, 10) n=70	0.555
Use of botox at time of pullthrough	6/223 (2.7%)	2 (2.4%)	0.999
Surgical Outcomes			
Total number of HAEC occurrences	104 (45.4%)	37 (44.1%)	0.829
Anastomotic leak	0/223 (0%)	2 (2.4%)	0.074
Anastomotic stricture	24/223 (10.8%)	8 (9.5%)	0.837
Stricture management			
Reoperation	10/24 (41.7%)	2/8 (25%)	0.676
Dilations only	14/24 (58.3%)	6/8 (75%)	
Return to OR for EUA/irrigation/botox	47/222 (21.2%)	20 (23.8%)	0.643

15

NO-DISCHARGE-ANTIBIOTICS AFTER COMPLICATED APPENDICITIS: A WESTERN PEDIATRIC SURGERY RESEARCH CONSORTIUM PROSPECTIVE STUDY

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Abstract: Purpose:
Acute appendicitis is a common surgical emergency in childhood. Although laparoscopic appendectomy remains the standard of care, the optimal duration of postoperative antibiotics in complicated cases is unclear. In 2025, our consortium reviewed postoperative antibiotic regimens across nine pediatric hospitals and found no significant differences in deep surgical site infections across protocols. Based on these findings, the consortium agreed to eliminate routine discharge antibiotics as a quality improvement initiative. This study evaluates the effectiveness of this standardized protocol eliminating routine discharge antibiotics after laparoscopic appendectomy for complicated appendicitis.

Methods:
Seven pediatric hospitals implemented a standardized no-discharge-antibiotics protocol after laparoscopic appendectomy for complicated appendicitis. We compared outcomes from the year preceding protocol implementation with those from the implementation year. Patients with intraoperative confirmation of perforated appendicitis were included. The primary outcome was postoperative post-discharge deep organ space infection requiring intervention, excluding patients with pre-discharge abscess. Secondary outcomes included length of stay (LOS), antibiotic-free days, and postoperative 30-day ER visits/readmissions.

Results:
We included 1,709 patients: 736 (43%) pre-protocol and 973 (57%) on-protocol. There were no significant differences between protocol groups in terms of age, sex, BMI, days of symptoms, or operative approach. Prescription of antibiotics at discharge significantly decreased after

protocol implementation (40% v 9%, p< 0.001). There were 87 (5.6%) deep organ space infections diagnosed after discharge across the cohort. This was not significantly different between pre-protocol and on-protocol patients (5.6% v 5.6%, p=0.97). On-protocol group patients had significantly shorter hospital LOS (4d v 5d, p< 0.001), no change in hospital readmission (7.2% v 9.5%, p=0.09), and more antibiotic-free days 30-days postoperatively (27d v 26d, p< 0.001).

Conclusion:
In this multi-center prospective implementation study, we directly capture the effect of a standardized antibiotic protocol change across nearly 1,000 patients with complicated appendicitis at seven different children's hospitals. This study demonstrates the feasibility of coordinating multiple centers to implement and adhere to a unified protocol, underscoring the strength of consortia collaboration. We found that there was no increase in the rate of postoperative post-discharge abscess formation, suggesting that the routine prescription of antibiotics at discharge after laparoscopic appendectomy for complicated appendicitis is unnecessary.

Abbreviations:

16

PEDIATRIC SURGERY FELLOWSHIP APPLICANT SCREENING FOR THE IDEAL CANDIDATE

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Abstract: Purpose:
Selection of diverse, top tier pediatric surgery fellowship candidates requires holistic screening strategies. Three methods of screening were piloted during a fellowship cycle to determine the optimal screening strategy.

Methods:
A novel system of pediatric surgery fellowship applicant screening was piloted during the 2025 application cycle at a single institution. Three techniques were used to screen applicants: the Standard method, the APSTPD method, and the Thalamus method. The Standard method consists of traditional application review by a faculty member. The APSTPD method follows the Association of Pediatric Surgery Training Program Directors recommendations for holistic review. The Thalamus method utilizes artificial intelligence with blinding of select attributes. Each method produced a list of top applicants. Applicants on all three lists were granted an automatic interview, while those on at least one list were reviewed for an interview offer. Following interviews, a maximally objective rank list was created. Spearman's correlation coefficients were used to test for an association between screening methods and interview results. Chi-square tests were used to compare application outcomes between gender and race/ethnicity groups; $p < 0.05$ was considered significant.

Results:
Sixty-six applications were screened for pediatric surgery fellowship. Top applicants were identified by each method; 21 from Standard, 30 from APSTPD, and 21 from Thalamus. A 15% overlap between all three methods generated 10 automatic interviews. The remaining 28 top applicants were reviewed; interview offers were extended to 38% from Standard, 42% from APSTPD, and 19% from Thalamus. Selection by multiple methods did not correlate with interview score ($r=0.24$, $p=0.28$) or final rank ($r=-0.16$, $p=0.46$). The APSTPD method did not show statistically significant bias toward underrepresented minorities or women, while Standard favored men ($p=0.04$) and Thalamus favored white/unknown ethnicity candidates ($p=0.02$). APSTPD method scoring had the strongest correlation with interview performance ($r=0.41$, $p=0.054$) and final rank ($r=-0.40$, $p=0.057$).

Conclusions:
Screening by APSTPD methodology produced an interview pool that did not favor gender or ethnicity. Interview performance and rank position correlated most with the APSTPD method. This method of pediatric surgery fellowship candidate screening should be considered as a holistic, equitable strategy for selection of top applicants.

Abbreviations: APSTPD: Association of Pediatric Surgery Training Program Directors

17

ADMINISTRATION OF EXOGENOUS ORAL SEROTONIN REDUCES SEVERITY OF EXPERIMENTAL NECROTIZING ENTEROCOLITIS

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Abstract: Purpose
Necrotizing enterocolitis (NEC) is a severe gastrointestinal disease of premature infants. Enteroendocrine cells in the small intestine produce 90% of total body serotonin, a multifunctional amine neurotransmitter with described effects on motility, secretion and gut immune cell activation. However, the role of intestinal serotonin signaling in NEC remains undefined. We observed that intestinal serotonin release decreases early in NEC development and sought to provide exogenous serotonin as a strategy to reduce NEC severity.

Methods
Experimental NEC was induced in postnatal day 7 mouse pups according to a well-validated disease model utilizing commercial infant formula spiked with gut bacteria from a human infant with NEC. NEC mice received experimental formula with saline, NEC+serotonin mice received experimental formula with serotonin hydrochloride (150 mg/kg total daily dose), and control mice were age-matched breastfed pups (n≥6 per group). Euthanasia was performed after 48 hours. Plasma serotonin was measured in platelet-depleted plasma by competitive ELISA. Plasma inflammatory cytokines were measured by multiplex ELISA. Terminal ileum was fixed, paraffin-embedded and H&E stained for histologic injury rating by blinded reviewers. Analysis was performed in GraphPad Prism 10 by ordinary one-way ANOVA followed by Tukey multiple comparison test for groups with equal variances. Significance was defined as $p< 0.05$.

Results
We observed a decrease in plasma serotonin in experimental NEC (control vs. NEC $p=0.002$). Exogenous serotonin restored plasma serotonin in NEC+serotonin to match that of breastfed controls (NEC vs. NEC+serotonin $p=0.8804$), while it drastically reduced plasma cytokines M-CSF (NEC vs. NEC+serotonin $p=0.006$) and IL-6 ($p=0.021$). Strikingly, oral serotonin attenuated histologic intestinal injury score (NEC vs. NEC+serotonin $p=0.034$) and reduced mortality from 25% in NEC alone to 0% (NEC vs. NEC+serotonin $p=0.035$).

Conclusion
Intestinal serotonin release is significantly reduced within 48h of experimental NEC treatment, and exogenous serotonin treatment reduces NEC severity, offering potential as a novel therapeutic for treatment of early disease in human infants.

Abbreviations: NEC - necrotizing enterocolitis
ANOVA - analysis of variance
H&E - hematoxylin and eosin

M-CSF - macrophage colony stimulating factor
IL-6 - interleukin 6

18

IMPACT OF ANTICOAGULANT AND OXYGENATOR TYPE ON ECMO OUTCOMES IN NEONATES WITH CONGENITAL DIAPHRAGMATIC HERNIA

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Abstract: Purpose:
Congenital diaphragmatic hernia (CDH) is a life-threatening anomaly necessitating extracorporeal membrane oxygenation (ECMO) support in severe cases. The increasing adoption of CDH repair during ECMO has prompted modifications in anticoagulation protocols to minimize morbidity. We aim to evaluate the impact of anticoagulant (heparin and bivalirudin) and oxygenator type (Quadrox, Nautilus MC3, Infant Euroset) on bleeding, thrombosis, and transfusion requirements in CDH patients on ECMO.

Methods:
Retrospective analysis (2014-2025) of neonates with CDH requiring ECMO was performed across three quaternary referral centers. We evaluated the impact of anticoagulant and oxygenator types on ECMO course, bleeding and thrombotic complications, transfusions and survival outcomes with univariate analysis (Mann-Whitney U) and multivariate analysis (logistic and linear regression).

Results:
Of 150 patients, 93 received heparin and 57 received bivalirudin. Demographics were comparable between groups. Bivalirudin was associated with a lower incidence of bleeding (47.4% vs 69.23%, p = 0.01) and circuit thrombosis (77.2% vs 91.4%, p=0.027), along with fewer circuit changes per patient (1.51 vs 0.649, p< 0.001). Univariate analysis of outcomes is presented in Table 1.
On multivariable analysis adjusting for oxygenator type, anticoagulant, ECMO duration, and weight at cannulation, bivalirudin remained protective against hemorrhagic events (aOR 0.06, p = 0.033). Similarly, bivalirudin reduced transfusion requirements for packed red blood cells (-48 ml/day, p = 0.01) and platelets (-27ml/day, p = 0.01) versus heparin. The Infant Euroset was associated with greater transfusion requirements for packed red blood cells (75 ml/day, p = 0.003) and platelets (47 ml/day, p = 0.001) compared with the Quadrox but trended toward fewer circuit thrombosis events (aOR 0.09, p=0.065). The Nautilus MC3 similarly increased packed red blood cell transfusions (59 ml/day, p=.002).
Neither anticoagulant nor oxygenator choice was associated with hospital length of stay, mortality on-ECMO, or overall mortality.

Conclusion:
Anticoagulant regimen and oxygenator selection influence ECMO morbidity in neonates with CDH. Bivalirudin was independently associated with reduced bleeding, transfusion requirements, and thrombosis, while newer-generation oxygenators were linked to increased transfusion burden but lower thrombotic complications. These findings underscore the

importance of circuit and anticoagulation strategy and support prospective evaluation to refine management in this high-risk population.

Abbreviations: CDH – Congenital diaphragmatic hernia

ECMO – Extracorporeal membrane oxygenation

aOR – Adjusted odds ratio

RBC – Red blood cells

19

UPREGULATION OF COLLAGEN IV AND INCREASED INTESTINAL STIFFNESS DURING DEVELOPMENT ARE INVOLVED IN THE PATHOGENESIS OF HIRSCHSPRUNG DISEASE

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Abstract: PURPOSE:
Hirschsprung disease (HSCR) is a congenital enteric neuropathy arising from defective migration of enteric neural crest cells (ENCCs) during gut development. Evidence suggests that extracellular matrix (ECM) dysregulation contributes to impaired ENCC migration, with aberrant collagen expression linked to fibrotic remodeling and increased intestinal stiffness. Collagen type IV (COL4), a key basement membrane component, has been reported to be upregulated in Hirschsprung; however, its developmental impact on tissue biomechanics and ENCC migration remains poorly understood. This study aimed to determine whether aberrant COL4 expression contributes to increased intestinal stiffness in a mouse embryonic model of Hirschsprung and to assess its potential role as a mechanical barrier to ENCC migration.
METHODS:
Ednrb knockout (Ednrb-/-) mouse embryo at embryonic day E14.5 was used as a developmental model of Hirschsprung and crossed with Sox10-Venus reporter mice to fluorescently trace ENCCs. Whole-mount immunofluorescence was performed on dissected intestines, and COL4 expression was quantified at the migratory wavefront. Biomechanical properties were assessed by light-sheet elastography, measuring elastic modulus across proximal, middle, and distal segments of wildtype and Ednrb-/- mice.
RESULTS:
Ednrb-/- E14.5 embryonic intestines exhibited significantly increased COL4 expression compared with wildtype controls, particularly at the distal region corresponding to the ENCC migratory front (Fig. A, B). Quantitative analysis demonstrated markedly elevated fluorescence intensity of COL4 in Ednrb-/- tissue (Fig. B). Elastography revealed a progressive gradient of stiffness in Ednrb-/- embryonic intestines from proximal to distal regions, a pattern absent in wildtype controls (Fig. C). Notably, the distal aganglionic intestine of Ednrb-/- embryos showed the highest stiffness, significantly exceeding that of wildtype distal intestine (Fig. D).
CONCLUSION:
Our results demonstrate that dysregulated ECM collagen expression arises early in development in the Hirschsprung model. This alteration is associated with increased intestinal stiffness, suggesting a mechanical barrier that impedes ENCC migration. These findings reveal a novel biomechanical aspect of Hirschsprung pathogenesis and highlight the potential of targeting the ECM microenvironment as a therapeutic strategy to promote neural migration.

Abbreviations: Hirschsprung disease (HSCR), extracellular matrix (ECM), enteric neural crest cells (ENCC), collagen IV (COL4)

20

FIBRILLIN-2-MEDIATED INCREASED FIBROBLAST ACTIVATION IN CHILDREN WITH ESOPHAGEAL ATRESIA

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Abstract: Purpose: To characterize phenotypic differences between patient-derived fibroblasts from patients with a history of esophageal atresia (EA) compared to healthy controls.

Methods: Following IRB approval, esophageal fibroblasts derived from endoscopic biopsies from children with EA (n=5) and controls (n=5) were established and cultured in Matrigel contraction assays in the presence and absence of TGFB stimulation (10 ng/mL). RNA profiling was performed through RNA sequencing and RT-PCR. Fibrillin-2 (FBN2) siRNA silencing was performed on primary fetal esophageal fibroblasts (FEF3 cells), and the expression of extracellular matrix biomarkers (ACTA2, alpha-smooth-muscle Actin; FN1, Fibronectin-1; COL1A1, Collagen IA1) and collagens (COL8A1; Collagen VIIIA1, COL12A1; Collagen XIIA1) was quantified using qRT-PCR. Activation of siFBN2-transfected FEF3 cells was assessed using contraction assays, with and without TGFB stimulation (10 ng/mL).

Results: Fibroblasts from EA patients demonstrated significantly greater contractility compared to non-EA fibroblasts at baseline, and TGFB stimulation induced a contraction response in both EA and non-EA fibroblasts (Figure 1A). RNA sequencing data identified Fibrillin-2 (FBN2) as one of the most significantly overexpressed genes in EA fibroblasts compared to controls (Figure 1B), which was confirmed using qRT-PCR (Figure 1C). FBN2 expression was not found to be correlated with children's age. Silencing of FBN2 by siRNA in FEF3 cells was validated by western blot (Figure 1D) and qRT-PCR (Figure 1E). Following TGFB stimulation, FEF3 cells transfected with siFBN2 showed significantly lower expressions of extracellular matrix biomarkers (ACTA2, FN1, COL1A1) and EA-stricture collagens (COL8A1, COL12A1) (Figure 1F). FEF3 cells transfected with siFBN2 demonstrated significantly reduced contractility and reduced response to TGFB stimulation compared to non-transfected controls (Figure 1G).

Conclusion: These results suggest that fibroblasts from EA patients have a pro-contractile phenotype (Figure 1H) which may in part explain the high rates of stricture formation following surgical repair in these patients. EA fibroblasts were found to express higher expression levels of FBN2, and blockade of FBN2 expression reversed the contractile phenotype as well as markers of fibrosis. Our results support a model of FBN2 as a regulator of fibroblast activation and downstream fibrosis, and future work will study pharmacologic modulators of this pathway to reduce stricture formation following EA repair.

Abbreviations: EA: Esophageal atresia

Friday, May 8, 2026

Plenary 3

7:30 AM – 9:15 AM

21

EARLIER ILEOCECECTOMY IN PEDIATRIC CROHN'S DISEASE IS ASSOCIATED WITH IMPROVED POSTOPERATIVE GROWTH RECOVERY

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Abstract: Background: Body mass index (BMI) is a marker of growth and nutritional status in pediatric Crohn’s disease (CD). Impaired BMI-for-age trajectories may indicate inadequate disease management, risking long-term growth failure. While ileocecectomy can facilitate disease control and catch-up growth, the optimal surgical timing to maximize postoperative growth recovery is unknown.
Methods: A retrospective cohort analysis was performed across four quaternary care centers, including patients aged 6–24 years with CD who underwent ileocecectomy. Data was collected via REDCap database. Growth assessment utilized BMI-for-age Z-scores from CDC growth charts for patients < 20 years (n=145) and BMI for those 20-24 years (n=29). Multivariable linear regression models were fit for postoperative Z-scores and BMI to evaluate association with time to surgery from CD diagnosis, adjusting for age, sex, race, baseline nutrition, preoperative steroid use, and hospital site. Malnutrition was categorized as mild (Z=-1 to -1.9), moderate (Z=-2 to -2.9), or severe (Z≤-3).
Results: Among 174 patients, median age at diagnosis was 13.72 years (IQR 10.85, 16.47) and 16.93 years (IQR 14.19, 18.78) at surgery. Median time from diagnosis to surgery was 2.39 years (IQR 0.53, 5.09). 121 patients underwent semi-elective surgery (69.5%), 50 (28.7%) urgent, and 3 (1.7%) emergent. Preoperatively, 40.9% of patients demonstrated malnutrition (mild 29.1%, moderate 7.1%, severe 4.7%), improving to 12.5% at 6-months postoperatively. In patients aged < 20, median BMI-for-age Z-score improved from -0.76 (IQR -1.38, 0.64) preoperatively to 0.20 (IQR -0.48, 0.94) at 6-months, 0.41 (IQR -0.42, 0.98) at 1-year, and 0.28 (IQR -0.49, 0.9) at 2 years postoperatively (Figure 1). In patients aged >20, BMI increased from 21.65 (IQR 19.39, 24.50) preoperatively to 22.55 (IQR 20.19, 25.92) at 6-months, 23.24 (20.05, 26.28) at 1-year, and 24.42 (IQR 21.06, 27.96) at 2-years postoperatively. Earlier surgery was independently associated with greater 6-month BMI-for-age Z-score catch-up in patients aged <

20 (β=-0.0096 per month delay, p=0.0012). This association wasn’t significant for BMI in patients aged 20-22 years (β=-0.0116, p=0.3630).
Conclusion: Earlier ileocecectomy is associated with improved growth recovery in pediatric CD. Delaying surgery may compromise nutritional rehabilitation, highlighting the necessity for timely evaluation to optimize postoperative growth outcomes.

Abbreviations: BMI: body mass index
CD: Crohn's disease
IQR: interquartile range

22

OPERATIVE VERSUS NON-OPERATIVE MANAGEMENT OF INFANT PERIANAL ABSCESSES: A PEDIATRIC SURGERY RESEARCH COLLABORATIVE PROSPECTIVE QUALITY IMPROVEMENT STUDY

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Abstract: Purpose

Treatment of infant perianal abscesses (IPA) remains controversial, with ongoing debate between operative and non-operative management. Recurrence is common and prospective data to guide care are lacking. We performed the first multi-institutional prospective quality improvement (QI) study comparing non-operative to operative IPA management.

Methods

The primary endpoint was time to complete abscess resolution. Secondary endpoints included surgical intervention (incision and drainage ± fistulotomy) and abscess recurrence. Institutions were recruited through a national research collaborative. IRB approval was obtained individually. Between 2022 and 2025, we prospectively enrolled patients < 1 year of age with an abscess ≤2 cm from the anal verge. Patients with predisposing conditions (e.g. inflammatory bowel disease) were excluded. Management was determined by the treating provider, with either upfront surgical intervention (control group) or non-operative care per our QI protocol (protocol group, Figure 1). Data were collected on management prior to surgical evaluation,

presentation, subsequent treatment and outcomes. Statistical analyses were performed using STATA, with $p < 0.05$ considered significant. Endpoints were compared between groups by non-parametric methods, with denominators based on available data.

Results
Fourteen institutions participated across the U.S., with a total of 288 patients (108 control, 180 protocol) enrolled. Median follow-up was 0.99 (interquartile range 0.23-3.93) and 1 (0.16-4.56) months for control and protocol groups. Abscess resolution occurred in 155 patients during follow-up (36/71 (51%) control, 119/134 (89%) protocol, $p < 0.01$). Median time to abscess resolution was 1.21 (0.33-4) and 1.13 (0.57-3.83) months for control and protocol groups ($p=0.64$). Recurrences were frequent in both cohorts (34/93 (37%) control, 62/153 (41%) protocol). Surgical intervention was significantly more common in the control group: incision and drainage were performed in 61/107 (57%) versus 19/166 (11%) and exam under anesthesia with fistulotomy in 31/106 (29%) versus 20/166 (12%) (both $p< 0.01$).

Conclusions
Time to abscess resolution was similar between patients treated with upfront surgical intervention and non-operative management according to our QI protocol. Significantly more patients underwent surgical intervention in the control group, without an impact on time to resolution. Our data support initial non-operative management of infant perianal abscesses, emphasizing antibiotics at initial presentation, sitz baths and family reassurance.

Abbreviations: IPA - infant perianal abscess; QI - quality improvement; IRB - institutional review board

23

BUILDING LOCAL CAPACITY FOR BOWEL MANAGEMENT IN LOW RESOURCE SETTINGS: PROGRAM SUSTAINABILITY AND EXPANSION

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Abstract: Congenital colorectal conditions including anorectal malformations (ARM) and Hirschsprung's disease (HD) can cause chronic issues with constipation and incontinence leading to reduced quality of life. Bowel management programs (BMP) are critical to addressing these challenges. We sought to evaluate local capacity for sustaining a bowel management program in a low-resource setting.

In June 2022, a BMP for patients with ARM or HD was initiated at a resource-limited tertiary referral hospital. Local staff were trained by visiting staff with experience in bowel management and collaboratively managed a pilot cohort. Patients began with a 2-week program with imaging, clean-out, titration of enema components by nursing staff, and family education. Caregivers completed forms at the start and end of the program and via phone call during periodic follow-ups. Local staff then continued to run the program, enrolling new patients. Outcomes from the pilot cohort, with both visiting and local clinical staff, and the expansion cohort, run exclusively by local staff, were compared using Fisher's exact test. A Cochran Armitage test was performed to determine association between adherence to program and reduction in involuntary bowel movements.

Since June 2022, 53 patients have enrolled in the BMP (12 in pilot cohort; 41 in expansion cohort). Intake forms were available for 44 patients. Median age at presentation was 3.5 years (IQR 2-5.5 years), 70% were male. Half of patients were reached on follow-up (n=28, 52%). Median number of days at final follow-up was 433.5 (IQR 390.5-694) with 2 (IQR 1-3.75) follow-ups per patient. Among those who followed up, program adherence was 74%. Adherence was associated with greater reduction in both daytime (p=0.013) and nighttime (p=0.012) involuntary bowel movements. There was no difference in final regimen (pilot: 75% enema, 16.7% laxatives, 8.33% discharged vs expansion: 68.4% enema, 15.8% laxatives, 15.7% discharged; p=0.9) or soiling outcomes (Figure 1) with sustained reduction in involuntary day and night bowel movements.

Bowel management patients managed exclusively by the local team had similar outcomes to the jointly managed pilot cohort, suggesting that longitudinal bowel management programs in low-income countries can be successful and sustainable, with great opportunity for local capacity development.

Abbreviations: ARM: anorectal malformations
HD: Hirschsprung's disease

BMP: Bowel management program
IQR: interquartile range

24

OUTCOMES OF THORACOTOMY VS THORACOSCOPIC ESOPHAGEAL ATRESIA/TRACHEOESOPHAGEAL FISTULA REPAIR: PROSPECTIVE MULTICENTER EVIDENCE ON THE CRITICAL RELATIONSHIP BETWEEN CENTER VOLUME AND OUTCOMES

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Abstract: Purpose:
Anastomotic leak (AL) remains the most common early complication after type C esophageal atresia/tracheoesophageal fistula (EA/TEF) repair. With the advent of thoracoscopic techniques, most comparative analyses have been limited to retrospective studies. We sought to compare AL rates after thoracotomy versus thoracoscopic repair.

Methods:
This is a secondary analysis of a recently completed multicenter RCT (2019-2025) evaluating the impact of transanastomotic tube on stricture rates. Prospective data collection included demographic, preoperative, intraoperative variables, including gap length and surgeon-assessed anastomotic tension. Primary outcome, AL, and secondary early outcomes were compared between thoracotomy vs thoracoscopic repairs.

Results:
Overall, 141 TEF repairs across 10 centers were analyzed: 89 (63.1%) thoracotomy and 52 (36.9%) thoracoscopy. Infants with lower median GA ($p < 0.001$), lower mean weight ($p=0.001$), and preoperative vasopressor ($p=0.005$) were more likely to undergo thoracotomy. Center variation was observed: the three high-volume centers were also more likely to perform thoracoscopic repair (45.7% vs 19.1%,$p=0.003$). Intraoperative variables, including ventilation mode, gap length, and operative time, were similar between groups. A higher rate of tension free anastomosis was reported in the thoracotomy group (32.5% vs 16.3%,$p=0.044$). There was no difference in AL (15.7% vs 26.9%,$p=0.128$), median POD feeding start (7[5,9] vs 7[5,8],$p=0.45$), POD full feeds (15[11,24] vs 13.5[9,23.5],$p=0.29$), and median LOS (47[20,92] vs 33.5[16,63.5],$p=0.064$). Center volume sub-analysis showed that thoracoscopic repairs at high-volume centers had significantly lower AL rates (20.9% vs 55.6%, OR 0.21, CI 0.047–0.955,$p=0.048$). No volume effect on AL was observed for thoracotomy repairs (15.4% vs 13.7%, OR 0.71, CI 0.22–2.21,$p=0.570$). On multivariate regression adjusting for gap, anastomotic tension, thoracoscopic approach, and center volume, treatment at high-volume centers was the only independent predictor of lower AL rates (OR 0.261, CI 0.081–0.840,$p=0.024$).

Conclusions:
With increasing adoption of thoracoscopic EA/TEF repair, we report the most contemporary multicenter prospective analysis of thoracotomy versus thoracoscopic repair in the literature. Contrary to prior retrospective findings, thoracoscopic approach was not associated with increased leak rates. Instead, center volume emerged as a key predictor of anastomotic leak in thoracoscopic repairs. These findings highlight the ongoing evolution of thoracoscopic adoption and underscore the critical relationship between center volume and outcomes.

Abbreviations: EA/TEF: esophageal atresia/tracheoesophageal fistula
AL: anastomotic leak
RCT: randomized controlled trial

Table 1: Multivariate Regression Analysis for Developing Anastomotic Leak

Variables	**OR (95% CI)**	*p-value*
Thoracoscopic approach	2.60 (0.89, 7.59)	0.079
Center Volume		
Low/Mid	REF	
High	0.26 (0.08, 0.84)	0.024
Tension		
None	REF	
Mild	3.33 (0.59, 18.7)	0.17
Moderate	8.33 (1.53, 45.3)	0.014
Severe	18.9 (0.86, 414.5)	0.062
Gap Length	0.96 (0.89, 1.04)	0.38

25

ARE WE SCOPING TO STANDARD? CHILDHOOD AND TRANSITIONAL EGDS IN ESOPHAGEAL ATRESIA USING COSMOS NETWORKED EHR DATA

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Abstract: Background
Surveillance endoscopy is recommended in asymptomatic patients with history of esophageal atresia (EA) before age 10 and at transition to adulthood. These children are often lost to follow up, and understanding adherence to surveillance guidelines remains challenging. Real-world electronic health record (EHR) data may offer advantages in broad capture of health services. We used Epic Cosmos, a national EHR networked database, to estimate adherence to age-based endoscopic surveillance guidelines.
Methods
We performed a retrospective cohort study in Epic Cosmos. Patients with EA were identified using ICD-9/10 diagnosis codes. Childhood esophagogastroduodenoscopy (EGD) was defined as at least one EGD between 1 and 10 years of age and transition EGD as at least one EGD between ages 16 and 25. EGDs were ascertained using Current Procedural Terminology codes 43235–43259, collapsing same-day codes to a single event. We summarized the proportion of children (exact 95% CIs) achieving each milestone, reporting a denominator restricted to birth year prior to 2016 for childhood EGD and for 2009 transitional EGD. Secondary measures included age at first EGD, total EGD count per patient, incidence of eosinophilic esophagitis and esophageal metaplasia.
Results
We identified 15,340 patients with EA born between 2001 to 2025. Overall, 6,122 (39.8%) had at least one EGD after 1 year of age. For the childhood milestone, 2,206 (26.8%) had ≥1 EGD before age 10. For the transition milestone 986 (29.2%) had ≥1 EGD between ages 16–25 (Table 1). The proportion meeting both childhood and transition milestones was 126 (3.7%). The median age at first EGD was 5 years (IQR 1-10). The mean number of EGDs per patient was 1.6 ± 3. In those born after 2015, 2,275 (32%) have received at least one EGD. Overall, 3,576 (23.3%) patients were diagnosed with eosinophilic esophagitis and 345 (2.2%) were diagnosed with esophageal metaplasia.
Conclusions
Though rates of endoscopy have increased in children born in more recent years, endoscopic surveillance after EA appears underused relative to guideline expectations, particularly at the transition milestone. Eosinophilic esophagitis and esophageal metaplasia are common in these cohorts. These findings highlight opportunities for standardized transition planning and surveillance pathways.

Abbreviations: Esophageal Atresia (EA), esophagogastroduodenoscopy (EGD), electronic health record (EHR)

Outcome	N with event	Denominator	Percent (95% CI)
Any EGD (all time)	6,112	15,340	39.8% (39.1–40.6)
Childhood EGD (<10y)	2,206	8,232	26.8% (25.8–27.8)
Transition EGD (16–25y)	986	3,372	29.2% (27.7–30.8)
Both Childhood & Transition	126	3,372	3.7% (3.1–4.4)

26

FAST-TRACK FASTING: EXPLORING CLINICAL FACTORS AND OUTCOMES OF LIMITED PERIOPERATIVE FASTING FOR ENHANCED RECOVERY IN PEDIATRIC SURGICAL PATIENTS

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Abstract: PURPOSE
Evidence for limited perioperative fasting mainly comes from adult studies, demonstrating critical improvements in hydration and shortened hospital stays. This study will evaluate clinical factors associated with variation in limited perioperative fasting and its association with clinical outcomes among children undergoing gastrointestinal surgery.

METHODS
We analyzed data from a national, prospective trial across 18 children's hospitals (July 2020-July 2024), including patients aged 10-18 undergoing elective GI surgery. “Limited fasting” included two components: 1) avoiding prolonged fasting preoperatively (i.e., clear liquids 2 hours before surgery) and 2) initiating early postoperative oral nutrition (i.e., clear liquids on day of surgery/regular diet by postoperative day 1).

Associations between limited fasting and patient/procedure-specific clinical factors (e.g., surgery performed, nasogastric tube removal) as well as outcomes (adherence to limited postoperative intravenous fluids, complications, and length of stay) were assessed using bivariate analyses, multivariable logistic regression, and quantile regression. Significance was set at $p< 0.05$.

RESULTS
Of the 567 patients included, 175 (30.9%) received both limited fasting components, 212 (37.4%) received one, and 180 (31.7%) received neither. Full limited fasting compliance varied significantly by hospital (0-85.7%, $p< 0.001$) but not by GI surgery (20.2-37.3%, $p=0.07$). Full compliance was significantly associated with naso/orogastric tube removal (OR=2.84, 95% CI=[1.42, 5.67]), intraperitoneal/intra-abdominal drain avoidance (OR=0.22, 95% CI=[0.06, 0.79]), anti-emetic use (OR=2.20, 95% CI=[1.01, 4.82]), and gut stimulation (e.g., chewing gum) (OR=11.25, 95% CI=[3.91, 32.32]). Among those who fully complied with limited fasting, adherence to limited postoperative intravenous fluids was higher (OR=4.71, 95% CI=[2.71, 8.20]) and median length of stay was lower (β= -1.03, 95% CI=[-1.59, -0.47]) than patients receiving 0 or 1 fasting components ($p < 0.001$). There were no differences in complication rates between the two groups.

CONCLUSION

Limited fasting for children undergoing gastrointestinal surgery enhanced fluid management, did not increase complication rates, and facilitated faster patient recovery. Limited fasting rates were similar among surgeries performed, demonstrating effective use even among more complex procedures. Further, its positive association with other enhanced recovery elements (e.g., drain avoidance) shows the importance of bundling interventions. Hospital variation in limited fasting compliance calls for additional research into the contextual factors impacting implementation.

Abbreviations: -GI: gastrointestinal
-OR: odds ratio
-CI: confidence interval

Table. Multivariable Logistic and Quantile Regression Analysis of Full Limited Fasting Compliance and Outcomes

Outcome	Adjusted OR	β	95% CI	p-value
Adherence to limited postoperative intravenous fluids	4.71		(2.71, 8.20)	<0.001
Median length of stay		-1.03	(-1.59, -0.47)	<0.001
Surgical complications	1.15		(0.45, 2.93)	0.76

27

ORGAN SYSTEM-SPECIFIC IMPACT OF THE TEXAS ABORTION BAN (SB8) ON OPERATIVE ADMISSIONS AND HEALTHCARE UTILIZATION OF INFANTS WITH CONGENITAL ANOMALIES

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Abstract: Purpose: Following the early abortion ban in Texas (Senate Bill 8, SB8) in September 2021, inpatient admissions and charges for infants with congenital anomalies increased by $1.89 billion. Because outcomes and operative needs vary among congenital anomalies, a better understanding is needed to aid in resource allocation and risk stratification. We aim to better characterize the impact of SB8 on outcomes and healthcare utilization of infants with congenital anomalies with operative needs stratified by organ system.

Methods: A retrospective, population-based study was conducted using the Texas Inpatient Public Use Data File, a publicly available hospital discharge database. Patients < 1 year old between 7/1/2020 and 6/30/2023 were included. Encounters were grouped as pre-SB8 (7/1/2020-6/30/2021) and post-SB8 (7/1/2022-6/30/2023) with congenital anomalies and organ systems defined by International Classification of Diseases (ICD-10) codes. Descriptive statistics were used to compare rates of admissions, mortality, length of stay (LOS) and hospital charges.

Results: Of 204,580 admissions for infants with congenital anomalies, 54,538 required operative intervention. Post-SB8, operative admissions associated with congenital anomalies increased by 1,443, representing an 8.2% increase (pre-SB8 n=17,545; post-SB8 n=18,988). Operative admissions associated with congenital anomalies increased across many organ systems with greatest increases noted in genital (19.7% increase), urinary (19.3%), and circulatory (15.1%); while smaller increases were noted in nervous (3.9%), digestive (7.6%), and face (2.8%). Decreases were seen in admissions for musculoskeletal (6.0% decrease), chromosomal (1.6%), and respiratory (4.0%). While overall mortality remained relatively low (overall: pre-SB8 1.8%, post-SB8 1.7%), some organ systems were noted to have disproportionately higher mortality, including nervous (pre-SB8 5.8%, post-SB8 6.1%), respiratory (pre-SB9 7.9%, post-SB8 10.0%) and chromosomal (pre-SB8 6.0%, post-SB8 7.0%). While LOS, hospital charges and mortality varied greatly between organ systems, healthcare utilization per admission remained similar between pre-SB8 and post-SB8 (Table).

Conclusion: Following SB8, operative admissions and charges for infants with congenital anomalies increased, with variable impact across organ systems. Outcomes and healthcare utilization of operative congenital anomalies differed significantly between organ systems. Although outcomes per admission remained similar post-SB8, the aggregate increase of overall admissions accounts for the substantial rise in operative needs and healthcare utilization.

Abbreviations: SB8 - Senate Bill 8
ICD - International Classification of Diseases
LOS - length of stay

Table. Healthcare utilization of operative admissions in infants with congenital anomalies by organ system.

Organ System (Pre-SB8 N; Post-SB8 N)	Pre-SB8 LOS days (IQR)	Post-SB8 LOS days (IQR)	Pre-SB8 Charges $ (IQR)	Post-SB8 Charges $ (IQR)	Pre-SB8 Mortality n (%)	Post-SB8 Mortality n (%)
Nervous (958; 995)	14 (3, 44)	16 (3, 52)	183,872 (61,879, 552,283)	236,598 (69,265, 714,827)	56 (5.8%)	61 (6.1%)
Face (3,761; 3,866)	2 (2, 3)	2 (2, 3)	6,604 (4,704, 14,561)	7,993 (5,512, 19,077)	37 (1.0%)	36 (0.9%)
Circulatory (5,908; 6,800)	17 (5, 53)	19 (5, 57)	259,432 (65,424, 709,446)	295,066 (82,077, 842,169)	258 (4.4%)	294 (4.3%)
Respiratory (809; 777)	14 (3, 55)	21 (4, 66)	201,188 (56,342, 808,599)	304,783 (86,241, 1,076,448)	64 (7.9%)	78 (10.0%)
Digestive (1,284; 1,382)	8 (3, 31)	8 (3, 30)	128,959 (49,160, 483,951)	142,999 (51,958, 501,288)	51 (4.0%)	40 (2.9%)
Genital (1,259; 1,507)	2 (2, 10)	2 (2,6)	10,162 (5,239, 100,651)	11,011 (6,818, 76,169)	19 (1.5%)	16 (1.1%)
Urinary (1,289; 1,538)	4 (2,24)	4 (2,24)	60,058 (8,969, 311,851)	60,708 (10,255, 355,629)	47 (3.6%)	59 (3.8%)
Musculoskeletal (2,353; 2,212)	3 (2,21)	3 (2,25)	52,710 (6,851, 260,203)	67,799 (8,856, 333,823)	65 (2.8%)	62 (2.8%)
Chromosomal (1,129; 1,111)	15 (5, 43)	19 (5,46)	283,148 (77,098, 674,646)	321,706 (103,858, 861,531)	68 (6.0%)	78 (7.0%)

28

CLINICAL OUTCOMES FOLLOWING TOTAL PANCREATECTOMY WITH ISLET AUTOTRANSPLANTATION IN CHILDREN: A SINGLE-CENTER RETROSPECTIVE STUDY

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Abstract: Purpose: Total pancreatectomy with islet autotransplantation (TPIAT) is an effective surgical therapy for children with chronic pancreatitis refractory to medical and endoscopic interventions. Pediatric series are small, limiting understanding of long-term outcomes. We evaluated perioperative outcomes and metabolic results in the largest single-center pediatric TPIAT cohort to date.

Methods: We performed a retrospective review of patients < 18 years who underwent TPIAT between 2009-2025. Demographic, operative, and follow-up data were collected from a prospectively maintained database. Primary outcomes included perioperative morbidity, length of stay, islet yield, total daily insulin use (TDD), glycemic control, C-peptide secretion, BMI, and opioid utilization.

Results: A total of 149 patients underwent TPIAT (median age 12 years [8, 15]; 58% female). Genetic etiologies were identified in 66%, including PRSS1 (49%), CFTR (50%), and SPINK1 (28%). Median operative time was 640 minutes [552, 736], and splenic preservation was achieved in 14%. Median ICU and hospital stays were 7 days [6, 8] and 17 days [15, 22], respectively. Postoperative complications occurred in 47%, with 20% classified as Clavien-Dindo grade ≥III. Reoperation (4%) was required for major bleeding (n=2), portal vein thrombosis (n=1), bowel obstruction (n=2), radial artery pseudoaneurysm (n=1), and bile leak (n=1). Readmission occurred in 19%, primarily for abdominal pain or GJ tube dysfunction, and 11% required interventional radiology procedures. Insulin use was common postoperatively: 90% of patients required insulin at 3 months (n=126), 51% at 36 months (n=67), and 73% at 60 months (n=30). Median HbA1c increased from 5.3 [5, 5.5] pre-TPIAT to 6.1 [5.7, 6.7] at 12 months (n=116) and 6.8 [5.7, 7.98] at 60 months (n=30). C-peptide remained detectable (>0.5 ng/mL), and median TDD stayed below 0.4 U/kg/day at 60 months. Preoperative opioid use was present in 44%, and all patients were opioid-free by 36 months (n=69). Two deaths occurred at 1- and 4-year follow-up.

Conclusions: In this largest pediatric TPIAT cohort, 53% did not have perioperative complications at 30 days, survival was 98.7% at all time points, opioid independence was complete, and islet graft function was durable with sustained metabolic control. TPIAT is a safe and effective option for children with chronically debilitating pancreatitis.

Abbreviations: TPIAT: Total Pancreatectomy with Islet Autotransplantation
TDD: Total Daily Insulin Dose
BMI: Body Mass Index
ICU: Intensive Care Unit
GJ: Gastrojejunostomy (tube)

HbA1c: Hemoglobin A1c

29

CHILD PHYSICAL ABUSE AND CERVICAL SPINE INJURY: A PROSPECTIVE OBSERVATIONAL STUDY OF OVER 1,200 CHILDREN IN THE WESTERN PEDIATRIC CERVICAL SPINE STUDY

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Abstract: Background:
Cervical spine injury (CSI) in children is rare, with an incidence of 1-2% nationally. In children with suspected child physical abuse (CPA), the incidence and patterns of injury have not been well described. The purpose of this study was to describe the pattern of CSI in patients with suspected CPA mechanism of injury in a large, prospectively collected dataset.

Methods:
This is a secondary analysis of a prospectively collected, multicenter, pediatric CSI dataset which included 72 trauma centers across the United States. All children with suspected CPA mechanism of injury were included, with mechanism determined by each participating center. All children had cervical spine imaging within 24 hours of injury.

Results:
A total of 1,246 children with suspected CPA mechanism were identified. Median age was 5 months [IQR 2, 12]. 42% were female, 47% white, 19% had GCS 3-13, and 11% required intubation. Concomitant traumatic brain injury (TBI) was present in 596 (48%), lower extremity fracture in 239 (19%), and rib fractures in 184 (15%).

In total, 74 (6%) were diagnosed with CSI, and 81% required the ICU for a median of 9 [5,15] days. In children with CPA and CSI, 15 (20%) had evidence of spinal cord injuries on MRI. While no patient was treated with operative intervention, 8% were treated with hard collar for unstable injury, and 1% with a CTO brace for unstable injury. In total, 14 (19%) of the CPA with CSI cohort died. On multivariable regression, GCS < 13 (OR 2.94, 95%CI 1.43–5.88, p=0.003), intubation (OR 3.1, 95%CI 1.58–6.32, p=0.001), and TBI (OR 3.09, 95%CI 1.60–6.35, p=0.001), were each found to be strong independent predictors of CSI in children with CPA mechanism.

Conclusion:
In this large, national, prospectively collected database, we found a 6% incidence of CSI in children evaluated for suspected CPA mechanism. Low GCS, intubation, and TBI were independent predictors of injury. Among children with suspected CPA undergoing cervical spine imaging, a high index of suspicion for injury should be maintained. MRI of the cervical spine remains the gold standard for definitive diagnosis in this population.

Abbreviations: Cervical spine injury (CSI)
child physical abuse (CPA)
glasgow coma scale (GCS)

traumatic brain injury (TBI)
intensive care unit (ICU)
cervical thoracic orthosis (CTO)
odds ratio (OR)

Table 1: Independent predictors of CSI in children with suspected CPA mechanism of injury

Predictor	Adjusted Odds Ratio (95% CI)	P value
Age	1.00 (0.98–1.01)	0.592
GCS 3-13 [ref: 14-15]	2.94 (1.43–5.88)	**0.003**
Intubation	3.10 (1.58–6.32)	**0.001**
TBI	3.09 (1.60–6.35)	**0.001**
Facial fractures	1.68 (0.37–5.32)	0.433
T/L fractures	3.00 (0.87–8.82)	0.058
Rib fractures	0.92 (0.45–1.76)	0.805
Data were analyzed using multivariable logistic regression; n = 1220		

30

A SIX-DAY WINDOW: DEFINING THE OPTIMAL TIMING FOR TRACHEOSTOMY IN SEVERE PEDIATRIC TRAUMATIC BRAIN INJURY

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Abstract: Purpose: Identifying children with severe traumatic brain injuries (TBI) that may require tracheostomy early in their clinical course is known to provide better outcomes with reduction in ventilator days, ICU length of stay, and hospital complications. However, there is a lack in clinical guidelines regarding optimal timing of tracheostomy. This study aims to use a national verified trauma database to predict the ideal timing of tracheostomy and provide updated outcomes for pediatric patients with severe TBI.

Methods: We performed a retrospective cohort study of patients < 18 years with severe TBI (GCS ≤8 on arrival AND an AIS head score ≥3 OR ICD-10 diagnosis code for intracranial injury) who required tracheostomy using the Trauma Quality Improvement Program (TQIP) database from 2019 to 2023. Patients were grouped into Early Tracheostomy (< 7 days from admission) and Late Tracheostomy (≥7 days). Propensity score matching was performed, and results were validated with multivariable regression modeling. Primary outcomes were ventilator-free days and ICU-free days calculated over a 28-day period.

Results: We identified 20,100 children with severe TBI of which 1181 met inclusion criteria and underwent tracheostomy (191-early, 990-late) with 342 patients (171-early, 171-late) analyzed after propensity score matching. The early cohort had greater median ventilator-free days and ICU-free days. We also identified 1.5-fold higher rate of accumulating ventilator-free days and a 1.47-fold higher rate of accumulating ICU-free days compared to late tracheostomy. In looking at the worst outcome (zero-free days), early tracheostomy was associated with a 47% reduction in the odds of having zero ICU-free days. There was higher mortality in the early group although this was not statistically significant. Hospital LOS was shorter in the early cohort with double the likelihood of being discharged directly home. Sensitivity analysis revealed an inflection point on day 6 in which benefits were maximized.

Conclusion: In this national analysis of children with severe TBI, early tracheostomy was associated with significantly decreased time on mechanical ventilation and in the ICU with a higher likelihood of being discharged home. Our findings suggest an optimal window for tracheostomy within the first 6 days of admission to optimize recovery.

Abbreviations: TBI - traumatic brain injury
ICU - intensive care unit
GCS - Glasgow Coma Scale
AIS - abbreviated injury scale
ICD - International Classification of Diseases
TQIP - Trauma Quality Improvement Program
ISS - injury severity score

Table 1. Outcome Summary of All Patients and Propensity Score Matched Cohort by Tracheostomy Timing

Outcome	All Patients (pre-matched)			Propensity Score Matched Cohort		
	Early (≤6 days) (n=191)	Late (>6 days) (n=590)	p-value	Early (≤6 days) (n=171)	Late (>6 days) (n=171)	p-value
Vent-free days, median (IQR)	16.0 (6.0, 20.0)	7.0 (0.0, 13.0)	<0.001	16.0 (5.0, 20.0)	9.0 (0.0, 13.0)	<0.001
Count model for Vent-free days, IRR (95% CI)	1.52 (1.38, 1.68)	(reference)	<0.001	1.50 (1.34, 1.68)	(reference)	<0.001
Inflation model for always-zero Vent-free days, OR (95% CI)	0.53 (0.36, 0.79)	(reference)	0.002	0.71 (0.43, 1.16)	(reference)	0.18
ICU-free days, median (IQR)	11.0 (0.0, 16.0)	1.0 (0.0, 8.0)	<0.001	11.0 (0.0, 17.0)	4.0 (0.0, 11.0)	<0.001
Count model for ICU-free days, IRR (95% CI)	1.58 (1.43, 1.78)	(reference)	<0.001	1.47 (1.29, 1.68)	(reference)	<0.001
Inflation model for for always-zero ICU-free days, OR (95% CI)	0.39 (0.27, 0.56)	(reference)	<0.001	0.53 (0.34, 0.84)	(reference)	0.01
Total hospital length of stay (days), median (IQR)	24.0 (15.0, 37.0)	37.0 (27.0, 55.0)	<0.001	24.0 (17.0, 39.0)	34.0 (26.0, 49.0)	0.003
Mortality, n (%)	22 (11.5)	35 (5.9)	<0.001	19 (11.1)	10 (5.8)	0.11
Discharged Home or self-care, n (%)	31 (16.2)	64 (6.5)	<0.001	28 (16.4)	14 (8.2)	<0.001

Models in All Patients (pre-matched) were adjusted for age, gender, ethnicity, AIS derived ISS, GCS total score upon arrival, weight, Facility Level, Pediatric State Designation, and primary ICD10 code; Models in the Propensity Score Matched Cohort are univariable.

Scientific Session 9: Colorectal

9:35 AM – 11:05 AM

S79

FRAILTY IN CHILDREN WITH INFLAMMATORY BOWEL DISEASE: APPLICATION OF THE SURGICAL COMPLICATION INDEX FOR PEDIATRIC PATIENTS (SCIPP) TO EVALUATE POST-OPERATIVE OUTCOMES

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Abstract: Purpose: Frailty has been extensively studied in adults, and several frailty indices have been developed to predict risk of post-operative complications. However, these are not well translated in children. The Surgical Complication Index for Pediatric Patients (SCIPP) is a recently developed frailty score that can accurately predict surgical complications in pediatric neurosurgery patients. This study aims to evaluate the effectiveness of SCIPP in predicting outcomes in children undergoing surgery for inflammatory bowel disease (IBD).

Methods: A retrospective cross-sectional study of patients ≤ 18 years who underwent surgery for IBD was performed. Individual health records were reviewed for demographics, preoperative functional status, operative details, and post-operative outcomes, including need for post-operative intubation, hospital length of stay (LOS), surgical site infection, anastomotic breakdown and need for re-operation. The full SCIPP score includes activities of daily living (ADLs), autonomic function, body mass index, continence, previous hospitalizations, mobility and polypharmacy. The reduced SCIPP score includes ADLs, autonomic function, and polypharmacy. Higher scores indicate greater frailty. Univariate logistic and Poisson regression were used to predict outcomes based on scores.

Results: We identified 198 patients who underwent surgery for IBD from 2015-2024. Among all patients, 33.8% had full scores from 0-1, 43.0% from 2-3, and 16.1% from 4-9. For reduced scores, 63.1% had scores from 0-1 and 38.9% had scores from 2-4. For every 1-point increase in the full and reduced SCIPP score, there was a 1.28 times and 1.35 times increased odds of developing a complication (Full: 95% CI 1.04 -1.57, $p < 0.05$; reduced: 95% CI 1.01 -1.81, $p < 0.05$). Similarly, there was a 21% and 36% increase in hospital LOS for each point increase in the full and reduced scores (full: 95% CI: 1.11 – 1.33, $p < 0.001$; CI 95% CI 1.20 – 1.55, $p < 0.001$). SCIPP was not predictive of need for post-operative intubation (Table 1).

Conclusion: SCIPP scores can predict the risk of post-operative complications and hospital LOS in patients undergoing surgery for IBD. High-quality prospective studies are needed to evaluate its predictive efficacy in all pediatric surgical patients to determine its utility in preoperative counseling.

Abbreviations: SCIPP - Surgical Complication Index for Pediatric Patients
IBD - inflammatory bowel disease
LOS - length of stay

ADLs - activities of daily living

S80

DIFFERENCES IN SURGICAL OUTCOMES IN PEDIATRIC PATIENTS WITH NEURODEVELOPMENTAL DISORDERS AND INFLAMMATORY BOWEL DISEASE

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Abstract: Purpose:
Neurodevelopmental disorders (NDD), such as autism spectrum disorder, have been associated with increased incidence of gastrointestinal disorders including inflammatory bowel disease (IBD). For children with NDD, difficulties with communication and sensory challenges can further complicate and delay access to care. This study hypothesizes that children with NDD and IBD have worse clinical outcomes before and after colectomy.

Methods:
1,978 children with IBD (ulcerative colitis or Crohn's Disease) who underwent total or partial colectomies were identified in the National Surgical Quality Improvement Pediatric (NSQIP-P) database from 2019 to 2023. Children with NDD were identified using the NSQIP-P variable for "developmental delay". Outcomes including length of stay, total operation and anesthesia time, nutrition status and postoperative complications were analyzed using Fisher's exact test for categorical outcomes and Rank Sum test for continuous variables, with p-values of less than 0.05 considered to be statistically significant.

Results:
3.6% (n=71) of children were identified as having NDD. NDD patients had longer hospital length of stay prior to their operation (Mean: 9.66 vs. 3.71 days, p=0.0045) but had no difference in length of stay post-operatively. They required more nutritional support pre-operatively (38.0% vs. 17.7%, p=0.0001) and at discharge (9.8% vs 3.0%, p=0.0082). They received more blood transfusions pre-operatively (12.6% vs 3.8%, p=0.0021) and post-operatively (11.2% vs. 0%, p< 0.00001). There were no differences in total operative time, time from closure to anesthesia stop, or conversions from laparoscopic to open. However, NDD patients had an almost double rate of ostomy creation following partial colectomies (23.9% vs. 12.7%, p=0.001).

Conclusion:
NDD patients are more likely to have a complicated hospital course compared to their non-NDD counterparts when undergoing colectomies for IBD. Prolonged pre-operative length of stay and nutritional support, along with higher likelihood of post-operative ostomy, suggest that they are more likely to present with more advanced disease. These patients are a unique population who require adaptive strategies for their individual needs to decrease disparities in care and outcomes.

Abbreviations: NDD: Neurodevelopmental disorders
IBD: Inflammatory Bowel Disease
NSQIP-P: National Surgical Quality Improvement Pediatric

S81

COLONIC DISTENSION INDUCES MUSCULAR HYPERTROPHY, FIBROSIS, AND IMPAIRED CONTRACTILITY

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Abstract: PURPOSE
Colonic distension is a hallmark of intestinal dysfunction in enteropathologies, such as Hirschsprung disease and chronic constipation. We investigated the histopathological and functional changes induced by prolonged colonic distension in a surgically induced mouse model of chronic constipation.
METHODS
Adult C57/BL6 mice underwent either sham surgery or creation of a distal rectal stricture to induce constipation and colonic distension. After 10-14 days, mice were euthanized, and their colons were harvested. Histopathologic evaluation for muscular hypertrophy and fibrosis was assessed using hematoxylin and eosin (H&E) and Masson's Trichrome (MT), and quantified with ImageJ (National Institutes of Health). Ex vivo contractility was measured with 3mm rings from the distal colon, suspended in carbogenated Kreb's solution within an organ bath myograph. Contractile responses to electrical field stimulation (EFS) with pulse trains (40 V, 5 Hz, 0.2 ms) for 15 seconds and with 100□M acetylcholine (ACh) were measured. Baseline contractility to 50mM potassium chloride (KCl) was used to assess tissue viability after the experiment. Responses to EFS, including contractile amplitude and duration, were recorded and normalized to maximum KCl responses. Student's t-test was performed for statistical analysis, and a p-value < 0.05 was considered significant. Our study was IACUC approved.
RESULTS
Mice in the sham group showed no evidence of intestinal distention, while those in the stricture group demonstrated colonic distention and an increased stool burden (Figure 1a). Constipated mice had a significantly thicker muscularis propria (145.80 ± 31.02 μm vs. 105.77 ± 19.72 μm, n=6 per group, p=0.035) and more collagen content in the extracellular matrix (23.54 ± 9.58% vs. 12.22 ± 5.16%, n=5 per group, p=0.012) compared to sham mice (Figure 1b-c). Additionally, colonic tissue from constipated mice showed reduced contractile amplitude (15.06 ± 8.90% vs. 40.79 ± 10.24%, n=6 per group, p=0.003), even with cholinergic stimulation (20.16 ± 6.69% vs. 47.96 ± 13.41%, p=0.008). Contractile duration was also longer in the constipated tissue (6.82 ± 1.30 vs. 5.32 ± 1.74 s, p=0.027).
CONCLUSIONS
Prolonged colonic distension causes muscular hypertrophy, fibrosis, and impaired contractility. These findings demonstrate how structural remodeling from colonic distension contributes to gut dysfunction.

Abbreviations: H&E-hematoxylin and eosin
MT-Masson's Trichrome
EFS- Electrical field stimulation
ACH-acetylcholine
KCL-potassium chloride

S82

WHAT IS THE “FISTULA” IN ANORECTAL MALFORMATIONS? A HISTOPATHOLOGICAL REVIEW OF 105 CASES

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Abstract: Background
In anorectal malformations (ARM), the distal segment connecting the rectum to the perineum, urethra, or vagina is often termed a “fistula.” Although this tract has been described as “anal canal–like,” its histology may differ by ARM subtype. We reviewed resected distal segments to determine which anal canal epithelial zones are present and to infer embryologic implications.
Methods
We retrospectively reviewed pathology reports of 105 ARM patients who underwent definitive repair (PSARP or LAARP) between 2005 and 2025. Histology of the resected distal segment (“fistula”) was categorized by anal canal epithelial zones—squamous, transitional, and colorectal. Information on fibrosis and inflammation was collected when available but was not systematically reported.
Results
ARM subtypes included rectoprostatic (n=8), rectobladder (n=3), rectobulbar (n=22), male rectoperineal/rectocutaneous (n=6), persistent cloaca (n=16), rectovaginal (n=2), rectovestibular (n=26), female rectoperineal (n=16), and imperforate anus without fistula (n=6). Rectourethral fistulas and cloaca typically showed transitional epithelium distally, consistent with communication at the level of the urogenital sinus. Rectovestibular and perineal fistulas opened through squamous zones toward the perineum, reflecting variable proctodeal ingrowth and anterior opening. Imperforate anus without fistula terminated in the transitional zone, most consistent with failure of anal membrane perforation after hindgut–proctodeum contact, and/or limited proctodeal ingrowth resulting in minimal or absent squamous epithelium. Two exceptional cases showed long tracts passing along the midline fusion line (perineal subcutaneous and between duplicated vaginas), representing true fistulas distinct from anal canal–derived tracts. In laparoscopic cases, the rectum was divided at the rectal wall, suggesting that the distal “fistula” portion was left in situ.
Conclusions
The distal segment in ARM is not uniform: its epithelial zone composition correlates with ARM subtype and supports distinct embryologic mechanisms. Rectourethral and cloacal types align with incomplete separation by the urorectal septum. Vestibular and perineal types reflect variable proctodeal ingrowth with anterior opening. Imperforate without fistula corresponds to anal membrane nonperforation with or without limited proctodeal ingrowth. Rare midline fusion–related tracts represent true fistulas. Histological classification by epithelial zone provides a concrete framework linking pathology with embryology and may aid in surgical planning.

Abbreviations:

S83

A NEW APPROACH TO A UNIQUE ANORECTAL MALFORMATION, RECTAL ATRESIA: USING A TRANSANAL RATHER THAN A POSTERIOR SAGITTAL APPROACH, WITH OR WITHOUT LAPAROSCOPY

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Abstract: Purpose: The purpose of this case series is to examine a new surgical approach to treating rectal atresia. Rectal atresia occurs in 0.3-1.2% of all anorectal malformations (ARM), and the unique anatomy in these patients is a normal or funnel-like anal canal with a stenosis or a complete atresia a few centimeters above the dentate line. The most common approach previously described was to use a posterior sagittal incision splitting the anal canal and sphincters and then reconstructing them once the rectum was mobilized. We propose instead to use a Hirschsprung Swenson-like pull-through which enables resection of the atretic segment, mobilization of the distal rectum, preservation of the anal canal, and avoids a posterior sagittal incision.

Methods: 3 patients with rectal atresia underwent a Swenson-like transanal approach. Patient demographics, associated anomalies, surgical approach, and postoperative outcomes, were collected.

Results: 3 patients, all with diverting colostomies, underwent repair; 1 was transanal only, 1 had laparoscopy with no need for abdominal mobilization (image), and 1 required laparoscopic mobilization of the rectum. No patients had a pre-sacral mass. The patients' lengths of stay were all within 2 days. There were no strictures or prolapses on post-operative examination at 1 month and their colostomies were reversed with good stooling postoperatively.

Conclusion: The transanal Swenson-like pull-through approach is a safe and reproducible technique to repair rectal atresia and stenosis, preserves the anal canal, and avoids the former posterior sagittal approach to repair this rare condition.

Abbreviations: ARM - anorectal malformation

S84

RATES OF POST-OPERATIVE COMPLICATIONS IN HIRSCHSPRUNG'S DISEASE: A STUDY BY THE CANADIAN CONSORTIUM FOR RESEARCH IN PEDIATRIC SURGERY (CANCORPS)

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Abstract: Purpose

Rates of postoperative complications following pull-through surgery for Hirschsprung's disease vary greatly in the literature and are largely from single center studies. The purpose of this study was to describe the rates of postoperative complications in a broadly representative population of children with Hirschsprung's disease.

Methods

A multi-centre, retrospective review of children (< 18 years) with Hirschsprung's disease was performed. Six Canadian Children's hospitals participated in the Canadian Consortium for Research in Pediatric Surgery (CanCORPS). Data was collected between January 2010 and January 2022. Patients were included if they had completed at least six months of follow-up.

Results

138 patients with Hirschsprung's disease were identified, with 106 having adequate follow-up data. The median age at diagnosis was 1 week (interquartile range [IQR]: 1-3 weeks) and the majority were male (86.1%). Diverting ostomies were performed in 20.0% of patients. The median corrected gestational age at the time of first pull-through was 3 months (IQR: 1-7 months). Surgical approach for the pull-through included laparoscopic-assisted (48.5%), open (41.8%), and laparoscopic-only (9.7%). The median length of hospital stay was 4 days (IQR: 3-9 days). The rate of unplanned reoperation was 10.1% and included dilatation of stricture (n= 2, 1.4%), diverting ostomy (n= 3, 2.2%), bowel resection (n= 1, 0.1%), redo pull-through (n= 1, 0.1%), examination under anesthesia +/- Botox (n= 2, 1.4%), and other (n= 5, 3.6%). Of the patients with an unplanned reoperation, 64.2% were readmitted due to the unplanned operation. Surgical-specific complications occurred in 11.8% of patients. These included stricture (n=2, 1.9%), anastomotic leak (n=2, 1.9%) and enterocolitis (n=1, 0.9%).

Conclusion

In this large Canadian experience, stricture and anastomotic leak rates after pull-through for Hirschsprung's disease are very low, but 10% of patients required an unplanned operation.

Children who required readmission had a high rate of second operations. Our findings may be reflective of contemporary complication rates and are lower than those reported in single center studies with complex referral patterns reported in the literature. This data can set national outcome benchmarks, as well as aid in discussions of outcomes and expectations with families.

Abbreviations:

S85

DONUT LEAVE IT TO CHANCE: FROZEN CIRCUMFERENTIAL BIOPSIES REDUCE RATES OF TRANSITION ZONE PULL-THROUGH

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Abstract: Purpose: This study assesses the utility of intraoperative frozen section circumferential biopsy to prevent transition zone (TZ) pull-through (PT) for patients with Hirschsprung Disease (HSCR).

Methods: We performed a single institution retrospective review of intraoperative and final pathology reports and operative records for all PTs in which a frozen section circumferential biopsy (donut) was sent from 2020 - 2025. Donuts were taken at the site of the planned anastomosis based on a previous normal full-thickness biopsy. If the initial donut was abnormal, another donut was taken more proximally and sent for frozen section. "Normal" donuts were defined as circumferential ganglion cells with fewer than 2 hypertrophic submucosal nerves in one high powered field [Kapur].

Results: Frozen donuts were sent for intraoperative consultation in 106 PTs during the study period (Table 1). Ten cases required two donuts, and one case required three; of these, nine had additional donuts performed due to concern for abnormal pathology, and two had additional donuts sent for technical reasons.

Final pathology was concordant with frozen section and demonstrated adequate pathology in 102 patients (96.2%). TZ PT was prevented in 10 patients (9.4%) with additional donuts. Two patients (1.9%) had circumferential ganglion cells with hypertrophic nerves on final pathology, both of whom had normal frozen results. In two patients, non-circumferential ganglion cells were found on final pathology—for one patient this was expected after a second abnormal donut and accepted after discussion with family, and for the second, the donut was inaccurately processed leading to a discordant final interpretation which revealed TZ PT.

Conclusion: Only 3.8% of patients had final pathology indicative of transition zone pull-through in our series, with an additional 9.4% prevented. With continued improvements in pathologic processing and reporting, frozen donut biopsies contribute to decreased rates of transition zone pull-through and inform intraoperative decision-making.

Abbreviations: TZ - Transition Zone; PT - pull-through; HSCR - Hirschsprung Disease

Table 1. Clinical and Pathological Characteristics by Number of Donuts

Final Pathology Result	N (%)	Full Cohort N = 106	Only 1 donut N = 95	Multiple donuts N = 11
Normal Final Path		102 (96.2%)	92 (96.8%)	**10 (90.9%)**
Circumferential ganglion cells, with hypertrophic nerves, age <1		2 (1.9%)	2 (2.1%)	0 (0%)
Incomplete circumference ganglion cells, +/- hypertrophic nerves		2 (1.9%)	1 (1.1%)	1 (9.1%)
Segment Length				
Short Segment		69 (65.1%)	65 (68.4%)	4 (36.4%)
Long segment*		21 (19.8%)	18 (18.9%)	3 (27.3%)
Total colonic HSCR		16 (15.1%)	12 (12.6%)	4 (36.4%)
Primary PT		78 (73.6%)	69 (72.6%)	9 (81.8%)
Redo PT		28 (26.4%)	26 (27.4%)	2 (18.2%)

*Defined as TZ proximal to splenic flexure

S86

PEDIATRIC ANORECTAL MALFORMATION AND HIRSCHSPRUNG DISEASE IMPAIR QUALITY OF LIFE INTO ADULTHOOD

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Abstract: Purpose: This study aims to characterize and compare the long-term impact of anorectal malformation (ARM) and Hirschsprung disease (HD) on quality of life (QOL) of adult patients.

Methods: A prospective observational study was conducted of patients (age ≥16 years) with history of ARM or HD (11/2020-09/2025). Validated surveys were administered: Gastrointestinal Quality-of-Life Index (GIQLI), Incontinence Quality-of-Life (I-QOL) Questionnaire, Short Form Health Survey (SF-36), and Female Sexual Function Index (FSFI) for females or International Index of Erectile Function (IIEF) for males. Scores are reported as means ± standard deviations and were considered reduced if below the mean scores of published healthy controls. Descriptive statistics and univariate analyses were used.

Results: Overall, 43 patients were surveyed: 22 (51%) ARM, 21 (49%) HD. Median age at survey was 34 years (IQR:25.6-47.5, p=0.12), and 67% were female (p=0.16). GIQLI scores were similar between ARM and HD patients (93.1±30.8, 89.1±25.5, p=0.63), both with high rates of reduced scores (82%, 91%; p=0.66). ARM patients scored lower in all I-QOL subsections: avoidance behavior (55.0±34.4, 92.7±9.0; p< 0.01), psychosocial impacts (55.6±36.5, 87.7±16.6; p< 0.01), and social embarrassment (59.7±34.4, 95.0±8.0; p< 0.01). Rates of reduced I-QOL total scores were higher in ARM and lower in HD patients (73%, 17%; p< 0.01). Groups had similar SF-36 subscores, except HD patients perceived worse current health than one year prior (58.0±28.2, 38.1±23.2; p=0.03). Notably, both groups had high rates of reduced SF-36 general health scores (73%, 91%; p=0.24). FSFI total scores were similar in ARM and HD patients (15.4±8.69, 15.2±10.5; p=0.97), with nearly all scores reduced (100%, 92%; p=0.41). Similar trends were observed in all FSFI subscores. There were no differences between groups in IIEF subscores, with similar overall satisfaction (4.2±3.77, 6.6±3.57; p=0.21), though more reduced scores in ARM patients (80%, 56%; p=0.58). (FIGURE)

Conclusion: ARM and HD patients have similar gastrointestinal, sexual, and overall QOL in adulthood; however, scores are largely reduced compared to controls. ARM patients endorse worse QOL related to urinary incontinence than HD patients and may require additional specialize urologic care. High rates of reduced quality of life scores highlight the need for multidisciplinary, long-term follow-up, with special emphasis on sexual health.

Abbreviations: ARM – Anorectal malformation
HD – Hirschsprung disease
QOL – Quality of life
GIQLI – Gastrointestinal Quality-of-Life Index

I-QOL – Incontinence Quality-of-Life Questionnaire
SF-36 – Short Form Health Survey
FSFI – Female Sexual Function Index
IIEF – International Index of Erectile Function

S87

INCIDENCE OF ENDOMETRIOSIS IN PATIENTS WITH CONGENITAL ANORECTAL MALFORMATIONS

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Abstract: Purpose: The purpose of this research is to determine the incidence of diagnosed endometriosis in patients with congenital anorectal malformations (ARM). Current literature suggests an association between endometriosis and Mullerian malformations, as well as an association between Mullerian malformations and ARM, but the association between endometriosis and ARM is unknown.
Methods: Data was collected from TriNetX, a global health research network that provides de-identified patient data from electronic health records, between January 2016 (first full year of ICD-10 use in the United States) and October 2025. Female patients with 2 or more visits in the TriNetX database, ICD-10 codes for endometriosis (N80) and ARM (Q42.0, 42.1, 42.2, 43.5, 43.6, 43.7, 53.3, 64.12, 64.73) were included. ARM patients and the general population were compared using the Fisher's exact test. A pairwise comparison of ARM subtypes was done using a Chi-square test.
Results: There was a total of 62,991,789 female patients with 2 or more visits in the TriNetX database, and 8,859 (0.014%) were diagnosed with ARM. ARM patients were more likely to be diagnosed with endometriosis compared to the general population (2.23% vs 1.12%, $p< 0.001$). After pairwise comparison of ARM subtypes, patients with an ICD-10 diagnosis of congenital absence, atresia and stenosis of the rectum (Q42.1, Q42.2) or with ectopic anus (Q43.5) were less likely to be diagnosed with endometriosis compared to other forms of ARM ($p < 0.001$). Patients diagnosed with cloacal exstrophy of the urinary bladder (Q64.12) or congenital urethrorectal fistula (Q64.73) and persistent cloaca (Q43.7) were more likely to be diagnosed with endometriosis compared to other forms of ARM ($p < 0.001$).
Conclusion: Female patients with ARM are more likely to also be diagnosed with endometriosis compared to the general population. Additionally, ARMs with more severe genital tract anomalies are associated with a higher risk of endometriosis compared to other forms of ARMs. Awareness of this association may help patients and providers by decreasing the risk of morbidities associated with a delayed diagnosis of endometriosis.

Abbreviations: ARM - anorectal malformation
ICD - International Classification of Diseases

S88

ENDORECTAL SCLEROTHERAPY AS TREATMENT FOR ANORECTAL VENOUS MALFORMATION IN A PEDIATRIC POPULATION: TECHNIQUE (WITH VIDEO DEMONSTRATION) AND EARLY COMPLICATIONS

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Abstract: Anorectal venous malformations (VM) arise from aberrant angiogenesis during embryologic development, and may occur in isolation or in association with complex combined vascular malformation conditions (e.g. Klippel-Trenaunay Syndrome). They present with chronic hematochezia but can also cause anorectal prolapse and pelvic pain. Substantial hemorrhage can cause iron deficiency anemia, necessitating iron supplementation and/or blood transfusions.

Definitive management of symptomatic anorectal VMs has been demonstrated with coloproctectomy and coloanal pull through. While this approach has resulted in favorable outcomes, it portends inherent surgical risk and considerable postoperative recovery. Sclerotherapy (a typical treatment for VMs in other anatomic locations) under direct visualization is a less invasive alternative treatment.

Twenty-one patients underwent injection sclerotherapy of anorectal venous malformations between 2006-2025. All patients presented with bleeding, sometimes associated with prolapse (n=11), and/or pain (n=8). 33% of the patients required one treatment; 19% had two, 4% had three, and 43% had four or more, over 5-16 years. Injections were performed under direct visualization and palpation with 1.5% sodium tetradecyl sulfate foamed with air (video demonstration). Three procedures resulted in mucosal ulceration causing rapid hemorrhage within two weeks, which required transanal suture repair by another surgeon closer to the patient’s home. No patients developed rectovaginal or rectourethral fistulae, fecal incontinence, nor sepsis. Only one patient underwent endorectal pull-through for persistent prolapse, despite controlled bleeding, after 7 injections over 9 years. Two patients had supplemental superior artery embolization.

Anorectal VMs can cause significant morbidity, presenting with substantial chronic hemorrhage, prolapse, or pain. While long-term follow-up is ongoing, this early experience supports endorectal sclerotherapy as a technically feasible, potentially preferable first-line minimally invasive therapeutic modality. Familiarity with this condition and procedure is largely concentrated amongst highly focused specialists in vascular anomalies, resulting in geographic/logistical challenge and substantial expense for patients who require multiple treatment sessions. Broader appreciation of this simple technique could minimize the need for patients to repetitively travel great distances for care.

Abbreviations: VM - Venous malformations

S89

EARLY POSTOPERATIVE COMPLICATIONS FOLLOWING CLOACAL REPAIR

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Abstract: Purpose: To describe early postoperative complications following primary cloaca repair.

Methods: A single-institution prospective database of 104 patients with cloaca was utilized. Primary repairs performed between 2020-2025 were assessed for short-term complications, including those occurring intra-operatively through post-operative exam under anesthesia (EUA) or 90 days. These were classified using the Clavien-Madadi score, type and timing. The exposure was complex cloaca anatomy (CC ≥3cm). Covariables included anatomic findings and surgical details. Descriptive statistics were performed (significance: $p<0.05$).

Results: 53 patients underwent primary repair at a median age of 0.7 years (IQR 0.6-1.5). 40% (n=21) had complex vs. 60% with moderate anatomy (n=32). Overall, 55% (29/53) underwent urogenital separation, 28% (15/53) underwent total urogenital mobilization, 17% (9/53) underwent other repairs including PSARP with introitoplasty, bowel vaginoplasty, or deferred management of vaginal agenesis. 47% underwent laparotomy (25/53). Median operative time was 307 minutes (QR 206-414; complex 445 v. moderate 238 minutes, $p<0.001$). Patients with complex anatomy also had higher rates of urogenital separation and laparotomy. 51 patients underwent EUA at a median of 62 days post-operatively.

Over two-thirds of patients (n=36, 68%) experienced 70 total complications. Patients with complex and moderate anatomy had similar complication rates (76%[16/21] v. 63%[20/32], p=0.30). However, complications were associated with longer procedures (344 v. 228 min, p=0.02) and those requiring laparotomy (88% v. 52%, p=0.01). Anorectal complications occurred in 18 patients (36%) including prolapse (n=12), skin-level anal stricture (n=6) and rectal stricture (n=2). 44% (8/18) required intervention at EUA including re-do rectal repair (n=2), prolapse repair (n=4), Heineke-Mikulicz anoplasty (n=3) and/or anorectal dilation (n=1). Anorectal complications were more common in those with complex anatomy (55%[10/18] v. 25%[8/32], p=0.03). Vaginal/introital stricture occurred in 19 patients (41%), more commonly with complex anatomy (67%[12/18] v. 25%[7/28], p=0.01). Urologic complications (ureteral/bladder injury, urinary retention, or UTI) occurred in 11 patients (21%) with similar rates by complexity. Other complication types are listed in the figure.

Conclusion: Early complications are common after cloaca repair and involve anorectal, gynecologic, and urologic events. While overall complications were not associated with complexity, complications specific to anorectal and gynecologic anatomy were significantly more common with complex cloacal anatomy.

Scientific Session 10: Oncology

9:35 AM – 11:05 AM

S90

MALNUTRITION DRIVES MORBIDITY IN PEDIATRIC ONCOLOGIC SURGERY

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Abstract: Introduction:
Malnutrition is an important variable in pediatric cancer treatment, with documented effects on a wide range of adverse outcomes. Due to metabolic demands in the perioperative period, malnutrition is hypothesized to increase infectious outcomes and overall morbidity in pediatric oncologic operations.

Methods: Children in the National Surgical Quality Improvement Program (NSQIP-P) (2013-2023) who underwent oncologic surgery were identified by ICD-9/10 and CPT codes. Malnutrition was defined by four measures: stunting (height-for-age z-score < 2), wasting (weight-for-height or BMI-for-age < 2), hypoalbuminemia (serum albumin < 3.5 g/dL), and nutritional support at the time of surgery. “Any malnutrition” was defined as the presence of one or more malnutrition measures. Outcomes included surgical site infection (SSI), composite infections (SSI, pneumonia, urinary tract infection, sepsis and C. difficile) and a composite morbidity outcome (infections, reoperation or 30-day mortality). Multivariate logistic regression was performed adjusting for age group, wound classification, operative setting, surgical approach, and case urgency. AI-assisted editing was used for language clarity.

Results: Of 10,219 patients, 19.6% met ≥1 malnutrition criteria. Any malnutrition independently increased the odds of infectious outcomes (OR 1.29, 95% CI 1.04-1.60, p = 0.018) and overall morbidity (OR 1.36, 95% CI 1.14-1.63, p < 0.001). On subgroup analysis, the association was strongest in patients ≤2 years of age (1.50, 95% CI 1.01- 1.22) and steroid-treated patients (OR 2.49, 95% CI 1.64-3.73). Regarding individual malnutrition variables, stunting, hypoalbuminemia, and nutritional support predicted morbidity; while stunting and nutritional support were associated with higher SSI risk. Sensitivity analyses for physiologic and developmental comorbidities confirmed the robustness of these associations. There was a clear dose response as patients with ≥2 malnutrition indicators had more than twice the odds of morbidity (OR 2.32, p < 0.001) and those with ≥3 indicators had nearly triple the odds (OR 3.02, p < 0.001).

Conclusion: In pediatric oncology surgery, malnutrition predicts overall infection and major postoperative morbidity. Increasing markers of malnutrition showed a clear dose-response, with up to a threefold rise in morbidity among patients with multiple variables. These findings support routine nutritional screening and optimization as a core element of perioperative planning.

Abbreviations: National Surgical Quality Improvement Program (NSQIP-P)

Surgical Site Infection (SSI)

Variable	SSI OR (95% CI)	p	All infections OR (95% CI)	p	All morbidity (no readmission) OR (95% CI)	p
Any malnutrition	1.02 (0.73–1.41)	0.91	**1.29 (1.04–1.60)**	**0.018**	**1.36 (1.14–1.63)**	**<0.001**
Albumin <3.5 g/dL	1.17 (0.73–1.80)	0.48	1.19 (0.88–1.60)	0.25	**1.33 (1.03–1.70)**	**0.025**
Nutrition support	**1.71 (1.05–2.65)**	**0.02**	**2.08 (1.54–2.76)**	**<0.001**	**2.25 (1.74–2.87)**	**<0.001**
Stunting	**1.53 (1.02–2.25)**	**0.03**	**1.47 (1.11–1.92)**	**0.006**	**1.49 (1.17–1.88)**	**<0.001**
Wasting	**0.40 (0.14–0.88)**	**0.04**	1.22 (0.82–1.74)	0.31	1.31 (0.95–1.78)	0.09

S91

MATERNAL NUTRITION INFLUENCES NEUROBLASTOMA PROGRESSION VIA INCREASED TUMOR BURDEN AND CD4$^+$ T CELL EXHAUSTION IN OFFSPRING

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Abstract: Purpose: Maternal nutrition during pregnancy is a key determinant of offspring health, influencing susceptibility to diseases including cancer. Neuroblastoma, a pediatric malignancy arising from neural crest cells, is highly sensitive to both genetic and early-life environmental factors. While oncogenic drivers like MYCN amplification are well-characterized, the role of in utero environmental exposures particularly maternal diet remains underexplored. This study investigates how a prenatal high-fat diet (HFD) influences neuroblastoma progression and anti-tumor immunity in genetically predisposed offspring.

Methods: Using the TH-MYCN transgenic mouse model, which develops spontaneous neuroblastoma, pregnant dams were fed either a control diet or an HFD throughout gestation. Offspring were assessed for tumor onset, progression rate, tumor burden, and survival. Immune profiling of the tumor microenvironment was performed to evaluate T cell function and exhaustion status.

Results: Offspring exposed to an HFD in utero exhibited significantly earlier tumor onset, accelerated progression, and increased tumor burden compared to controls. These changes were accompanied by reduced overall survival, indicating a more aggressive tumor phenotype. Spleen was enlarged in HFD group mice when compared to controls. Flow cytometric analysis of spleen immune composition revealed a suppressed anti-tumor immune response, particularly among CD4$^+$ T cells. These cells displayed elevated expression of exhaustion markers, including PD-1, TIM-3, and LAG-3, alongside reduced proliferation and diminished cytokine production (IL-2, IFN-γ). A notable increase in CD4$^+$CD44$^-$CD62L$^-$ cells was also observed, suggesting abnormal T cell differentiation or functional impairment. The HFD-exposed mice showed increased immunosuppressive signaling and altered antigen presentation, further supporting a state of immune dysfunction. These results suggest that prenatal HFD exposure induces long-lasting immune alterations that compromise anti-tumor immunity and promote neuroblastoma progression.

Conclusion: Prenatal exposure to a high-fat diet accelerates neuroblastoma development and impairs adaptive immunity through the exhaustion and dysfunction of CD4$^+$ T cells. These findings for the first time underscore the importance of maternal nutrition in shaping cancer biology and immune competence in offspring. Targeting maternal dietary habits may offer a novel approach to reducing childhood cancer risk.

Abbreviations: HFD- High Fat Diet

S92

RISK FACTORS, IMPLICATIONS, AND MANAGEMENT OF A CHYLE LEAK FOLLOWING NEUROBLASTOMA RESECTION: A MULTICENTER, RETROSPECTIVE REVIEW

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Abstract: Purpose: Neuroblastoma commonly involves retroperitoneal vasculature, and resection disrupts adjacent lymphatics with potential for postoperative chyle leak. This study aims to identify preoperative and intraoperative risk factors, postoperative implications, and management strategies of chyle leak.

Methods: A multicenter retrospective study was performed from January 2010 to July 2022 including patients 0-21 years of age diagnosed with neuroblastoma at 32 institutions in a North American surgical oncology collaborative. Data regarding preoperative, intraoperative, and postoperative factors were collected. Outcomes were compared by postoperative chyle leak status.

Results: 49 (3.0%) of 1,614 patients had a postoperative chyle leak. Chyle leak was more common in INGRSS stage M (67.4% vs. 48.8%, p=0.004), MYCN amplified tumors (37.2% vs. 22.3%, p=0.035), chemotherapy recipients (87.8% vs. 71.5%, p=0.020), and those requiring radiation (58.3% vs. 40.9%, p=0.024). Patients with chyle leak underwent greater number of named vessel skeletonization during resection (2.67±2.19 vs. 1.05±1.46 vessels, p< 0.001). Patients with chyle leak were more likely to experience delayed enteral feeding (>7 days: 6.1% vs. 0.5%, p < 0.001) and prolonged hospitalization (26.54±74.09 vs. 6.29±12.28 days, p< 0.001) than patients without a chyle leak, but time to chemotherapy resumption was not statistically different (35.21±47.63 vs. 24.75±40.49 days, p=0.144). Initial management included medical/nutritional therapy in 61.9% of patients, IR intervention in 28.6%, and surgery in 9.5%. Medical/nutritional management (low-fat diet 36.7%, NPO/TPN 28.6%, octreotide 16.3%) succeeded without escalation in 92% of cases. Additional treatment was required in 8% of medical/nutritional cases versus 42% of IR cases (p=0.011) and 25% of surgical cases. Stratified by initial intervention, recurrence rates of chylous ascites within 6 months was 4% for medical/nutritional management vs 33% for IR intervention (p = 0.016).

Conclusion: Chyle leak after neuroblastoma resection is an uncommon complication, associated with higher stage tumors and more extensive vessel skeletonization. Initial medical management has a high initial success rate, supporting a stepwise approach. Although chyle leak may prolong postoperative hospitalization, it does not significantly delay resumption of chemotherapy.

Abbreviations: INGRSS
NPO/TPN
IR

Parameter	Level	No Chyle Leak (n = 1565)	Chyle Leak (n = 49)	P-value
INGRSS (%)	L1	345 (23.6)	1 (2.2)	0.004
	L2	294 (20.1)	13 (28.3)	
	M	713 (48.8)	31 (67.4)	
	MS	91 (6.2)	1 (2.2)	
MYCN Status	Amplified	309 (22.3)	16 (37.2)	0.035
Number of vessels skeletonized Mean (SD)		1.05 (1.46)	2.67 (2.19)	<0.001
Surgical length of stay mean (SD)		6.29 (12.28)	26.54 (74.09)	<0.001
Days from surgery to restarting chemotherapy mean (SD)	All patients	24.75 (40.49)	35.21 (47.63)	0.144

Table 1: Comparing outcomes between patients with and without postoperative chyle leak.

S93

ANTIGEN AGNOSTIC TARGETED DELIVERY OF CYTOTOXIC THERAPY IN PEDIATRIC SOLID TUMORS

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Abstract: Purpose: There is a pressing need for novel therapies in pediatric solid tumors. Developing targeted therapies are limited by a reliance on sustained high target antigen expression. Tumors have an acidic microenvironment (pH 6.0–7.1), which can be selectively targeted using pH-Low Insertion Peptides (pHLIPs). Monomethyl auristatin E (MMAE), an inhibitor of microtubule polymerization, has been widely used as a payload in antibody-drug conjugates. CBX-15 is a pHLIP-MMAE conjugate that selectively delivers MMAE to tumors in an antigen agnostic manner. Here, we evaluated the preclinical activity of MMAE and CBX-15 in neuroblastoma (NB), Ewing's sarcoma (ES), and rhabdomyosarcoma (RMS).

Methods: We tested MMAE sensitivity in ES (RD-ES, A673, SKNMC), NB (SKNAS, SKNDZ, CHP 212, SKNBE(2), IMR-32) and RMS (RH28, RH30, RH41, RD) by performing in vitro cell viability assays using serial dilutions of free MMAE to determine half-maximal inhibitory concentration (IC50) values. The cell lines selected are representative of N-myc high vs low (NB), PAX3/7-FOXO1 fusion positive vs negative (RMS), and EWSR-FLI1 subtype (ES). Orthotopic murine models were created by injecting RD (RMS) into the hind legs of mice. Treatment with CBX-15 (20 mg/kg) or vehicle was given via intraperitoneal injection on a 2-days-on/5-days-off schedule for three cycles. Tumor volumes were measured twice weekly. Study endpoints included tumor size (> 2000 mm^3) or ≥20% weight loss. Kaplan-Meier curves were analyzed using the Mantel-Cox test and a simple unpaired t-test was used to analyze mouse body weight mean fold change from baseline.

Results: The IC50 of MMAE was in the low nanomolar concentration across all cell lines and tumor types indicating broad sensitivity. It is established that free MMAE is not tolerated in vivo due to severe toxicity. In our in vivo RMS model (RD), CBX-15 was well tolerated with no significant change in weight after 3 cycles ($p = 0.9755$). CBX-15 abrogated tumor growth and prolonged survival ($p < 0.005$).

Conclusion: CBX-15 leverages the acidity of the tumor microenvironment to deliver MMAE to tumor cells in a manner that is both effective and well tolerated. Our findings warrant further preclinical development and carry potential for clinical translation.

Abbreviations: pH-Low Insertion Peptides (pHLIP)
Monomethyl auristatin E (MMAE)
neuroblastoma (NB)
Ewing's sarcoma (ES)
rhabdomyosarcoma (RMS)
half-maximal inhibitory concentration (IC50)

S94

HISTONE DEACETYLASE INHIBITION ENHANCES CHEMOTHERAPY RESPONSE IN PRECLINICAL MODELS OF MALIGNANT RHABDOID TUMOR

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Abstract: Purpose
Malignant rhabdoid tumor (MRT) is a highly lethal cancer of infancy characterized by resistance to intensive chemotherapy. Due to the fact that MRT is primarily driven by loss of the SMARCB1 gene, a key epigenetic regulator, we hypothesized that epigenetic targeting via histone deacetylase (HDAC) inhibition would enhance the effect of chemotherapy.

Methods
We performed high-throughput drug screening in the G-401 MRT cell line to identify candidate HDAC inhibitors, and selected clinically relevant agents for further in vitro validation. A patient-derived spheroid (PDSp) model generated from a 14-month-old with a hepatic MRT was then used to test the most effective HDAC inhibitor in combination with vincristine + irinotecan (VI). This combination was further evaluated in vivo using an intrahepatic G-401 xenograft, with tumor growth monitored by serial MRI. Treatment began when tumors measured 0.1 – 0.5 cm3, and animals were euthanized at progression to 1.5 cm3, after 6 weeks of therapy, or if signs of toxicity developed.

Results
Among 3,896 compounds screened, 184 reduced G-401 viability to < 30% of control, including 11 HDAC inhibitors. Panobinostat demonstrated the greatest potency of the selected HDAC inhibitors (IC50 0.12 μM), outperforming vorinostat (3.22 μM) and entinostat (8.55 μM). In our PDSp model, VI + panobinostat (VIP) decreased spheroid viability to 25%, significantly lower than VI alone (73%, p = 0.0039) and panobinostat alone (64%, p = 0.0028). At 8 mg/kg, panobinostat monotherapy delayed intrahepatic G-401 tumor growth but was toxic in combination with VI. However, when the panobinostat dose was decreased to 2.5 mg/kg, VIP treatment was well tolerated with stable animal weight throughout the study. Panobinostat alone was ineffective at 2.5 mg/kg, but VIP substantially decreased tumor progression, with 75% of VIP treated animals surviving to 6 weeks compared to 0% in both the VI and panobinostat monotherapy groups (Figure).

Conclusions
Histone deacetylase inhibition combined with vincristine + irinotecan demonstrated marked antitumor activity in our preclinical models of malignant rhabdoid tumor. These findings support clinical evaluation of this strategy as a therapeutic approach for this devastating pediatric cancer.

Abbreviations: Malignant rhabdoid tumor (MRT), histone deacetylase (HDAC), patient-derived spheroid (PDSp), vincristine + irinotecan (VI), vincristine + irinotecan + panobinostat (VIP)

S95

ACTIVATION OF PP2A TARGETS MYCN DRIVEN RHABDOMYOSARCOMA

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Abstract: Introduction
Rhabdomyosarcoma (RMS) is the most common pediatric soft tissue sarcoma. High-risk RMS presents a significant therapeutic challenge, and these children continue to have poor outcomes. High-risk RMS is characterized by a PAX3-FOXO1 fusion gene that upregulates transcription of proto-oncogenes, including MYCN. In RMS, MYCN amplification is associated with aggressive disease, metastasis, and chemoresistance. Protein phosphatase 2A (PP2A) is a serine/threonine phosphatase that functions as a tumor suppressor, but its activity is suppressed in RMS. Recent studies have increasingly highlighted the role of PP2A in epigenetic reprogramming of chromatin architecture, and we have previously found that PP2A activation decreases the abundance of MYCN mRNA and MYCN protein expression in RMS. Because of these previous findings, we hypothesized that pharmacologic reactivation of PP2A will decreases aggressive oncogenic phenotype in MYCN driven RMS.

Methods
Two MYCN amplified human RMS cell lines, RD (embryonal, PAX3-FOXO1 fusion negative) and SJC-RH30 (alveolar, PAX3-FOXO1 fusion positive) were treated with a small molecule PP2A activating compound, ATUX-1215, at increasing concentrations (0 – 15 μM) for 72 hours. Cell counting ascertained effect of PP2A activation on cell proliferation. Modified Boyden chamber assays were used to assess migration and invasion, and flow cytometry detected apoptosis. Experiments were performed in biologic triplicates and data was reported as mean ± standard deviation, with $p \leq 0.05$ considered significant.

Results
Treatment of RD and RH30 human RMS cells with increasing doses of ATUX-1215 (0 - 15 μM) for 72 hours significantly decreased cell proliferation (Fig. A, B). In the RD cell line, ATUX-1215 treatment increased the percentage of apoptotic cells compared to untreated controls (Fig. C). ATUX-1215 significantly decreased motility in both cell lines as witnessed by decreased migration (Fig. D, E) and invasion (Fig. F, G) following PP2A activation.
Conclusion
PP2A activation with ATUX-1215 decreases RMS cell proliferation, migration and invasion in MYCN amplified RD and RH30 cell lines and increases apoptosis in the RD cell line. These findings in combination with previous data showing decreasing MYCN abundance at the mRNA and protein level, suggest that PP2A activation may hold promise as a therapeutic intervention for MYCN driven RMS tumors.

Abbreviations: RMS- Rhabdomyosarcoma
MYCN

PP2A- Protein Phosphatase Activator 2A

S96

DIAGNOSTIC ACCURACY OF PET IMAGING FOR DETECTION OF REGIONAL LYMPH NODE METASTASES IN CHILDREN, ADOLESCENTS, AND YOUNG ADULTS WITH RHABDOMYOSARCOMA

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Abstract: Purpose: For patients with rhabdomyosarcoma (RMS), regional lymph node (LN) involvement affects risk stratification, treatment, and prognosis. The accuracy of positron emission tomography (PET) in detecting LN metastases for RMS is unclear; therefore, histologic assessment is required for extremity, trunk, and paratesticular (≥10 years) locations. Failure to perform proper LN assessment can lead to under- or over-treatment, affecting survival. The aim of this study was to evaluate the diagnostic accuracy of PET in detecting regional LN metastases in patients with RMS.

Methods: A retrospective multi-institutional study was conducted through the Pediatric Surgical Oncology Research Collaborative (PSORC) with 37 participating institutions. Patients aged 0-25 years with RMS of the extremity, trunk, head and neck, or paratesticular sites treated between 2014-2023 were included. PET imaging was evaluated for evidence of regional LN involvement and compared to surgical histopathology. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated.

Results: A total of 862 patients were identified, of which 670 (77.7%) underwent PET and 341 (39.5%) underwent regional LN biopsy. LN biopsy was performed in 54.5% of extremity, 31.0% of trunk, 81.9% in paratesticular sites in patients ≥10 years of age, and 26.4% in head and neck. Only 238 (27.6%) patients had undergone both PET and LN biopsy. In this smaller cohort, 131 patients were regional LN PET positive, of which 80 (61.1%) had positive histology. Of the 107 patients who were PET negative, 24 (22.4%) had positive histology. Overall diagnostic accuracy for PET was sensitivity 76.9%, specificity 61.9%, PPV 61.0%, and NPV 77.6%. Sensitivity was highest for extremity (82.9%) and head and neck (82.7%) sites, whereas specificity was highest for paratesticular (85.2%).

Conclusion: The diagnostic accuracy of PET imaging in RMS is inadequate and therefore should not replace histologic confirmation of regional LN involvement. Despite current requirements for extremity, trunk, and paratesticular (≥10 years) RMS, regional LN biopsy remains highly underutilized. Efforts to improve adherence to clinical management guidelines for regional node evaluation are warranted.

Abbreviations: RMS - rhabdomyosarcoma
LN - lymph node
PET - positron emission tomography
PSORC - Pediatric Surgical Oncology Research Consortium
PPV - positive predictive value
NPV - negative predictive value

Diagnostic accuracy of PET on regional LN histology for rhabdomyosarcoma

	PET positive	Histology positive	Diagnostic accuracy for PET on LN involvement			
Primary site (N)	**N (%)**	**N (%)**	**Sensitivity**	**Specificity**	**PPV**	**NPV**
All sites (238)	131 (55.0)	104 (43.7)	76.9	61.9	61.0	77.6
Extremities (97)	59 (60.8)	47 (48.5)	82.9	60.0	66.1	78.9
Trunk (20)	8 (40.0)	6 (30.0)	66.7	71.4	50.0	83.3
Paratesticular* (46)	15 (32.6)	19 (41.3)	57.9	85.2	73.3	74.2
Head and neck (67)	47 (70.1)	29 (43.3)	82.7	39.4	51.0	75.0

* For patients ≥ 10 years of age

S97

SURGICAL MANAGEMENT OF RECURRENT DESMOPLASTIC SMALL ROUND CELL TUMOR

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Abstract: Purpose
Desmoplastic small round cell tumor (DSRCT) is a rare sarcoma characterized by the EWSR1-WT1 gene fusion that occurs in pediatric and young adult patients. Prognosis is poor, with 5-year survival rates of 15-30% despite aggressive multimodal therapy. This study aims to evaluate the surgical management and outcomes of recurrent DSRCT.

Methods
With IRB approval, a retrospective review of 234 patients with DSRCT treated at a single institution between 1/1/2001 and 1/31/2025 identified patients who achieved no evidence of disease (NED) status, recurred, and then underwent surgical management of recurrent disease. Patient characteristics, treatment regimens, and disease course data were collected. Survival was analyzed using Kaplan-Meier method.

Results
Thirty-three patients meeting study criteria were identified. The median age at diagnosis was 18 years (range: 6-42), with 30 male (90.9%) and 3 female (9.1%) patients. Initial sites of disease were all abdominopelvic, with ascites (n=13), liver (n=12), and thoracic (n=12) disease noted. All patients received chemotherapy. R1 resection occurred in 30 patients (90.9%), requiring between 1 to 4 surgeries. Additional initial therapies included whole abdominopelvic radiation (n=24) and intraperitoneal radioimmunotherapy (n=14). All patients achieved NED status. Median recurrence-free survival (RFS) was 18 months (range: 2-247), with 10 patients (30.3%) recurring within 1 year. Thirty patients had abdominopelvic recurrences, and 11 patients had thoracic recurrences, with liver (n=9) and lung (n=2) recurrences noted.
Patients received between 1 to 3 surgeries to manage recurrence. Additional therapies included chemotherapy, immunotherapy, and radiotherapy. Post-recurrence NED status was achieved in 23 patients (69.7%). Postoperative complications requiring invasive intervention or rehospitalization occurred in 6 patients (18.2%), with 0 perioperative deaths. Median overall survival following surgical management of recurrence was 6.0 years (95% CI: 4.5-7.6). On univariate analysis, RFS > 1 year (p=0.00016) and achieving post-recurrence NED (p=0.015) were associated with improved survival following surgery for recurrent disease.

Conclusion
Recurrent desmoplastic small round cell tumor is associated with poor outcomes. Initial time to recurrence greater than 1 year and achieving no evidence of disease after recurrence were all significantly associated with longer survival. Improved surgical and systemic therapy options are essential to prolonging survival in this complex disease.

Abbreviations: DSRCT: desmoplastic small round cell tumor
IRB: institutional review board
NED: no evidence of disease
RFS: recurrence-free survival

S98

PP2A ACTIVATION DECREASES HEPATOBLASTOMA TUMOR GROWTH THROUGH PIM3 KINASE

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Abstract: Introduction:
Hepatoblastoma (HB) is the most common primary malignant pediatric liver tumor. Most children are cured with surgical resection and chemotherapy, but outcomes for those with refractory, recurrent, or metastatic disease continue to be poor, prompting a dire need for improved therapies for these children. We have shown that PIM3, a serine/threonine kinase, is associated with HB therapeutic resistance and metastasis. Protein phosphatase 2A (PP2A) is a known tumor suppressor that is downregulated in HB, and we have found that reactivation of PP2A leads to a less aggressive HB phenotype, but the mechanisms responsible for these findings have not been elucidated. Other researchers have reported that PP2A activation downregulates PIM kinases. Our collaborator recently developed two novel PP2A activating compounds that demonstrate favorable side effect profiles and pharmacokinetics. Because of our preliminary findings, and those of other investigators, we hypothesized that PP2A activation would alter the tumorigenic phenotype of HB cells through changes in PIM3 kinase.
Methods:
We transfected HuH6 human HB cells to stably overexpress PIM3. These PIM3 overexpressing HB cells (PIM3 OE) were treated with increasing doses of the novel PP2A activators, ATUX-1215 or ATUX-5800, for 72 hours. To assess the effects of these PP2A activators on PIM3 OE cells, we used a colorimetric assay for viability, cell counting for proliferation, and qRT-PCR to detect changes in PIM3 mRNA abundance.
Results:
ATUX-1215 and ATUX-5800 decreased cell viability with a calculated lethal dose 50% (LD50) of 17.2 and 18.5 μM, respectively (Fig. 1A). ATUX-1215 and ATUX-5800 both decreased proliferation at 72 hours (31,000 vs 11,000 cells, control vs ATUX-1215; 26,000 vs 11,000 cells, control vs ATUX-5800) (Fig. 1B,C). Treatment of PIM3 OE cells with ATUX-1215 decreased PIM3 mRNA abundance (fold change = 0.34 vs 1 (control)). Similarly, PIM3 mRNA was decreased following treatment with ATUX-5800 (fold change = 0.3 vs 1 (control)) (Fig. 1D).
Conclusions:
PP2A activation with two novel pyran sulfonamide compounds led to decreased viability, proliferation, and mRNA abundance of PIM3 in PIM3 OE HB cells. These findings underscore the need for further investigation into the role of PP2A activation as a potential therapeutic adjunct in HB.

Abbreviations: Hepatoblastoma (HB)
Protein phosphatase 2A (PP2A)
PIM3 overexpressing HB cells (PIM3 OE)

S99

EXTRARENAL WILMS TUMOR: A REPORT FROM THE CHILDREN'S ONCOLOGY GROUP RENAL TUMOR COMMITTEE

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Abstract: Purpose: Although Wilms tumor (WT) is a common pediatric solid tumor, extrarenal WT (ERWT) is extremely rare. Treatment recommendations have traditionally been based on standard renal WT therapy. The purpose of this study is to describe the characteristics, treatment approaches, and outcomes of patients with ERWT included in the Children's Oncology Group (COG) AREN03B2 and National Wilms Tumor Study (NWTS) 5 cohorts.

Methods: Patients with ERWT enrolled on COG AREN03B2 and NWTS5 were identified. Demographics, tumor characteristics, biology, surgical details, therapies utilized and relapse information were collected. Outcomes, including relapse-free survival (RFS) and overall survival (OS) were calculated. Descriptive statistics and Kaplan–Meier survival analyses RFS/OS were performed.

Results: 28 patients (out of 9221 total patients on AREN03B2 and NWTS5) with ERWT were identified. Median age was 4.8 years and 57% were female. Primary tumor location included abdomen/pelvis (n=10, 36%), abdomen (n=8, 29%), pelvis (n=4, 14%), groin (n=5, 18%), and lumbar (n=1, 3.6%). Median tumor diameter was 9 cm. Overall, Stage III predominated (n=18, 64%). All patients with Stage IV disease had pulmonary only metastases and were local Stage III (n=4, 14%). Favorable histology was noted in 27 patients; only 1 patient had diffuse anaplasia. Operative details revealed that 22 (79%) were managed with upfront resection and 6 (21%) with initial biopsy and delayed resection after chemotherapy. Intraoperative spill (n=20, 71%) was frequent and preoperative rupture occurred in 11% (n=3). Nodal sampling was infrequent (n=8, 25%). Chemotherapy largely followed standard-of-care regimens (DD4A 73%, EE4A 23%). 50% received radiation. At 4 years, RFS was 86.4% and OS was 95.5%. Observed relapses were predominantly local.

Conclusions: ERWT represents < 1% of all WT, typically presents with advanced local stage, and is associated with high rates of tumor spill. Despite excellent OS, RFS compares unfavorably to published outcomes for most renal WT patients. These data support the need for improved clinical staging with adequate node sampling and minimizing intraoperative spill as well as a more appropriate assignment of chemotherapy and radiation based upon contemporary prognostic factors for renal WT. Furthermore, clinicians should consider ERWT in the differential diagnosis of unusual retroperitoneal or pelvic masses.

Abbreviations: WT = Wilms tumor
ERWT = Extrarenal Wilms tumor
COG = Children's Oncology Group
NWTS = National Wilms Tumor Study
RFS = Relapse Free Survival
OS = Overall Survival

Characteristic	NWTS5, N = 12[1]	AREN03B2, N = 16[1]	Overall, N = 28[1]
Tumor Location			
Abdomen	5 (42%)	3 (19%)	8 (29%)
Abdomen/Pelvis	4 (33%)	6 (38%)	10 (36%)
Groin	2 (17%)	3 (19%)	5 (18%)
Lumbar	0 (0%)	1 (6.3%)	1 (3.6%)
Pelvis	1 (8.3%)	3 (19%)	4 (14%)
Disease Stage			
Stage I	3 (25%)	0 (0%)	3 (11%)
Stage II	0 (0%)	3 (19%)	3 (11%)
Stage III	6 (50%)	12 (75%)	18 (64%)
Stage IV	3 (25%)	1 (6.3%)	4 (14%)
Lymph Nodes Sampling			
Sampled	4 (33%)	3 (19%)	7 (25%)

Scientific Session 11: NEC

9:35 AM – 11:05 AM

S100

OPTIMIZING EXPERIMENTAL VAGAL NERVE STIMULATION TO REDUCE NEONATAL SEPSIS

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Abstract: Purpose: Targeting neuroimmune pathways such as the cholinergic anti-inflammatory pathway (CAIP) offers a promising therapeutic strategy for inflammatory diseases. The vagus nerve modulates immune responses through nicotinic α7-acetylcholine receptors (α7nAChR), suppressing cytokine-driven inflammation. While vagal nerve stimulation (VNS) has been studied in adult murine models, neonatal research remains limited. Previous work in our laboratory using a necrotizing enterocolitis (NEC) model showed a non-significant reduction in inflammatory cytokines with VNS. We developed a novel VNS protocol to evaluate effect on inflammation in a neonatal endotoxemia model, hypothesizing that VNS would attenuate lipopolysaccharide (LPS)-induced cytokine production.

Methods: Twenty-four neonatal mice (3–4 g) were randomized into four groups (n=6): LPS only, VNS only, LPS + post-VNS, and LPS + pre- and post-VNS. LPS (5 mg/kg) was administered intraperitoneally. Saline served as a sham injection for controls. VNS was applied to the auricular branch of the vagus nerve (ear helix) at 15 Hz for 5 minutes (2 minutes on, 1 minute off, 2 minutes on). Mice were euthanized 2 hours post-LPS for collection of plasma, spleen, ileum, and brain. Plasma cytokines were quantified via ELISA, and statistical analysis was performed using ANOVA ($p < 0.05$).

A separate 3-day NEC model included formula-fed (FF, n=4), VNS-treated (n=6) groups, and breast-fed controls (BF, n=12). VNS was initiated 18 hours after bacterial oral gavage using identical parameters twice daily. Immunohistochemistry for 4HNE assessed oxidative stress, which was quantified using Fiji and analyzed via unpaired t-test.

Results: LPS increased circulating IFN-γ, IL-1β, and TNF-α, confirming systemic inflammation. VNS significantly reduced these cytokines and chemoattractants CCL5 and IL-12p70, indicating suppression of innate and adaptive immune activation. Compared to a prior NEC model using 20 Hz for 20 minutes, the current protocol achieved greater cytokine reduction. Strikingly, immunostaining for reactive oxidative species marker 4HNE revealed a trend towards reduction in VNS-treated NEC mice compared with controls, suggesting the mechanism involved.

Conclusion: Vagal nerve stimulation, when applied within specific parameters, significantly reduces pro-inflammatory cytokines and chemoattractant signaling in neonatal endotoxemic mice. Utilizing new parameters of vagal nerve stimulation, we demonstrate a novel therapeutic

approach for neonatal inflammatory disorders such as necrotizing enterocolitis.

Abbreviations: CAIP: Cholinergic anti-inflammatory pathway
VNS: Vagal nerve stimulation
NEC: Necrotizing enterocolitis
LPS: Lipopolysaccharide
α7nAChR: Nicotinic α7-acetylcholine receptor
FF: Formula-fed
BF: Breast-fed
ELISA: Enzyme-Linked Immunosorbent Assay
ANOVA: Analysis of Variance
4HNE: 4-hydroxynonenal
IFN-γ: Interferon gamma
IL-1β: Interleukin 1 beta
TNF-α: Tumor necrosis factor alpha
CCL5: C-C Chemokine Ligand 5
RANTES: Regulated on Activation Normal T Cell Expressed and Secreted
IL-12p70: Interleukin 12 p70

S101

THE PATHOPHYSIOLOGY OF CARDIAC-ASSOCIATED VS. PREMATURITY-ASSOCIATED NECROTIZING ENTEROCOLITIS

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Abstract: Purpose: Necrotizing enterocolitis (NEC) is a devastating inflammatory intestinal disease with high morbidity and mortality. Although it most commonly affects newborns born prematurely, 10% of affected patients are born full-term, commonly with congenital heart disease (CHD). There is a paucity of data concerning the molecular and cellular pathways involved in cardiac-associated-NEC (cNEC) vs. prematurity-associated-NEC (pNEC). This study aimed to address the pathophysiology of cNEC compared to pNEC.

Methods: Human intestinal tissue samples were collected from five patients with acute cNEC, four patients with acute pNEC, and five control patients (four undergoing ileostomy takedown after recovery from acute pNEC, and one donor with a non-survivable congenital brain defect and no intestinal pathology). Bulk RNA-sequencing was performed to evaluate differential gene expression and signaling pathways involved; gene expression was validated by qRT-PCR. Pathway selection was based on a p-value < 0.05 and Z-score>2, indicating the magnitude and direction of pathway activity.

Results: Bulk RNA-sequencing examining differential gene expression revealed that patients with cNEC had significant upregulation of 507 genes, while those with pNEC had upregulation of 727 genes, compared to controls, with 246 upregulated genes shared between the two diseases (Figure 1). cNEC had 261 unique upregulated genes, including NLRP12, DGAT2, and OSM. qRT-PCR validated several of the commonly upregulated genes including IL1A/B and S100A8/9. Patients with cNEC had significant downregulation of 126 genes, while those with pNEC had downregulation of 594 genes, with 44 downregulated genes shared between the two diseases. cNEC had 82 unique downregulated genes, including NXPE1/2/4, TDRD5, and ITLN1. Patients with cNEC had significant activation or inhibition of 189 signaling pathways compared to controls, compared to 170 for pNEC, with 98 pathways shared between the two diseases. Of 91 significantly activated signaling pathways unique to cNEC, most notable included Neutrophil Extracellular Trap Signaling, Autophagy, and Antigen Presentation (data not shown).

Conclusion: Although some commonalities exist in their pathophysiology, significant differences exist in differential gene expression and individual signaling pathways involved in cardiac-associated versus prematurity-associated necrotizing enterocolitis. Further studies are needed to develop individualized treatments and novel therapeutics designed to address these unique disease processes.

Abbreviations: CHD, congenital heart disease; NEC, necrotizing enterocolitis; cNEC, cardiac-associated necrotizing enterocolitis; pNEC, prematurity-associated necrotizing enterocolitis; qRT-PCR, quantitative reverse transcription polymerase chain reaction.

S102

COST EFFECTIVENESS ANALYSIS OF INTRAPERITONEAL DRAIN PLACEMENT VS EXPLORATORY LAPAROTOMY FOR NEONATAL INTESTINAL PERFORATION

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Abstract: Purpose: Neonatal intestinal perforations require surgical interventions for source control. This can be due to spontaneous intestinal perforation (SIP) or necrotizing enterocolitis (NEC). Perforation is managed with a combination of intraperitoneal drain placement (IP) and/or exploratory laparotomy (EL) with similar rates of survival. However, the cost-effectiveness of initial IP compared to initial EL has not been studied. We hypothesized that IP before EL would be more cost-effective than EL as an initial treatment from the payer's perspective at an 18-month time horizon (the time horizon for which longitudinal data is available).

Methods: In this cost-effectiveness analysis, we generated microsimulation models to simulate morbidity, mortality, and utility measured by survival without moderate-to-severe cerebral palsy (CP) for IP and EL. Cost effectiveness was measured as an incremental cost-effectiveness ratio (ICER), defined as the cost in US dollars per additional CP-free survival event by either surgical approach. We used a standard willingness-to-pay (WTP) threshold of $100,000 to denote cost-effectiveness. Frequency of morbidity outcomes (intraoperative complications, subsequent laparotomy after initial drain or laparotomy, and CP) and associated costs were derived from the existing literature.

Results: In 1,000 iterations of our model, each containing 10,000 microsimulations, we found that the ICER for IP was below our WTP threshold of $100,000 in 82.5% of iterations. The mean cost per CP-free survival was lower for IP compared to the mean cost of EL ($121,802 vs $142,849). Because CP was more common in the IP group, the ICER for CP-free survival for EL was $292,217. However, due to the low event rate of CP in both groups, IP remained the more cost-effective strategy at standard WTP thresholds (Fig. 1).

Conclusion: After accounting for pertinent costs, initial surgical management of neonatal intestinal perforations with intraperitoneal drain placement is cost-effective at a willingness-to-pay threshold of $100,000 and a time horizon of 18-months. However, at higher willingness-to-pay thresholds, alternative time horizons, different perspectives, or alterations in other model variables, exploratory laparotomy may be a more cost-effective strategy and may be considered as an initial management option in appropriate clinical contexts.

Abbreviations: SIP - Spontaneous intestinal perforation
NEC - Necrotizing enterocolitis
IP - Intraperitoneal drain placement
EL - Exploratory laparotomy
CP - Moderate-to-severe cerebral palsy
ICER - Incremental cost-effectiveness ratio (ICER)
WTP - Willingness-to-pay

S103

ANTIMICROBIAL MANAGEMENT OF SURGICAL NECROTIZING ENTEROCOLITIS: INSIGHTS FROM A MULTI-INSTITUTIONAL ANALYSIS

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Abstract: Purpose: There is no established best practice for the type or duration of antimicrobial treatment for surgical necrotizing enterocolitis (sNEC). We evaluated the association between antimicrobial practices and outcomes.

Methods: We conducted a retrospective cohort analysis of infants with sNEC from 2010-2019 at ten academic children's hospitals. Demographics, antimicrobial choice at NEC diagnosis and postoperatively, and outcomes were assessed. Chi-square and multivariable regression analyses as well as Kaplan-Meier and Cox proportional hazards model were used. AI was used to help with Stata commands.

Results: Among 306 neonates, median gestational age was 26wks [IQR 25-29], birth weight

(BW) 850g [680-1100], and age at diagnosis 8.5wks [3-21]. 15% had positive blood cultures. At diagnosis, 12 antimicrobials were used in 96 regimens. Post-operatively, 14 were administered in 109 regimens. Pre- and post-operative regimens differed in 67%. The most frequently used antibiotics were ampicillin, clindamycin, gentamicin, and vancomycin.[FIGURE 1] Antifungals were given in 9% at diagnosis and 28% post-operatively. Ampicillin was more frequently prescribed in infants with greater BW, and antifungals were used in those with lower BW. 105 (34%) died during the index admission, of whom 48 (16%) died within two days of diagnosis. No initial antimicrobial regimen was associated with incidence of or time to death. Excluding early deaths, patients received a median of 14d [IQR 10-14, range 0-35] of post-operative antibiotics. Duration was not associated with the incidence of positive blood cultures (p=0.10). Among survivors, median hospital stay was 125d [90-170], 76% achieved enteral autonomy, 6% developed recurrent NEC, and 30% had long-term neurodevelopmental impairment (NDI). Adjusted regression analyses identified no association between post-operative antibiotic choice and post-operative infection, stoma stricture, recurrent NEC, time to enteral autonomy, cholestasis, intraventricular hemorrhage, NDI, or late mortality. Among patients who survived at least 2 wks (n=240), the duration of post-operative antibiotics (>14d vs < 14d) was not associated with mortality (p=0.48).

Conclusion: Antimicrobial management in sNEC varied widely. Ampicillin, clindamycin, gentamicin, and vancomycin were most often prescribed. No antibiotic/antifungal was associated with improved outcomes. Longer antimicrobial duration was not associated with improved survival. Prospective randomized studies may help define optimal antibiotic choice and duration.

Abbreviations: sNEC: surgical necrotizing enterocolitis
IQR: interquartile range
BW: birth weight
NDI: neurodevelopmental impairment

S104

OPTICAL TRANSPARENCY WITH TARTRAZINE ENABLES NON-INVASIVE IMAGING OF NECROTIZING ENTEROCOLITIS IN A MOUSE MODEL

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Abstract: Purpose: Necrotizing enterocolitis (NEC) is a life-threatening disease of preterm neonates in which gastrointestinal inflammation can rapidly progress to sepsis and death. A major clinical challenge is determining when surgery is required for compromised intestine. While ultrasound and abdominal films are used, no additional non-invasive tools exist to evaluate NEC. Recently, the food dye tartrazine, an FDA-approved food coloring commonly used in corn-cheese puff snacks (ie, Cheetos®), has been shown to alter the refractive index of mouse skin, rendering internal organs transparent under white light. Building on this finding, we tested whether topical tartrazine could permit direct visualization of bowel pathology and disease progression in a murine NEC model.

Methods: NEC was induced by oral gavage feeding neonatal mice formula (Esbilac) with 2% dextran sodium sulfate every 4 hours starting on postnatal day 3. Control mice were breastfed or received formula alone. A tartrazine-agarose gel was prepared by combining tartrazine (30% w/w) with agarose (6 mg/mL), which was then heated to homogeneity, then cooled at 4 °C to form a gel. The gel was topically applied to the abdomens of neonatal mice, which were then cover-slipped for macro-lens imaging. Under white light conditions, intra-abdominal organs were visible under the tartrazine-agarose gel and imaged twice daily during NEC induction using a full-frame mirrorless digital camera (Sony a7RV) mounted on a tripod.

Results: In living NEC-induced mice, tartrazine imaging revealed characteristic features and disease progression (Figure 1A). Early findings included intestinal wall thickening, which advanced to bowel dilatation, intraluminal gas, and bloody stool the following day. Findings were confirmed at dissection (Figure 1B), with lesions corresponding to those visualized through the tartrazine gel. The imaging protocol was well tolerated, and mortality did not differ between imaged and non-imaged groups. The gel was easily removed with water.

Conclusion: Topical tartrazine provides a novel, non-invasive, repeatable, and reversible method for visualizing pathological changes associated with NEC in neonatal mice. This technique offers a valuable experimental tool for studying NEC progression and may have future clinical applications for monitoring and guiding management of preterm infants.

Abbreviations: NEC: necrotizing enterocolitis, FDA: Food and Drug Administration

S105

BIOPTERIN METABOLISM AND OXIDATIVE STRESS DURING NECROTIZING ENTEROCOLITIS.

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Abstract: Purpose: Human breast milk prevents the occurrence of necrotizing enterocolitis (NEC). Tetrahydrobiopterin (BH4) is abundant in breast milk, but BH4 is highly unstable and easily oxidized in stored milk, which limits its beneficial effects. Inflammation causes inducible nitric oxide synthase (iNOS) activation with generation of pathological levels of superoxide (NOS uncoupling) characterized by high levels of BH2 and imbalance of BH4/BH2 ratio (Figure A). To counter this condition, cells utilize the crucial antioxidant enzyme, superoxide dismutase (SOD) to specifically catalyze the breakdown of superoxide into less harmful hydrogen peroxide and oxygen. Guanosine triphosphate Cyclohydrolase I (GCH1) is first rate-limiting enzyme involved in the biosynthesis of BH4 which plays an important role in nitric oxide (NO) regulation as scavenger of reactive oxygen species. The mechanism of NOS uncoupling in NEC remains unknown. This study aims to clarify the involvement of biopterin metabolism in the intestine during NEC.
Methods: Following ethical approval, C57BL/6 pups were randomly assigned to 2 groups. (i) Breastfed control (n=10) and (ii) NEC (n=15). NEC was induced from postnatal day 5 to 9 by maternal-Infant separation, hypoxia and gavage administration of lipopolysaccharide and formula. On postnatal day 9, pups were sacrificed, terminal ileum was collected for histology and RT-qPCR analysis.
Results: During NEC, there was intestinal injury (Figure B, p=0.0001) and elevated inflammatory marker IL6 compared to control (Figure B, p=0.030). GCH1 mRNA expression in the intestine was significantly higher in NEC compared to control (p=0.020), as well as iNOS (p=0.007) and SOD (p=0.026) mRNA expression (Figure C).
Conclusions: This study shows that in NEC oxidative stress and inflammation are associated with NOS uncoupling as indicated by the upregulation of GCH1, iNOS and SOD expression. These findings further elucidate the pathogenesis of NEC and the role of biopterins (BH4 and BH2). Future studies will determine if BH4 administration can reduce oxidation and the intestinal damage in NEC.

Abbreviations: NEC, necrotizing enterocolitis; BH4, tetrahydrobiopterin; iNOS, inducible nitric oxide synthase;BH4, dihydrobiopterin; SOD, superoxide dismutase; GCH1, Guanosine triphosphate Cyclohydrolase I; NO, nitric oxide;

S106

EXTRACELLULAR VESICLES DERIVED FROM INTESTINAL EPITHELIAL ORGANOIDS PROMOTE REGENERATION DURING NECROTIZING ENTEROCOLITIS

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Abstract: Purpose: Necrotizing enterocolitis (NEC) is a devastating intestinal disease that mainly affects premature infants. NEC is characterized by impaired intestinal stem cell activity, epithelial regeneration, and cellular migration. It has been demonstrated that transplantation of intestinal epithelial organoids (IEO) can rescue both inflammatory bowel disease and experimental NEC. However, there are translation difficulties of establishing clinical cellular based therapies in neonates. Therefore, we investigated the regenerative potential of extracellular vesicles derived from IEOs (IEO-EV), a non-cellular based, non-immunogenic therapy.

Methods: IEOs were derived from postnatal day (p) 9 C57BL/6 mice and the culture media was collected. IEO-EVs were isolated from the IEO culture media via differential ultracentrifugation. NEC was induced from p5-9 by administering hyperosmolar formula, lipopolysaccharide, and hypoxia prior to each feed. Proteomic characterization was performed on the IEO-EVs. Wound healing scratch assay was performed on lipopolysaccharide-stimulated human intestinal epithelial cells (HIEC-6). Either IEO-EVs or PBS were administered in vivo by enema (p6-9) and in the in vitro culture media.

Results: IEO-EVs were successfully isolated and characterized by nanoparticle tracking and protein expression analysis (data not shown). Experimental NEC injury was confirmed using a histological scoring system, with IEO-EV treatment reducing intestinal epithelial damage ($p = 0.0241$). In addition, immunostaining and protein expression analysis of stem cell marker OLFM4 demonstrated increased stem cell activity in the IEO-EV treated group (Figure A). Furthermore, gene ontology enrichment analysis identified IEO-EV proteins are related to wound healing, as well as tissue and epithelial cell migration (Figure B; highlighted in red). To investigate these findings, a wound healing scratch assay on HIEC-6 was performed. Compared to the HIEC-6 LPS + PBS group, IEO-EV administration was able to significantly promote cell migration (Figure C).

Conclusion: IEO-EVs were successfully isolated, and their administration resulted in reduced NEC incidence and improved stem cell activity. Proteomic analysis of IEO-EVs revealed proteins related to epithelial cell migration, which was then demonstrated by a wound healing scratch assay. These proteins and other factors of IEO-EVs can contribute to reduced intestinal injury and improved regeneration. IEO-EVs can be prepared and stored before disease onset representing a potential novel therapeutic strategy.

Abbreviations: intestinal epithelial organoids (IEO)
extracellular vesicles derived from IEOs (IEO-EV)
human intestinal epithelial cells (HIEC-6)
lipopolysaccharide (LPS)

S107

GLP-1 PRODUCED BY ENTEROENDOCRINE CELLS REGULATES NECROTIZING ENTEROCOLITIS SEVERITY IN MICE

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Abstract: Purpose: With this study, we aimed to investigate the effect of GLP-1 agonists, such as exendin-4, on necrotizing enterocolitis (NEC) in a mouse model. Enteroendocrine cells (EEC) have been shown to be modulated in NEC, however the role of GLP-1 agonists remains largely undescribed.
Methods: Neonatal mice were removed from their dams to undergo high osmolar formula feeds via gastric lavage supplemented with bacteria collected from human samples to induce NEC. For initial measurement of serum GLP-1, age-matched breast-fed pups were used as healthy control animals. Subsequently, twelve mice underwent formula feeds alone as controls and thirteen mice underwent formula feeds with intraperitoneal exendin-4 injections at a dose of 10nm/kg administered daily for a total of four days. Data involving the two groups was then analyzed with an unpaired two tailed t-test and a p value of less than 0.05 was considered significant.
Results: Neonatal mice receiving formula feeds with bacteria experience a surge of GLP-1 releasee at the 12-hour mark compared to breast fed same age mice. The mice undergoing treatment with exendin-4 had a statistically significant worsened overall mortality compared to same age littermates undergoing formula feeding alone. Additionally, there were significantly higher levels of the inflammatory cytokines tumor necrosis factor, interleukin-1, and lipocalin-2 observed from ileum samples by qRT-PCR in mice treated with exendin-4. This would indicate an overall worsening inflammatory process in mice exposed to exendin-4. Hematoxylin and Eosin staining of ileum shows overall visibly worsened tissue appearance in the GLP-1 agonist treated mice in terms of increased tissue edema and fracture of villi. Immunohistochemical staining for GLP-1 confirms preserved presence of GLP-1 positive cells in ileum samples from both groups.
Conclusion: We conclude that administering GLP-1 agonists worsens the intestinal inflammation and overall outcomes in mouse necrotizing enterocolitis models, meaning that the surge of GLP-1 noted in the model may also play a role in worsening outcomes in necrotizing enterocolitis.

Abbreviations: Necrotizing enterocolitis, NEC; Enteroendocrine cells, EEC

Scientific Session 12: Quality

9:35 AM – 11:05 AM

S108

IMPLEMENTING AND INCREASING UTILIZATION OF SPINAL ANESTHESIA IN GROIN AND GENITAL SURGERY: A QUALITY IMPROVEMENT PROJECT

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Abstract: Purpose: Spinal anesthesia is a safe and effective anesthetic method for children undergoing short groin and genital procedures and can be used in lieu of general anesthesia to reduce risk to the developing brain and improve perioperative pain control. Following the introduction of spinal anesthesia as a primary anesthetic method at our institution, we aimed to improve its utilization from baseline of 28% to 35%.
Methods: The baseline utilization of spinal anesthesia for groin and genital surgery in infants was measured between January 2019-December 2020. Between January 2021-August 2025, sequential interventions were introduced: improvements in the spinal anesthesia pathway, surgeon to anesthesiologist communication to identify eligible patients, and the case request process to schedule these patients. Next, we expanded inclusion criteria from < 12 months to < 18 months and adjusted PACU discharge criteria to remove the requirement to observe leg movement prior to discharge. We disseminated a publication describing our initial success with spinal anesthesia, and shared data showing success rate of spinal blocks in older children. We then developed parent information packets and added the spinal anesthetic to the operating room pyxis. Our outcome measure was the percentage of groin and genital procedures receiving a successful spinal block. The balancing measures were spinal anesthesia success rate, administration of opioids in PACU, and PACU length of stay. We calculated cost savings from published rates for the cost of PACU time.
Results: We increased spinal block utilization from 28% to 45%, exceeding our goal of 35%. The spinal anesthesia success rate improved from 89.1% to 93.8% throughout this period. No patients receiving spinal anesthesia required opioids in the PACU. PACU length of stay decreased from 59.7 to 48.6 minutes, leading to a 19% reduction ($632 from $776) in the cost of PACU stay.
Conclusion: Spinal anesthesia can be implemented as an effective primary anesthetic method for infants and young children undergoing groin and genital surgery. Standardization of the spinal anesthesia process can increase utilization rates while decreasing PACU length of stay and cost and eliminating the use of opioids. Further efforts, including pediatrician education initiatives, may support ongoing improvement in utilization.

Abbreviations: PACU - post-operative care unit

S109

ELIMINATING PROPHYLACTIC ANTIBIOTIC USAGE FOR LAPAROSCOPIC PYLOROMYOTOMY: A QUALITY IMPROVEMENT INITIATIVE

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Abstract: Laparoscopic pyloromyotomy is a procedure with a low rate of surgical site infection (SSI). In previous analysis using a national database, we showed no difference in wound complication rates irrespective of whether or not patients received antibiotic prophylaxis. A retrospective study from our institution between 2017 and 2020 similarly showed that prophylactic antibiotics had no impact on the rate of SSI for pyloromyotomy; average prophylactic antibiotic utilization was 39%, varying from 0-100% between individual surgeons, with an average SSI rate of 1.3%. Based on this, we developed a QI initiative to decrease prophylactic antibiotic usage from 39% to 0% from February 2023 to February 2024 and to maintain this rate.

Background data and the key driver diagram (Figure 1A) were provided to all attendings, fellows, residents, and nurse practitioners on the pediatric surgery team. Monthly reports were generated monitoring antibiotic usage. Anesthesia providers were alerted not to give pre-operative antibiotics unless instructed to do so during the time out process. Non-compliance was tracked through chart review, and discussion with involved personnel performed as needed. Patients who received antibiotics for an indicated medical reason were excluded. Protocol compliance was monitored monthly using a control chart.

Between February 2023 and February 2025, a total of 112 laparoscopic pyloromyotomies were performed. Of those, 10 patients were excluded from analysis due to antibiotic administration for unrelated indications (infections, sepsis workups, presence of an implanted device). Of the remaining 102 patients who underwent laparoscopic pyloromyotomy, none received antibiotic prophylaxis (Figure 1B). 1 patient (0.02%) developed an SSI during the study period compared to 3 patients (1.3%) between 2017-2020, prior to this initiative.

Following implementation of this QI initiative, the rate of preoperative antibiotic usage decreased from 39% to 0%, and has been successfully maintained for 2 years with no increase in SSI rate. Prophylactic antibiotics are unnecessary for pyloromyotomy as it is a clean case with a low incidence of SSI. Appropriate use of prophylactic antibiotics can improve antibiotic stewardship efforts, decrease system-wide healthcare costs, reduce supply shortages, and reduce antimicrobial resistance in surgical patients.

Abbreviations: SSI - Surgical Site Infection
QI - Quality Improvement
IRB - Institutional Review Board

S110

TAKE OFF TO SAVINGS: ALL ABOARD THE CARDIAC G-TUBE BOARDING PASS!

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Abstract: Purpose: This study evaluates the efficacy of a standardized pre-operative boarding pass (BP) for cardiac surgery pediatric patients requiring gastrostomy tube (GT) placement on hospitalization outcomes and costs.

Methods: A before-after quality improvement study (IRB approved) among congenital heart disease (CHD) surgery patients undergoing GT placement (01/2020–08/2025) was conducted. A multidisciplinary team developed/implemented a pre-procedure boarding pass (05/2022) that standardized pre-operative workup (i.e. ± reflux/concomitant operations) and operating room (OR) readiness. Total hospitalization cost (hospital perspective) was obtained from hospital cost accounting system, inflated to 2025 US dollars. CHD was stratified based on disease severity (physiology/morphology). Differences in consultation-to-OR time, consultation-to-discharge time, hospital length of stay (LOS), and total hospital costs were assessed using Bayesian generalized linear models with log-link, gamma distribution, and neutral priors, adjusting for age, height-for-length z-score, and CHD severity.

Results: The cohort included 107 patients with 23 distinct cardiac defects included. CHD severity (severe: 46%, moderate: 42%, mild: 11%), did not differ significantly between pre- and post-BP groups (p = 0.66). Baseline demographics were similar between groups (Table 1). In Bayesian multivariate analysis, consultation-to-OR time decreased a mean 3.3 days (risk ratio [RR]=0.56; 95% credible interval [CrI]: 0.47–0.66; >99.9% probability of decrease). Consultation-to-discharge time decreased a mean 11.1 days (RR=0.71; 95% CrI: 0.66–0.76; >99.9% probability of decrease), and hospital LOS was reduced a mean 7 days (RR=0.82; 95% CrI: 0.65–1.03; 95% probability of decrease). Total hospital costs declined a mean $86,917 (RR=0.78, 95% CI 0.56–1.08; 94% probability of decrease).
Conclusion: Implementation of a simple standardized pre-operative boarding pass for pediatric cardiac surgery patients requiring GT placement streamlined pre-surgical processes, reduced care variability and decreased time-based metrics for healthcare utilization. This multidisciplinary quality improvement effort highlights the value of structured, multidisciplinary coordination in improving efficiency and resource utilization without compromising patient outcomes. Sustaining and scaling this approach across other high-risk surgical populations may further enhance quality, safety, and value in pediatric perioperative care.

Abbreviations: BP – Boarding Pass
GT – Gastrostomy tube
CHD – Congenital heart defect
LOS – Length of Stay
OR – Operating room

TABLE 1. Estimated Time from Consultation to OR and Discharge, Length of Hospital Stay, and Hospital Costs for Congenital Cardiac Patients Requiring Gastrostomy Tube Before and After Implementation of the Boarding Pass

Variable	Pre-BP (n = 61) Mean ± SD	Post-BP (n = 46) Mean ± SD	P-value / Adjusted RR (95% CrI)	Bayesian Probability of Decrease
Age (days)	131 ± 238	102 ± 215	0.514	—
Sex	32 M / 29 F	24 M / 22 F	0.977	—
Height-for-Length Z-score	−0.582 ± 5.57	0.365 ± 2.79	0.294	—
Consultation-to-OR (days)	7.5 ± 10.4	4.2 ± 3.29	0.56 (0.47–0.66)	> 99.9%
Consultation-to-Discharge (days)	37.5 ± 42.9	27.4 ± 28.3	0.71 (0.66–0.76)	> 99.9%
Hospital Length of Stay (days)	79.1 ± 63.7	65.1 ± 37.7	0.82 (0.65–1.03)	95%
Total Hospital Costs (USD)	$482,310 ±$431,561	$395,493 ±$396,493	0.80 (0.60–1.07)	94%

* Reported in 2025 US dollars, adjusted using the Consumer Price Index for medical care.
**Estimates of differences in LOS, costs (hospital perspective), consultation-to-OR time and consultation-to-discharge time were obtained by using Bayesian generalized linear models with gamma distribution, log link, neutral priors (assuming no benefit: RR=1.0; 95% CrI, 0.3-3.3). The models included the dependent variable, group (Pre-BP vs. Post-BP), CHD severity, Height-to-length Z-Score, and Age (in days).

S111

EVALUATING SUTURE CHOICE AS A MODIFIABLE FACTOR IN PEDIATRIC GASTROSTOMY SURGICAL SITE INFECTIONS

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Abstract: Purpose: Laparoscopic gastrostomy tube (GT) placement carries the risk of early tube dislodgement and is often secured with absorbable subcutaneously tunneled transabdominal tacking sutures. However, these buried sutures may increase the risk of surgical site infection (SSI). This study aimed to investigate the SSI rates associated with various types of transabdominal tacking sutures used in laparoscopic GT placement.

Methods: A two-institution, retrospective review was performed of all patients ≤18 years old undergoing laparoscopic GT placement between 2023 and 2025. Patients were stratified into three groups by suture type used, and the primary outcome was SSI within 60 days of surgery.

Results: A total of 116 (57% female) laparoscopic GT placements were performed at a median age of 5 months (IQR, 3-12 months) and a median gestational age of 50 weeks (IQR, 42-60 weeks). Prophylactic antibiotic was used in all the patients. Fifteen patients (23.1%) in the Vicryl suture group and 17 patients (26.6%) in the chromic suture group developed an SSI, all of which were treated with antibiotics alone. No SSIs were observed with the use of Monocryl antibacterial suture (N = 26) group.

Conclusion: Absorbable braided and long-lasting monofilament transabdominal tacking sutures may increase the risk of SSI following laparoscopic gastrostomy tube placement. In this cohort, the use of Monocryl antibacterial suture was associated with no SSIs. The choice of suture material is an important factor in minimizing postoperative SSI in this common pediatric procedure.

Abbreviations: GT: gastrostomy tube; SSI: surgical site infection; N: number

S112

SYNERGISTIC IMPACTS OF STEPWISE QUALITY IMPROVEMENT IN POSTOPERATIVE CARE FOR PEDIATRIC COMPLICATED APPENDICITIS

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Abstract: Purpose: This study aims to evaluate the impact of stepwise quality improvement (QI) efforts in postoperative care for pediatric complicated appendicitis.

Methods: A retrospective study was conducted of pediatric patients who underwent appendectomy for complicated appendicitis (perforation/abscess) (7/2019-6/2025). Demographics, hospital courses, and 30-day outcomes were collected. An initial QI effort in 7/2022 focused on postoperative imaging: prioritizing an ultrasound-first approach, and imaging no earlier than postoperative day 7. A second QI effort in 9/2023 focused on discharge criteria: excluding white blood cell count normalization and reducing postoperative antibiotic duration to four days. Patients were treated before initial QI effort (pre-QI), between QI efforts (inter-QI), or after the second QI effort (post-QI). To account for sustainability, the first year of pre-QI patients (baseline) was compared to the last year of post-QI patients (endpoint).

Results: Overall, 864 patients were treated: 390 (45%) pre-QI, 212 (25%) inter-QI, 262 (30%) post-QI. Patients were median age 10 years (IQR:7.0-13.3) and 65% male. Outcomes by pre-QI, inter-QI, and post-QI are depicted in FIGURE. Baseline (131) and endpoint (128) patients were similar in age (10 years, IQR:7-13; p=0.32) and sex (63% male; p=0.10). Postoperative imaging was performed more commonly in baseline than endpoint patients (21% vs 10%; p=0.02). Baseline patients were also more likely to have an organ space surgical site infection (OS-SSI) identified prior to discharge (18% vs 8%; p=0.01) and to undergo a subsequent percutaneous drainage procedure (14% vs 6%; p< 0.05). Postoperative length-of-stay decreased significantly in endpoint patients (4 days [IQR:3-5.5] vs 3 days [IQR:2-5]; p< 0.01). Baseline and endpoint patients had similar rates of at least one 30-day emergency department visit (8% vs 2%; p=0.08) and at least one 30-day hospital readmission (12% vs 19%; p=0.10). Overall, 30-day OS-SSI rates were similar (27% vs 23%; p=0.45).

Conclusion: Stepwise QI in postoperative care for complicated appendicitis resulted in reduced postoperative imaging, percutaneous drainage procedures, and lengths-of-stay, without increasing emergency department visits or 30-day OS-SSIs. A clinically relevant increase in hospital readmissions may be attributable to late-presentation OS-SSIs after earlier discharge. Synergistic QI efforts variably impact outcomes and require regular reevaluation to assess for continued benefit.

Abbreviations: QI – Quality improvement
OS-SSI – Organ space surgical site infection

S113

MINIMIZING CT UTILIZATION IN POST APPENDECTOMY PATIENTS WITH SUSPECTED ABSCESS: A QUALITY IMPROVEMENT PROJECT

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Abstract: Introduction: Incidence of an intra-abdominal abscess following appendectomy has been reported in 10-16% of cases of complicated appendicitis. These abscesses are typically diagnosed using computed tomography (CT), but magnetic resonance imaging (MRI) is an alternative which avoids radiation exposure. We altered our complicated appendicitis pathway to incorporate MRI as the first-line imaging modality for patients with suspected post-operative abscess. We aimed to reduce postoperative CT use in all post-appendectomy patients from 4.6% to 3.3% within 12 months.

Methods: We convened stakeholders including surgery, diagnostic radiology, and interventional radiology (IR) to ensure universal buy-in regarding the decision to replace CT with MRI as the first-line modality to detect postoperative abscesses. We updated our complicated postoperative appendicitis pathway, replacing CT with MRI for any inpatient with suspected abscess on postoperative day seven or later. A new MRI protocol was created to ensure adequate visualization for IR drainage. Our primary outcome was the percent of appendectomy patients (overall and complicated appendicitis) undergoing post-operative CT. We tracked use of post-operative MRI as a process measure, and the need for CT following MRI as a balancing measure.

Results: Our baseline post-appendectomy CT rate was 4.6%. After the first Plan-Do-Study-Act cycle, we expanded inclusion criteria to post-operative patients returning to the Emergency Department (ED) with concern for abscess. CT utilization is currently 3 .9% due to ED workup prior to surgery consultation. We increased MRI use from 0% to 2.74% for any post-appendectomy patient. The charge for post appendectomy CT is $7316, while the cost for MRI is $4708. Consequently, the mean charges of an imaging study per patient at baseline were significantly higher at $7316 compared to implementation of MRI at $6212.61($p < 0.0001$). There were no additional CTs obtained following MRI use in any patient.

Conclusion: It is feasible to replace CT with MRI for most post-operative appendectomy patients with suspected abscess, leading to decreased radiation exposure and decreased cost. Efforts are underway to facilitate continued increase in use of MRI to detect abscesses by improving stakeholder education/buy-in.

Abbreviations: CT= computer tomography
MRI= Magnetic resonance imaging
ED= Emergency department

S114

PERIOPERATIVE NON-STEROIDAL ANTI-INFLAMMATORY DRUG USE IN PEDIATRIC SURGICAL ONCOLOGY

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Abstract: Purpose

Non-steroidal anti-inflammatory drugs (NSAIDs) are effective adjuncts for peri-operative pain control. These are often avoided after complex tumor resections, due to concerns for nephrotoxicity and bleeding risk. The aim of this study was to assess the safety and efficacy of NSAIDs following tumor resections in children.

Methods

This is a subset analysis of a multi-institution prospective study of patients >1 month old undergoing resection of abdominal tumors at three children's hospitals (2020–2022) on an Enhanced Recovery After Surgery (ERAS) pathway. NSAIDs were encouraged but not mandatory. A historic cohort (2014–2020) was identified from each institution that was matched for 16 variables. For this subset analysis, patients were divided into those that received NSAID within 24 hours of surgery, and those that did not. We excluded patients with pre-existing renal insufficiency. Baseline creatinine was the last value collected prior to surgery and compared to post-operative creatinine (collected based on institutional practices). Acute kidney injury (AKI) was defined as >1.5x increase from baseline. Pain scores, opioid usage, and blood transfusion requirements were also recorded.

Results

Among 190 patients in ERAS and historical cohorts, 61 patients received NSAIDs and 129 did not. Patients in both groups had a small increase in creatinine on post-operative day 1 (Table), but this increase was lower in patients receiving NSAIDs. No patients developed renal failure. Postoperative opioid usage was significantly lower among patients receiving NSAIDs (0.10 [0.03-0.37] vs 0.53 OME/kg/day [0.21-1.25]; < 0.001). Maximum pain scores on postoperative day 1 were also significantly lower among patients receiving NSAIDs (5 [0-6] vs 6 [4-7]; p=0.043). Nephrectomy (partial or radical) was performed in 94 patients with 20.2% receiving NSAIDs. Among patients who underwent radical nephrectomy, NSAID use was not predictive of postoperative AKI (OR 0.65 [95% CI 0.19-2.22]).

Conclusion

NSAIDs are an important adjunct for post-operative analgesia and can lower opioid usage while maintaining excellent pain scores. While there are several uncontrolled confounders in this study, NSAIDs did not appear to negatively impact kidney function in those with normal function

pre-operatively. This study challenges historic dogma and should alleviate some concern for side effects.

Abbreviations: CI: Confidence interval; ERAS: Enhanced Recovery After Surgery; NSAID: Non-steroidal anti-inflammatory drugs; OR: odds ratio

S115

OPIOID-FREE HERNIA REPAIR PROTOCOL REDUCES PEDIATRIC OPIOID EXPOSURE WITHOUT COMPROMISING PAIN CONTROL

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Abstract: Purpose: Protocolizing perioperative pain management may reduce opioid exposure in children. We designed a multimodal pain management protocol for pediatric ambulatory hernia surgery with the goal of reducing opioid use. This study evaluates the impact of this protocol on opioid use, pain control, and patient/proxy satisfaction.

Methods: Our protocol utilized child life services, regional anesthesia, and non-opioid analgesic adjuncts in the perioperative period. We reviewed all pediatric ambulatory hernia cases two years before and after protocol implementation. Protocol adherence was stratified by level of opioid use: high (no opioid use), medium (opioids used intraoperatively or postoperatively), and low adherence (opioids used intra-operatively and post-operatively). Patient or patient proxy surveys were used to measure satisfaction with the protocol and pain control.

Results: A total of 721 cases were reviewed with 356 pre-implementation and 365 post-implementation cases. The median age and weight were 4.9 years (IQR 1.8-7.5) and 18.7 kg (IQR 11.5-26.1). The pre-implementation group included more male patients (65.7% vs. 57.8%), but demographics and hernia types were otherwise similar. Following protocol implementation, there was a significant increase in the use of regional anesthesia (6.2% to 44.1%, p<.0001) and non-opioid analgesics intraoperatively (34.5% to 95.3%, p<.0001). This was accompanied by a significant decrease in intraoperative opioid use (86% to 8.2%, p<.0001) and postoperative opioid use (50.8% to 16.4%, p<.0001). Opioid prescriptions at discharge also decreased from 11.5% to 1.9% (p <.0001). Maximum reported pain scores were unchanged (p=.706), while minimum reported pain scores decreased (p <.0001). Rates of postoperative nausea/vomiting, postoperative complications, and unplanned emergency department visits or readmissions were similar. Overall, 82.1% of patients or their proxy reported extreme satisfaction with their pain control in the hospital and 76.1% of respondents reported extreme satisfaction with their pain control at home. High protocol adherence was achieved in 77.3% of post-implementation cases.

Conclusion: Our opioid-free pediatric hernia repair protocol significantly reduced perioperative opioid use, without compromising pain control, postoperative outcomes, or patient/proxy satisfaction. These findings support the wider integration of opioid-free multimodal pain regimens in pediatric surgical care.

Abbreviations:

Table I. Comparison of Pre- and Post-Implementation Cohorts

Pre- and Intra-operative Medications	Pre-implementation n=356	Post-implementation n=365	P value[a]	Use after protocol implementation
Acetaminophen (IV/PO), n (%)	2 (0.6)	275 (75.3)	**<.0001**	increased
NSAID (IV/PO), n (%)	121 (34.0)	257 (70.4)	**<.0001**	increased
Any non-opioid analgesic, n (%)	123 (34.5)	348 (95.3)	**<.0001**	increased
Dexmedetomidine, n (%)	0 (0)	228 (62.5)	**<.0001**	Increased
Opioid (IV), n (%)	306 (86.0)	30 (8.2)	**<.0001**	decreased
Post-operative Medications	Pre-implementation n=356	Post-implementation n=365	P value[a]	Use after protocol implementation
Acetaminophen (PO/IV), n (%)	107 (30.1)	61 (16.7)	**<.0001**	decreased
NSAID (IV/PO), n (%)	48 (13.5)	11 (3.0)	**<.0001**	decreased
Any non-opioid analgesic, n (%)	149 (41.8)	79 (21.7)	**<.0001**	decreased
Dexmedetomidine, n (%)	0 (0)	9 (2.5)	**.004**	increased
Opioid (PO), n (%)	81 (22.7)	10 (2.7)	**<.0001**	decreased
Opioid (IV), n (%)	151 (42.4)	54 (14.8)	**<.0001**	decreased
Any opioid, n (%)	181 (50.8)	60 (16.4)	**<.0001**	decreased

[a] X^2 or Fisher's exact test, depending on frequencies

S116

ELIMINATION OF THE CONVENTIONAL OPIOID SLIDING SCALE ACROSS A HEALTH SYSTEM IMPROVES OPIOID STEWARDSHIP METRICS FOR PEDIATRIC PATIENTS

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Abstract: Purpose: Hospitals conventionally utilize an opioid sliding scale which provides a low-dose opioid for a pain score of 4-6 and a high-dose opioid for a score of 7-10. We assessed the impact of eliminating this traditional opioid sliding scale for pediatric patients in our municipal, safety-net hospital system. We hypothesized that making this change in the electronic health record (EHR) would improve compliance with opioid stewardship best practices by decreasing opioids administered in-hospital and prescribed at discharge.

Methods: Our intervention was designed and implemented with a multidisciplinary group of health system stakeholders. The conventional opioid sliding scale options to give "as needed" for "moderate" (4-6) and "severe" (7-10) pain were eliminated from the EHR. A novel order set was developed encouraging use of around-the-clock non-opioids and providing low-dose oxycodone for a pain score of 5-10 and a clear breakthrough pain order. We utilized a mixed-methods approach to evaluate our intervention, including focus groups with key stakeholders and comparison of baseline and post-intervention data extracted from the EHR for inpatients < 21 years old and a subset undergoing surgery. Morphine milligram equivalents (MME) administered and prescribed at discharge were compared using the Wilcoxon rank-sum test.

Results: Over 2000 inpatients < 21 years old undergoing an operation were included in the analysis from each period (baseline and postintervention). There was a 55% reduction in the mean inpatient MMEs administered ($p < 0.0001$) for all patients and 22% decrease in mean inpatient MMEs administered for the surgical patients ($p < 0.0001$; 21% of overall cohort). Additionally, improvements were observed in analgesics prescribed at time of discharge with an increase in acetaminophen prescriptions and a reduction in non-favored opioids (e.g. combination acetaminophen-opioid medications). In post-implementation focus groups, stakeholders reported that the novel order set simplified pain management and reduced duplicate orders.

Conclusion: Eliminating the conventional opioid sliding scale for pediatric patients was associated with less opioids administered inpatient and improved outpatient opioid stewardship evidenced by decreased discharge hydrocodone-acetaminophen prescriptions with concomitant increase in acetaminophen prescriptions. Similar findings for pediatric surgical patients demonstrate that pediatric surgeons can lead the charge in improving opioid stewardship at a system level.

Abbreviations: EHR: electronic health record
MME: morphine milligram equivalent

Table. Comparison of pre- and post-intervention data for all patients and surgical subset <21 years old

	All patients <21 years old			Surgical cohort <21 years old		
	Baseline Period (1/1/2022-6/30/2022)	Postintervention (1/1/2024-6/30/2024)	p-value	Baseline Period (1/1/2022-6/30/2022)	Postintervention (1/1/2024-6/30/2024)	p-value
Number of Inpatients Admissions	2044	2322		421	497	
Mean Age (SD)	9.6 (7.7)	8.6 (7.6)	<0.0001	13 (6.1)	12 (6.1)	0.18
Mean Inpatient Morphine Milligram Equivalent Administered (SD)	36 (194)	16 (69)	<0.001	32 (219)	25 (169)	<0.0001
Prescribed Acetaminophen at Discharge (%)	24%	28%	<0.01	57%	65%	0.008
Prescribed Ibuprofen at Discharge (%)	17%	19%	0.14	40%	43%	0.46
Prescribed Oxycodone at Discharge (%)	7.4%	8.0%	0.49	29%	31%	0.16
Prescribed Hydrocodone-Acetaminophen at Discharge (%)	2.1%	0.2%	<0.0001	5.5%	1.0%	<0.001
Prescribed Naloxone (%)	1.7%	3.1%	<0.01	3.3%	8.9%	<0.001

S117

DECREASING POST-OPERATIVE OPIOID USE AFTER PECTUS EXCAVATUM REPAIR WITH INTRA-OPERATIVE METHADONE ADMINISTRATION

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Abstract: PURPOSE:
Intercostal nerve cryoablation (INC) has markedly improved pain control after minimally invasive pectus excavatum repair (Nuss procedure); however, there is a window of time before cryoablation provides full analgesic effect. The aim of this study was to evaluate the addition of intra-operative methadone (IM) with INC on opioid usage for patients undergoing Nuss repair.
METHODS:
Our Enhanced Recovery after Surgery (ERAS) Pathway for pectus repair includes INC and intra-operative intercostal nerve blocks with bupivacaine 0.5% at 0.5 mg/kg (up to 25 mL) and multi-modal analgesia. In 2024, administration of one dose of intraoperative methadone 0.15 mg/kg IV to assist with post-operative pain management was added as part of an existing quality improvement initiative. This study compared patients undergoing Nuss procedure with IM and INC (2024 to present) with a historical cohort of patients who underwent Nuss procedure with INC only (2018 to 2024). Post-operative opioid use was the primary outcome measure with secondary measures including length of stay (LOS), 30-day complications, reoperations, emergency department (ED) visits, and readmissions.
RESULTS:
The cohort included 42 patients: 13 received IM + INC, and 29 received INC only. Haller indices and number of bars placed were similar between groups. Post-operative opioid consumption was significantly lower in the IM + INC cohort 0.0 MME/kg (IQR 0,0) compared to INC (2.85 MME/kg [IQR 1.82-4.25]) ($p < 0.0001$). LOS was significantly decreased for the IM + INC group (1.06 days [IQR 0.92-1.21] vs 2.47 days [IQR 2.24-3.40]) ($p < 0.0001$). Median total visit charges for the IM + INC group were also lower compared to INC ($45,084 vs $59,071, $p=0.0045$). No readmissions, re-intervention, or bar revisions have occurred since methadone implementation. There was no difference in the number of ED visits between IM + INC (n=2) vs INC (n=1) ($p=0.220$).
CONCLUSION:
Implementation of one dose of IM in conjunction with INC for patients undergoing Nuss procedure was associated with decreased post-operative opioid use and hospital LOS with no change in ED visits, readmissions, or bar migrations. The addition of methadone to an ERAS pathway may minimize or negate the need for opioid use post-operatively and avoid opioid-induced side-effects.

Abbreviations: INC= Intercostal Nerve Cryoablation
IM= Intra-operative Methadone
ERAS= Enhanced Recovery After Surgery
LOS= Length of Stay

ED= Emergency Department
IV= Intravenous
MME= Morphine Milligram Equivalents
Kg= Kilograms
IQR= Interquartile Range

Quickshots I: Geneal Surgery and Oncology

11:15 AM – 12:00 PM

QS1

GALLBLADDER FIRST APPROACH FOR MANAGEMENT OF CHOLEDOCHOLITHIASIS: COMPARISON OF HOSPITAL-LEVEL STRATEGIES IN THE PEDIATRIC HEALTH INFORMATION SYSTEM

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Abstract: Purpose:
Single institution retrospective studies have demonstrated short lengths of stay for patients with choledocholithiasis following up front laparoscopic cholecystectomy with possible common bile duct (CBD) exploration as opposed to common bile duct interrogation and clearance prior to cholecystectomy with endoscopic retrograde cholangiopancreatography (ERCP). This has not yet been confirmed in large multi-institution cohorts. We hypothesized that institutions practicing a gallbladder first approach—regardless of whether CBD exploration is performed—would realize shorter lengths of stay and fewer encounter charges than institutions that clear the duct prior to surgery.

Methods:
The Pediatric Health Information System was queried for children presenting with choledocholithiasis between 2017-2024, treated with laparoscopic cholecystectomy and biliary tract intervention (intraoperative cholangiogram, CBD exploration, or ERCP). Patients were excluded if they were diagnosed with pancreatitis or cholangitis. Gallbladder first hospitals were those that used a laparoscopic cholecystectomy with intraoperative cholangiogram prior to or in lieu of ERCP to treat 1) more than 10 patients and 2) a majority of patients presenting to the institution with choledocholithiasis. The primary outcome was hospital length of stay; secondary outcome was hospital adjusted charges.

Results:
There were 1,959 patients treated for choledocholithiasis. There were 787 (40.2%) patients treated by gallbladder first approach. Eleven institutions were gallbladder first hospitals, with 476 (24.3%) patients treated at one of these hospitals and 329 (69.1%) patients treated at these hospitals with a gallbladder first approach. Children treated at gallbladder first hospitals were younger and more likely to be white. Gallbladder first hospitals had lower median lengths of stay (3 vs 4 days, $p< 0.01$) and admission associated charges ($74,668.5 vs $81,138.0, $p< 0.01$; Figure 1). Multivariable logistic regression controlling for sex, age, race and payor status demonstrated that children admitted to gallbladder first hospitals were significantly more likely to stay two days or fewer (OR 1.45, 95% CI 1.14-1.84, $p< 0.01$)

Conclusions:
A gallbladder first approach to choledocholithiasis should lead to fewer procedures by avoiding ERCP if the duct is cleared during the laparoscopic cholecystectomy. These data confirm at a national level that institutions managing choledocholithiasis with a gallbladder first approach have shorter lengths of stay and fewer encounter charges.

Abbreviations: CBD: Common bile duct
ERCP: Endoscopic retrograde cholangiopancreatography

QS2

OPTIMIZING CLOSTRIDIOIDES DIFFICILE TESTING TO ACCURATELY TREAT PEDIATRIC SURGICAL PATIENTS

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Abstract: Purpose

Clostridiodes difficile infection (CDI) can occur in pediatric surgical patients exposed to antibiotics. Our hospital was an outlier on the 01/2022 NSQIP-P Semiannual Report. We instituted a QI initiative to investigate whether patients were tested appropriately to distinguish active infection from colonization, and to improve our hospital's testing methods. Our aim was to decrease the percentage of patients treated for postoperative CDI from a baseline of 0.64% to 0.32% (Figure 1A).

Methods

Baseline data from all surgical patients eligible for NSQIP-P sampling from 01/2022-07/2025 were analyzed to identify patients treated for CDI within 30 days of surgery. Prior to project initiation, screening polymerase chain reaction (PCR) tests were used, but often without confirmatory cytotoxin culture assays (CCA) to differentiate active infection from colonization. In 01/2022, an initiative to increase confirmatory testing for patients screening positive for CDI was begun. Initially, confirmatory CCA testing was sent to an off-site laboratory, with results received in 3-7 days. In-house enzyme-linked immunoassay (EIA) confirmatory toxin testing was developed in 08/2024, and once accuracy was verified, it was automatically deployed using the same stool sample of any patient that screened positive. This decreased the time of confirmatory testing to 2-4 hours, allowing for delayed initiation of antibiotic therapy until confirmatory test results were obtained.

Results

Over the study period, 16,926 NSQIP-P eligible patients were identified and 56 patients were treated for postoperative CDI. Eight patients (14.3%) were treated for CDI despite negative confirmatory testing. With education, CDI treatment was appropriately targeted to patients with active infection and decreased from 0.58% to 0.26% over the first 18 months of the project (Figure 1B). With the implementation of in-house automatic EIA testing in 06/2024, the rate of confirmatory testing increased to 100%, and appropriate CDI treatment decreased further to 0.07% over the subsequent 12 months (Figure 1B).

Conclusion

Confirmatory cytotoxin testing in an in-house automatic fashion allows accurate treatment of patients with active Clostridioides difficile infection instead of colonization. A quality improvement initiative focused on antibiotic stewardship can successfully decrease system-wide healthcare costs and reduce resource utilization, while improving patient care.

Abbreviations: CDI, Clostridioides difficile infection; NSQIP-P, National Surgical Quality Improvement Program-Pediatric; PCR, polymerase chain reaction; CCA, cytotoxin culture

assay; EIA, enzyme-linked immunoassay; QI, quality improvement

QS3

IMPLEMENTATION OF DIGITAL CHEST DRAINAGE DEVICES IN A PEDIATRIC POPULATION: A SINGLE-CENTER EXPERIENCE

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Abstract: Background:
Digital chest drainage devices (DCDs) objectively quantify rates of air and fluid evacuation through chest tubes. In adults, their use has been associated with earlier tube removal, fewer radiographs, reduced opioid requirements, lower reinsertion rates, and shorter hospital stays. However, few studies from U.S. institutions have evaluated their impact in pediatric populations. This study compares outcomes of digital versus traditional pleural drainage systems at a Level I Pediatric Trauma Center.

Methods:
A retrospective cohort study was conducted of all pediatric patients who underwent chest tube placement between November 2021 and November 2023, either following elective surgery or for elective or urgent bedside indications. DCDs were introduced at our institution in November 2022. Patients managed with traditional systems (November 2021–2022) were compared with those using DCDs (November 2022–2023). Data collected included demographics, number of radiographs, inpatient opioid use (morphine milligram equivalents), length of stay, and complications.

Results:
Sixty-four patients were included (mean age 9.1 years; 61% male). Overall, 47% identified as Black or African American and 30% as Hispanic or Latino; 58% had public insurance, and the mean Area Deprivation Index percentile was 36.3. The most common indications for chest tube placement were pleural effusion (38%) and pneumothorax (28%), with 19% following elective procedures. Thirteen patients (20%) used DCDs. Demographics and socioeconomic indicators did not differ significantly between groups. DCDs were used more often in elective cases, while traditional systems were more common for effusions and pneumothoraces ($p = 0.004$). Compared with traditional systems, DCDs were associated with shorter chest tube duration (3.3 vs. 5.4 days, $p = 0.02$), reduced length of stay (4.0 vs. 12.7 days, $p = 0.009$), and fewer radiographs (6.1 vs. 11.7, $p = 0.01$). Opioid use, tube replacement, and complication rates were similar between groups.

Conclusions:
DCDs were associated with shorter chest tube duration, fewer radiographs, and reduced hospitalization without increased complications or opioid use. The enhanced monitoring and feedback provided by DCDs may enable earlier, safer tube removal, and greater efficiency in management of pediatric pleural drainage. Larger prospective studies are warranted to confirm these findings and guide clinical practice.

Abbreviations: DCD - Digital Chest Drainage Device
U.S. - United States

QS4

DISCORDANCE IN DIAGNOSTIC IMAGING INTERPRETATION BETWEEN PEDIATRIC AND COMMUNITY RADIOLOGIST READS IN SUSPECTED APPENDICITIS

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Abstract: PURPOSE:
For pediatric patients with suspected appendicitis, imaging interpretations from transferring institutions may differ from those of pediatric radiologists. At our freestanding children's hospital, it is standard practice to repeat ultrasounds (US) and re-interpret CT scans by pediatric radiologists. This study aimed to determine the discordance rate between outside hospital (OSH) interpretation and overread CT or repeated US for suspected appendicitis and to assess whether secondary review remains necessary.
METHODS:
We retrospectively compared OSH and pediatric radiologist interpretations of CT scans from patients with suspected appendicitis evaluated through our center's telehealth service between 2022 and 2025. Inclusion criteria were: (1) outside interpretation available and (2) pediatric overread completed. We also compared OSH US interpretations to repeat US performed at our institution. Discordance was defined as either downgrading from appendicitis or upgrading to appendicitis from an equivocal or normal read/interpretation.
RESULTS:
A total of 268 patients met the inclusion criteria for the CT cohort. Discordance between OSH and pediatric interpretations occurred in 35 cases (13%). Demographics were similar between discordant and concordant groups. Patients with discordant CT reads had lower rates of appendectomy (23% vs 91%; $p< 0.001$) and no perforations (0% vs 34%; $p< 0.001$). Discordant cases had significantly lower white blood cell count, absolute neutrophil count, and immature white blood cell percentage. The negative appendectomy rate was higher in discordant reads (25% vs 3.7%; $p< 0.001$).
For the US cohort, 110 patients met the inclusion criteria; 42 (38%) had discordant reads between OSH and repeat US. Patients with discordant US reads were less likely to undergo surgery (9.5% vs 85%; $p< 0.001$) and had lower perforation rates (2% vs 24%; $p< 0.001$). Laboratory values again differed significantly between concordant and discordant groups.
CONCLUSION:
Clinically significant discordance exists between outside and pediatric interpretations of both CT and US imaging for suspected pediatric appendicitis. Patients with discordant studies were less likely to have surgery, have complicated appendicitis, or have laboratory findings consistent with appendicitis. These results support the continued value of secondary review by pediatric radiologists at freestanding children's hospitals to ensure accurate diagnosis and avoid unnecessary surgery.

Abbreviations: CT: Computerized tomography
US: Ultrasound
OSH: Outside hospital

QS5

THE HIDDEN MORBIDITY OF GASTROSTOMY TUBE PLACEMENT IN CHILDREN: EVALUATING EARLY DISLODGMENTS AND HOSPITAL REVISITS IN A NATIONAL COHORT STUDY

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Abstract: Intro
Dislodgement after gastrostomy tube (GT) insertion is a common postoperative complication that often necessitates return to the healthcare system for replacement, and in some cases, incurs additional morbidity such as reoperation or interventional radiology procedure. This study evaluates dislodgement rates and variation between sites across a national cohort.

Methods
This was a retrospective cohort study of children (0-17 years) who underwent GT placement in the National Surgical Quality Improvement Program – Pediatric database from January 2023-April 2024. Dislodgement rates, readmissions, and emergency department (ED) visits across hospitals were analyzed using descriptive statistics, including medians and interquartile ranges (IQR).

Results
Of the 5179 children who underwent GT placement, 5.0% (259/5179) experienced a dislodgement within 30 days across 73 NSQIP-Ped sites, with a median rate of 4.2% (IQR: 3.1, 8.5%; Figure). Additionally, 11.9% (617/5179) visited the ED within 30 days, with 31% of these visits (194/617) due to dislodgement. Similarly, 2.47% (128/5179) were readmitted within 30 days, with 23% (29/128) of these readmissions for dislodgement. Of 0-30 day dislodgements, 94.2% (244/259) experienced one dislodgement, 3.5% (9/259) with two, 1.2% (3/259) with three, and 1.2% (3/259) with four leading to 283 total 0-30 day dislodgement events. Of these, 32.2% (91/283) occurred in hospital and 67.8% (192/283) occurred outside the hospital. Extended follow-up to 60 days in 3895 patients revealed an additional 6.1% (237/3895) dislodgement rate across 71 sites, median rate 5.7% (IQR: 2.2, 10.5%).

Conclusion
Early dislodgement events, a previously untracked outcome, are common after GT insertion in children, with many events occurring before scheduled GT exchange. GT dislodgement may be an important quality improvement target to reduce healthcare resource utilization after GT insertion, and the substantial variability in dislodgement rates across hospitals suggests there is opportunity to identify best practices from high performers and disseminate these learnings to prevent dislodgements.

Abbreviations: gastrostomy tube (GT)
emergency department (ED)
interquartile ranges (IQR)

QS6

DEVELOPMENT AND IMPLEMENTATION OF A HIGH FIDELITY PEDIATRIC LAPAROSCOPIC INGUINAL HERNIA REPAIR SIMULATOR

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Abstract: Background:
Laparoscopic pediatric inguinal hernia repairs (IHR) have become increasingly popular in recent years. Although a conceptually simple procedure, the technique's unique hand-eye coordination is not a transferable skill from other general surgery procedures. Our aim was to create an anatomically accurate, high fidelity simulation model of pediatric laparoscopic inguinal hernia repair.

Methods:
The learning objectives of a laparoscopic pediatric IHR were identified then translated into specific tasks and skills. Iterative design and construction resulted in a 3D printed frame and multi-stage silicone molded cartridges of the pediatric inguinal anatomy. The silicone anatomical cartridges were designed to reproduce the inguinal anatomy of a 5 year old male, while accurately mimicking tissue haptics, quality and behavior. Using the simulator, an observational "just in time" study is being performed on trainees within 1 hour of a real-life IHR, randomized into a simulation arm or video arm. Both arms completed questionnaires prior to and after a real-life IHR to assess their knowledge, skills and attitude towards IHRs. Additionally, the attending completed a questionnaire following the IHR assessing the trainee's skills and knowledge.

Results:
A team of surgeons and engineers developed a simulator to allow performance of the key steps of laparoscopic IHR including anatomically accurate haptic feedback, hydrodissection of the peritoneum, simulated peritoneal cauterization, and percutaneous internal ring suturing (Figure 1). Each consumable cartridge costs $12 and the permanent 3D printed frame was $242. Preliminary results of the "just in time" use of the simulator by trainees shows a non-significant trend toward increased knowledge of the steps of the procedure and confidence in their surgical skills. Trainee-reported knowledge strongly correlates with the attending's assessment of the trainee's knowledge of the case ($r=0.95$; $P< 0.05$). Overall, simulation realism including anatomy, feel, and environment on average marked a 3.38 on a 5-point Likert scale (with 5 being "very realistic").

Conclusion:
A high fidelity pediatric laparoscopic IHR simulator allows realistic simulation of the key operative steps, and demonstrates promising improvement of trainee confidence and skill in pediatric laparoscopic IHR.

Abbreviations: IHR - inguinal hernia repair

QS7

THE IMPACT OF PHYSICIAN 'NUDGING' ON TREATMENT DECISION MAKING FOR UNCOMPLICATED APPENDICITIS

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Abstract: Purpose: Clinical 'nudging' describes any aspect of how a physician attempts to alter a patient's treatment decision making without outright forbidding a choice. The extent to which nudging can impact patient decision-making is not well understood. This study investigates the influence of 'nudging' in a scenario of uncomplicated appendicitis to quantify the power of a physician's words on a patient's treatment decision between antibiotics and surgery.

Methods: A cross-sectional survey that asked participants to imagine having an 8-year-old child with uncomplicated appendicitis was designed and distributed to participants who had a child under the age of 18 via an online market research panel (Prime Panels, Cloud Research) in September of 2025. Participants were randomized equally to a conversation where a surgeon 'nudged' them towards an appendectomy or antibiotics alone for their child. Their treatment preference and decisional conflict were then measured before and after being presented with the alternative script. Descriptive statistics were calculated as frequencies; treatment choice by script was analyzed using the chi-squared test at a significance level of $\alpha=0.05$.

Results: 321 people (69.6% female) met inclusion criteria and passed our survey quality check. Participants were significantly more likely to choose the option 'nudged' by the surgeon both before (63.6%, $p< 0.001$) and after seeing the alternative script (62.1%, $p< 0.001$), with 28% of patients ultimately switching their initial decision to align with the surgeon. While most patients demonstrated no decisional conflict (75.2%), patients who were initially unsure were three times more likely to feel confident in their decision after seeing the alternative script, even if they did not align with the physician's nudge (5.2% vs. 1.6%).

Conclusions: In an online survey-based study, physician nudging influenced more than one quarter of patient decisions. Patients also felt less decisional conflict after they had seen all the information presented to them. Ethical nudging should acknowledge the significant impact of language on treatment choice and champion unbiased shared decision making when able.

Abbreviations:

QS8

EVALUATION OF SUCCESS IN CATHETER SALVAGE AND VENOUS SITE PRESERVATION IN CATHETER-RELATED BLOODSTREAM INFECTIONS IN PEDIATRIC PATIENTS WITH INTESTINAL FAILURE

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Abstract: Purpose
To evaluate the success rate of clinical treatment and venous site preservation in catheter-related bloodstream infections among pediatric patients with chronic intestinal failure receiving home parenteral nutrition (HPN) managed by a specialized multidisciplinary team. The secondary objective was to compare the characteristics of patients with different outcomes, namely catheter maintenance versus removal.
Methods
This retrospective cohort included pediatric patients with chronic intestinal failure receiving HPN treated at the Intestinal Rehabilitation and Transplantation Center. Data were collected from medical records between October 2018 and October 2022. Patients up to 12 years of age using long-term tunneled central venous catheters were included. Exclusion criteria were loss to follow-up, loss of eligibility for HPN, or intestinal transplantation. Comparisons were performed using Fisher's exact test for qualitative variables and ANOVA or Mann-Whitney tests for quantitative variables. Incidence rates were calculated per 1,000 catheter-days. Generalized Estimating Equation models identified factors associated with catheter replacement. Results were expressed as Odds Ratios (OR) with 95% confidence intervals (CI). Analyses were conducted using JAMOVI (v2.2.5) and RStudio (v1.4.1717).
Results
Thirty-three patients receiving HPN were analyzed. The cohort was predominantly male, and short bowel syndrome was the main etiology. The mean residual small bowel length was 32.3 cm. During the study, 67 tunneled catheters were used, and 29 bloodstream infections occurred in 16 patients. Polymicrobial infections were most frequent, followed by gram-positive and gram-negative bacteria. Gram-negative infections showed the highest catheter salvage rate (75%), while all Staphylococcus aureus infections required removal. The clinical success rate was 51.7%, increasing to 57.7% after excluding fungal infections and 68.2% when both fungal and S. aureus infections were excluded. The total venous site preservation rate was 79.3%. No relapse occurred within 30 days, and one recurrence within 100 days. Higher bilirubin (p=0.050) and polymicrobial infections correlated with removal, while venous thrombosis (p=0.078) correlated with preservation.
Conclusion
Catheter salvage and venous site preservation are feasible in pediatric patients with chronic intestinal failure on home parenteral nutrition, with low relapse and recurrence rates. Maintaining central venous access is critical in this population, underscoring the clinical relevance of these findings.

Abbreviations: home parenteral nutrition (HPN)
Odds Ratios (OR)

Confidence intervals (CI)

QS9

DIAGNOSTIC DELAYS AND NONSTANDARD TREATMENT CHARACTERIZE ADULT WILMS TUMOR IN THE SEER DATABASE

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Abstract: Background: Wilms tumor (WT) is the most common pediatric kidney cancer but comprises only 0.5% of adult renal malignancies. Adults with WT experience poorer outcomes relative to children, possibly due to different tumor biology, delays in diagnosis and therapy initiation, or less treatment tolerance. The purpose of this study was to compare patient and disease characteristics among patients with WT to optimize adult care.

Methods: The NCI Surveillance, Epidemiology, and End Results (SEER)-17 database was queried for all WT cases (8960/3) registered between 2000-2022. Patients were grouped into adult (>18 years) or pediatric (□18) ages. Categorical and continuous variables were analyzed using Pearson Chi-square and Wilcoxon tests, respectively. Survival was estimated using Kaplan-Meier curves and Cox regression.

Results: SEER-17 included 2,949 patients with WT: 108 (3.7%) adults and 2,841 children. Median age at diagnosis was 34.5 [IQR:24.75-50.75] years for adults and 3.0 [IQR:1-5] for children. Female sex predominated: 66% adults, 54% children (p=0.015). Race did not differ significantly between age groups, although Hispanic-Latino ethnicity was more common among children (27%) than adults (14%, p=0.002). Histology confirmed definitive diagnosis more consistently among children than adults: 99% to 86% (p < 0.001). Interval from diagnosis to treatment was shorter for children (4.2□14.5) than adults (22.9□36.5; p< 0.001) All primary WT occurred in the kidney among children relative to 93% of adults (p < 0.001). Bilateral WT occurred in 8% of children compared to 3% of adults (p < 0.001). Adults received fewer radical and more partial nephrectomies (p < 0.001). Lymph node sampling was more common for children than adults, of whom 53% had no nodes sampled (p < 0.001). Chemotherapy was administered to 91% of children but only 52% of adults (p < 0.001). Similarly, radiation was administered to 46% of children but only 19% of adults (p < 0.001). WT-specific death occurred in 27% of adults but only 7% of children (p < 0.001). Kaplan-Meier and Cox analysis showed inferior survival for adults (Figure; p< 0.001).

Conclusion: SEER-17 underscores the poorer cancer-specific survival of adults with WT compared to children. Diagnostic delays and variability in multimodal treatment may indicate lack of disease familiarity, in which case earlier consultation with experts in pediatric WT may improve outcomes for adults.

Abbreviations: National Cancer Institute (NCI)
Surveillance, Epidemiology, and End Results (SEER)

QS10

SURGICAL OUTCOMES AFTER THORACIC PROCEDURES IN PEDIATRIC ONCOLOGY PATIENTS

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Abstract: Purpose

Thoracic operations are commonly required in pediatric oncology patients. The purpose of this study is to determine the effect of surgical approach, perioperative chemotherapy management, and type of chemotherapy regimens on postoperative complications.

Methods

We conducted a retrospective review of patients who underwent thoracic surgery at our tertiary pediatric oncology institution (2009 – 2022). We collected information on patient demographics, oncologic diagnosis, perioperative course, and 30-day postoperative complications. Frequencies and means of demographic and operative characteristics were calculated. Patients who experienced a 30-day postoperative complication were compared to those who did not using Kruskal-Wallis and Fisher tests. Cumulative incidence curves for complications within 30 days accounting for competing risks were produced. Statistical analyses were completed using R version 4.3.0.

Results

358 patients underwent 526 operations. The most common indication was osteosarcoma (160 operations, 30.4%). Thoracoscopy was used for 238 operations (45.2%). The 30-day postoperative complication rate was 8.2%. Postoperative complications were not associated with thoracotomy versus thoracoscopy, however there was a statistically significant difference in 30-day complication rate based on number of thoracic operations ($p = 0.0290$). Patients who experienced postoperative complications had a higher intraoperative blood loss (mean 223.0 vs 99.8 mL, $p = 0.0085$) and longer surgery duration (mean 201 vs 147 minutes, $p = 0.0090$). Patients with hematologic malignancies experienced a higher cumulative incidence of postoperative complications compared to those with other indications ($p = 0.0073$, see figure). Type of preoperative chemotherapy risk factor (eg, angiogenesis inhibition, kinase inhibition) was also associated with postoperative complications ($p = 0.0195$). In patients who had received chemotherapy within 30 days, there was no statistically significant difference in postoperative complication rate with respect to duration of preoperative chemotherapy hold (shorter vs longer than 30 days, $p = 0.5980$) or surgical approach ($p = 0.1710$). There were seven postoperative deaths within 30 days, none of which were directly attributable to their operation.

Conclusion

Despite a wide variety of indications and underlying diagnoses, the 30-day postoperative complication rate in pediatric oncology patients undergoing thoracic surgery in this study was low and not associated with surgical approach. Perioperative chemotherapy management

requires further investigation.

Abbreviations:

Quickshots II: Neonatal and Basic Science

11:15 AM – 12:00 PM

QS11

VARIATION IN RECTAL BIOPSY UTILIZATION FOR MECONIUM PLUG SYNDROME: IMPACT OF HOSPITAL VOLUME ON HIRSCHSPRUNG DISEASE DIAGNOSIS

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Abstract: Purpose:
Meconium plug syndrome (MPS) occurs in approximately 1 in 500 live births and is strongly associated with Hirschsprung Disease (HD), with 10-38% of affected neonates historically diagnosed with HD. This relationship has led many to advocate for early rectal biopsy in MPS to expedite HD recognition and treatment. We aimed to evaluate nationwide trends in rectal biopsy utilization for MPS and examine whether hospital volume influences HD diagnoses and missed cases.
Methods:
Using the Nationwide Readmissions Database (2016–2022), neonates with MPS were identified. Birth hospitals were stratified into high-volume (≥90th percentile, >20 MPS cases/year), moderate-volume (6–20/year), and low-volume (≤5/year). Demographics, biopsy use, HD diagnoses, complications, and readmissions were compared across volume groups. Missed HD was defined as a diagnosis after readmission.
Results:
Among 14,006 neonates with MPS, 50% were male and 32% were premature. Rectal biopsies were performed in 5% of MPS cases nationally. HD was diagnosed in 2.5% of neonates with MPS. Across hospitals, 11% were high-volume, 42% moderate-volume, and 47% low-volume. Neonates with MPS born at high-volume hospitals were more likely to undergo a rectal biopsy but had fewer HD-related readmissions and missed fewer HD cases compared to neonates at lower-volume hospitals (Table 1). Among neonates who underwent rectal biopsy, the HD diagnosis rate was 24%. In neonates with MPS born at lower-volume hospitals, the rate of missed HD was higher (7% in low-volume hospitals, 4% in moderate-volume hospitals, and 0% in high-volume hospitals), $p < 0.001$.
Conclusion:
In this nationwide analysis, the incidence of HD in neonates with MPS was lower than previously reported. Neonates with MPS born at high-volume hospitals were more likely to undergo rectal biopsy and had fewer missed HD cases and readmissions. These findings underscore the importance of standardizing biopsy practices for neonates with MPS to reduce care variability and minimize missed diagnoses.

Abbreviations: MPS, HD

QS12

PRENATAL MRI VOLUMETRICS AND OUTCOMES AFTER EARLY SURGERY OR PAINT-AND-WAIT FOR GIANT OMPHALOCELE

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Abstract: Purpose
Giant Omphalocele (GO) poses significant challenges in neonatal management. Standard treatment is escharization with delayed fascial closure at 1-2 years-of-age. Alternatively, early surgery (ES) entails sac removal with either primary fascial closure or staged patch/silo approach. Escharization requires long-term wound care but avoids early abdominal compartment syndrome (ACS) risk. ES restores abdominal wall mechanics but adds neonatal surgical risk. We compared outcomes between these strategies hypothesizing ES enables earlier closure without increasing complications in the newborn period.
Methods
We performed a retrospective study (2008-2024) of newborns with GO (sac diameter >5cm with liver). Neonates who died from severe congenital anomalies or extreme prematurity before management were excluded. Patients were grouped by initial strategy and analyzed by intention-to-treat. Baseline clinical and perioperative outcomes were compared. Institutional Review Board approval was obtained.
Results
After excluding 11 perinatal deaths, 44 patients were analyzed: 26 ES and 18 escharization. Groups were similar for infants born < 34 weeks, weight, sex, sac diameter, cardiac and non-cardiac anomalies, and pulmonary hypertension. No patients in either group required ECMO. Two patients in each group died during their index hospital stay (ES 7.7% versus escharization 11.1%; p-value=1.00). ES achieved earlier fascial closure (27 versus 464 days; p-value < 0.01) with 37.5% successfully closed at the first operation. Two ES patients (7.7%) required patch loosening for ACS during staged closure. Sepsis rates between groups did not differ. Tracheostomy was more common with escharization (33.3% versus 3.9%; p-value=0.01). Nutritional milestones favored escharization with fewer days to first feed (3 versus 8; p-value < 0.01), full feeds (16 versus 48; p-value=0.02), and TPN utilization (66.7% versus 96.2%; p-value=0.01). However, 3-month and 6-month weight Z-scores showed no difference.
Conclusions
ES provided fascial closure earlier than escharization without increases in hospital stay, mortality, sepsis, and 3- and 6-month growth metrics. Notably, 37.5% of GO patients were successfully closed with a single operation without development of ACS. Additionally, there was a higher tracheostomy rate with escharization suggesting that restoration of abdominal wall mechanics with early surgery may benefit long-term respiratory outcomes. A multi-center study examining optimal GO patient selection for early surgery will be beneficial.

Abbreviations: GO = Giant Omphalocele
ES = Early Surgery
ACS = Abdominal Compartment Syndrome

Table 1. Baseline cohort characteristics with outcomes. Unpaired Student's *t*-test was used for normally distributed data and Mann Whitney U for non-normally distributed. Fisher's Exact or Chi-Square test was used where appropriate. Data reported as *n* (%) or median (IQR).

	Escharization N = 18	Early Surgery N = 26	*p*-value
Born Before 34 Weeks	2 (11.1%)	1 (3.9%)	0.56
Birth Weight (kg)	2.8 (2.3, 3.3)	3.1 (2.8, 3.5)	0.06
Sac Diameter (cm)	7.0 (5.8, 7.9)	7.8 (6.4, 9.3)	0.08
Congenital Heart Anomaly	11 (61.1%)	20 (64.5%)	0.26
Pulmonary Hypertension	11 (61.1%)	9 (34.6%)	0.08
Need for Tracheostomy	6 (33.3%)	1 (3.9%)	0.01
Sepsis During Hospital Stay	12 (66.7%)	16 (57.1%)	0.52
Length of Hospital Stay for Survivors (Days)	43 (29, 294)	77 (37, 158)	0.99
Days to Definitive Closure	464 (326, 910)	27 (1, 61)	<0.01

QS13

CONTEMPORARY RATES OF ABDOMINAL WALL REPAIR AND MORTALITY FOR INDEX OMPHALOCELE ADMISSIONS

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Abstract: Purpose: Omphalocele presents with varying anatomic complexity and comorbidities that lead to variability in surgical closure. We sought to determine contemporary rates of surgical intervention and mortality for omphalocele and to identify conditions that impact these outcomes.

Methods: We analyzed available data from the National Inpatient (NIS) from 2016-2020. We included live-born infants in their index hospitalization with an ICD-10 diagnosis of omphalocele and excluded transfer patients. We used survey-weighted chi-square and Fisher's exact tests to compare patient characteristics by diagnosis and management and logistic regression to determine odds of omphalocele closure (abdominal wall repair) and death during the index hospitalization.

Results: 663 (0.018%) unique patients with omphalocele were identified (rate of 1.83 per 10,000 live births annually). Comorbid conditions associated with omphalocele included prematurity (29%); pulmonary hypoplasia (7.4%); critical congenital heart disease (CCHD; 3.3%); trisomy 13 (5.9%), 18 (2.3%), and 21 (0.45%); Beckwith Wiedemann (3.9%); and exstrophy (3.0%). The overall mortality rate was 20% with higher rates in those born very premature, or with pulmonary hypoplasia, CCHD, or trisomy 13 or 18. 26% of patients underwent abdominal wall repair during their index hospitalization. In multivariable logistic regression adjusted for clinical and demographic factors, extreme and very preterm status (extreme: AOR 0.09, 95%CI [0.02-0.43], very: AOR 0.36, 95%CI [0.14-0.94]), pulmonary hypoplasia (AOR 0.40, 95%CI [0.18-0.89]), CCHD (AOR 0.16, 95%CI [0.04-0.74]), and trisomy 13 or 18 (AOR 0.24, 95%CI [0.10-0.61]) were associated with lower odds of undergoing abdominal wall repair. Late preterm status (AOR 2.41, 95%CI [1.44-4.03]), Beckwith-Wiedemann syndrome (AOR 4.51, 95%CI [1.79-11.40]), and bladder or cloacal exstrophy (AOR 3.51, 95%CI [1.20-10.26]) were associated with higher odds of undergoing repair.

Conclusion: In this nationally representative analysis, there was a high mortality rate of 20% associated with prematurity and other congenital anomalies. Only about a quarter of patients were repaired during the index operation. This highlights the need for ongoing work to risk stratify patients and improve guidance in prenatal counseling for families with a fetal diagnosis of omphalocele.

Abbreviations: NIS: National Inpatient Sample
ICD: International Classification of Diseases
CCHD: critical congenital heart disease

AOR: adjusted odds ratio

QS14

SURGICAL MORTALITY OF NECROTIZING ENTEROCOLITIS AMONG EXTREMELY PREMATURE INFANTS BORN AT <24 WEEKS GESTATIONAL AGE IN A NATIONAL COHORT

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Abstract: Purpose
Though the population of extremely premature infants born at < 24-weeks gestational age (GA) is growing, surgical risk for necrotizing enterocolitis (NEC) is unknown. This study aims to compare mortality of surgical intervention for NEC in < 24-week GA infants to that of 24-28-week GA infants in a national cohort, hypothesizing increased mortality in the < 24-week population.
Methods
Extremely premature infants (≤28 weeks GA) who underwent non-elective surgery for NEC within 90 days of birth were identified from 2012–2023 NSQIP-P participant use files. The primary outcome was 30-day postoperative mortality. Risk factors were evaluated using univariate and multivariable analyses, with restricted cubic splines assessing associations of GA at birth, age at surgery, and weight at surgery with mortality.
Results
Of 1138 patients, 155 (14%) completed < 24 weeks, 227 (20%) completed 24 weeks, 411 (36%) completed 25-26 weeks, and 345 (30%) completed 27-28 weeks; 30-day mortality was 35%. Mortality was associated with corrected GA at surgery (p=.030), postnatal age at surgery (p=.02), and weight at surgery (p <.001) but not with GA at birth (p=.94) or birthweight (p=.38). Univariate restricted cubic spline analyses demonstrated non-linear associations between gestational age at surgery, postnatal age at surgery, and weight at surgery with mortality (Figure 1). For corrected GA at surgery (knots at 26, 29, and 33 weeks), mortality risk peaked near 27–28 weeks and declined with advancing maturity. For postnatal age at surgery (knots at 6, 12, 19, 26, 38, and 65 days), risk was highest around 10–15 days and decreased thereafter. For weight at surgery (knots at 0.65, 1.04, and 1.8 kg), mortality peaked near 1.0 kg and declined steadily with increasing weight. On multivariable analysis, weight at surgery remained associated with mortality (p <.001).
Conclusions
Surgical mortality of infants born at < 24 weeks GA with NEC is like that of other extremely premature infants and demonstrates non-linear relationships with corrected GA, postnatal age, and weight at surgery rather than birthweight or birth GA. An early period of heightened vulnerability is followed by a progressive decline in risk with increasing maturity and growth. Cubic spline analysis permits individualized risk stratification.

Abbreviations: NEC - necrotizing enterocolitis
GA - gestational age

QS15

NECROTIZING ENTEROCOLITIS IN EXTREMELY PREMATURE INFANTS: DIAGNOSIS, MANAGEMENT, AND MORTALITY

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Abstract: Purpose: Increased prematurity is associated with a higher risk of NEC. As resuscitation of infants at the extremes of viability (gestational age [GA] < 23 weeks) has increased, we sought to determine NEC risk and severity, procedures being performed, and outcomes among extremely premature infants. We hypothesized that NEC-related mortality would be highest in the most premature infants.

Methods: The Pediatric Health Information System (PHIS) database was used to identify extremely premature infants (GA 22-28 weeks) ≤60 days old from January 2016–June 2024. Those with NEC, including those requiring surgical intervention (peritoneal drain, PD; laparotomy, Lap), were identified using relevant ICD-10 codes. Patient characteristics and outcomes were compared between those with NEC treated medically (M-NEC) and surgically (S-NEC), stratified by GA.

Results: Of 28,557 extremely premature infants, 5,086 (17.8%) developed NEC, with infants 22-23 weeks-GA having the highest and infants 26-28 weeks-GA having the lowest incidence of NEC (24.3% vs. 13.9%, p< 0.0001) (Table 1). Of patients with NEC, 55.6% had M-NEC and 44.4% had S-NEC. Increased prematurity was associated with S-NEC (53.9% of 22-23 weeks-GA vs. 37.1% of 26-28 weeks-GA; p< 0.0001). Patients with S-NEC were treated with PD 13.9%, Lap 71.9%, or PD+Lap 14.2%. PD alone (13.9%) or with Lap (14.2%) was more common in 22-23 weeks-GA infants compared to 26-28 weeks-GA (6.9% PD, 8.9% PD+Lap, respectively) (p < 0.0001). Overall mortality was higher among the most premature infants (34.0% of 22-23 weeks-GA vs. 17.6% of 26-28 weeks-GA, p< 0.0001), irrespective of M-NEC (34.8% of 22-23 weeks GA vs. 13.3% of 26-28 weeks-GA, p< 0.0001) or S-NEC (33.3% of 22-23 weeks-GA vs. 24.8% of 28 weeks-GA, p=0.002).

Conclusions: Infants at the extremes of viability (i.e., 22-23 weeks-GA) more commonly required surgical intervention, indicative of more aggressive NEC, and had the highest mortality (approximately 1 in 3). The high mortality in 22-23 weeks-GA infants with M-NEC suggests that many of these infants may have been deemed too ill for surgical intervention, or surgery was not offered. As infants at the extremes of viability are more commonly surviving beyond resuscitation, overall NEC mortality may increase in the future.

Abbreviations: GA, gestational age; NEC, necrotizing enterocolitis; M-NEC, medical NEC; S-NEC, surgical NEC; PD, peritoneal drain; Lap, laparotomy

Table 1: Management & Outcomes among Extremely Premature (22-28 Weeks Gestational Age) Neonates with Necrotizing Enterocolitis at PHIS Hospitals (2016 Jan-2024 Jun), Stratified by Gestational Age

		Cohort (N=28,557)	22–23 weeks GA (N = 3,635)	24–25 weeks GA (N=8,904)	26–28 weeks GA (N=16,018)	*p* value
NEC Diagnosis N (%)		5,086 (17.8)	885 (24.3)	1,970 (22.1)	2,231 (13.9)	<0.0001
Management of NEC N (%)	M-NEC	2,829 (55.6)	408 (46.1)	1,018 (51.7)	1,403 (62.9)	<0.0001
	S-NEC	2,257 (44.4)	477 (53.9)	952 (48.3)	828 (37.1)	
	PD	313 (13.9)	100 (21.0)	156 (16.4)	57 (6.9)	<0.0001
	Lap	1,624 (71.9)	295 (61.8)	632 (66.4)	697 (84.2)	
	PD + Lap	320 (14.2)	82 (17.2)	164 (17.2)	74 (8.9)	
Mortality N (%)	Overall	1,152 (22.7)	301 (34.0)	459 (23.3)	392 (17.6)	<0.0001
	M-NEC	544 (19.2)	142 (34.8)	215 (21.1)	187 (13.3)	<0.0001
	S-NEC	608 (26.9)	159 (33.3)	244 (25.6)	205 (24.8)	0.002

QS16

A NATIONAL ASSESSMENT OF DEXMEDETOMIDINE AFTER NEONATAL THORACIC AND ABDOMINAL OPERATIONS

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Abstract: Purpose
Dexmedetomidine is a selective alpha-2 adrenergic receptor agonist that provides analgesia and sedation without respiratory depression and is promising as an opioid-sparing agent. We sought to evaluate the adoption and efficacy of dexmedetomidine in US children's hospitals for infants who have undergone thoracic and abdominal operations.
Methods
The Pediatric Health Information System (PHIS) database was used to identify infants who underwent open or minimally invasive repair of esophageal atresia (EA) or duodenal atresia (DA) at 49 US children's hospitals between 2016 and 2023. All postoperative administrations of sedative/analgesic medications were recorded. Outcomes, including time to goal feedings, need for prolonged mechanical ventilation, length of stay, and days of opioid administration were evaluated. The duration of any treatment for analgesic/sedative withdrawal with methadone and/or clonidine was assessed.
Results
2,265 infants met inclusion criteria. 25% (n=564) received dexmedetomidine in the postoperative period (mean, 6.4 days) and it was administered in the first 10 postoperative days in 19% (24% of EA and 11% of DA) for a median of 2 days. Individual hospitals used dexmedetomidine in 0-62% of their EA and DA patients. Overall, patients managed with dexmedetomidine in the initial postoperative period had a longer length of stay and were more likely to require more than four days of mechanical ventilation. (Table) In addition, they received more days of morphine, fentanyl, and methadone and were more likely to be treated with clonidine. On multivariable analysis, only dexmedetomidine use and illness severity score independently predicted longer length of stay, more morphine days, and administration of clonidine.
Conclusions
In a large cohort of infants with EA and DA managed at US children's hospitals there was substantial variability in the use of dexmedetomidine. While disease severity was a strong driver of outcomes, dexmedetomidine was independently associated with increased opioid use and longer lengths of stay. In addition, patients managed with dexmedetomidine were significantly more likely to have received clonidine, presumably for management of withdrawal. Despite laudable intentions that underlie the use of dexmedetomidine in neonates, our findings suggest that it increases morphine use and may extend hospital stay, due perhaps to management of withdrawal.

Abbreviations: PHIS=Pediatric Health Information System
DA=Duodenal atresia
EA=Esophageal atresia

	Dexmedetomidine (n=428)	No Dexmedetomidine (n=1837)	p
Birth weight (g)**	2430 (1794,2953)	2470 (1860,3005)	.50
Disease severity index	4 (3,4)	3 (3,4)	<.001
Acetaminophen in 1st 10 POD (d)	5 (3,8)	4 (2,7)	<.001
Morphine in 1st 10 POD (d)	3 (1,6)	1 (0,3)	<.001*
Length of stay (d)	45 (22,97)	27 (18,52)	<.001*
Time to goal feedings (d)	9 (6,14)	9 (6,13)	<.001
>96 hours mechanicel ventilation (n, %)	143 (33)	367 (20)	<.001
Clonidine (n, %)	89 (21)	141 (8)	<.001*
Methadone (n, %)	44 (10)	62 (3)	<.001

*Independently associated with dexmedetomidine in 1st 10 postoperative days and disease severity**

**All continuous data presented as median and IQR

QS17

PILOT EVALUATION OF A STEM CELL-LOADED ALGINATE-BASED SEALANT FOR TRACHEAL REPAIR AND REGENERATION

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Abstract: Introduction:
Tracheal injuries require urgent repair, yet standard suture repair carries up to a 20% complication rate. Sealant patches offer a promising alternative, although none are FDA-approved. We have previously shown that an alginate patch cold seal a large tracheal defect, however, long term regeneration was disorganized. This pilot study assesses adipose-derived mesenchymal stem cell (AD-MSC) survival on dopamine conjugated methacrylated alginate (ALG-MA-DA) patches to advance stem cell-based sealants an improved alternative to conventional repair.
Methods:
Two cell seeding methods were evaluated. Method 1 included sterile ALG-MA-DA patches placed individually into separate wells of a multi-well culture plate and seeded with 25 µL of mesenchymal cell media (StemX) containing > 200,000 AD-MSCs. Method 2 included ALG-MA-DA patches sterilely placed collectively into a larger culture plate and seeded with 15 µL of StemX media containing > 200,000 AD-MSCs. The patches were then incubated at 37 ° C with 5% oxygen. Cell viability was assessed at 48 hours and at 7, 14, and 21 days using Live/Dead staining with Calcein AM and Ethidium homodimer. Imaging was performed using a Zeiss Confocal Microscope. Hematoxylin and eosin (H&E) staining was performed on fresh frozen patches to evaluate structural characteristics.
Results:
Method 2 was more reliable in seeding AD-MSCs, as it allowed for more space to evenly seed the ALG-MA-DA patches. Live/Dead staining confirmed viable AD-MSCs on the ALG-MA-DA patches at all time points (Figure 1). AD-MSCs predominantly occupied the pores of the patches and grew in clusters, rather than individually. Cells exhibited circular morphology and did not appear spiculated as they typically do when plated in 2-dimensions, suggesting altered cell behavior. Additionally, the patch exhibited inherent autofluorescence and a porous surface, which was further validated through H&E staining.
Conclusion:
This proof-of-concept pilot study demonstrates the feasibility of seeding AD-MSCs onto ALG-MA-DA patches. AD-MSCs remained viable for at least 21 days, highlighting the potential of stem cell seeded sealant patches to enhance tracheal injury repair and regeneration. Future work will focus on optimizing patch composition and surface properties with extracellular matrix protein coatings to promote more typical AD-MSC morphology.

Abbreviations: FDA - Food and Drug Administration; ALG-MA-DA - Dopamine conjugated methacrylate alginate; AD-MSC - Adipose-derived mesenchymal stem cell; H&E - Hematoxylin and eosin;

QS18

IDENTIFICATION OF REGULATORY GENES AND CORRESPONDING PATHWAY ENRICHMENT ASSOCIATED WITH BILIARY ATRESIA DISEASE PROGRESSION

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Abstract: Introduction
Biliary atresia is a rare congenital anomaly of the liver and bile ducts that affects about 1 in 10,000 infants each year. Despite surgical intervention, many patients will continue to have hepatic disease progression. Previous studies have reported the molecular profile associated with progression of this disease from inflammation to fibrosis, however identification of the regulatory genes governing the pathways of disease progression has not yet been reported.
Methods
This study applies regulatory gene analysis using differential gene expression data from the gene expression omnibus (GSE15235) to identify regulatory genes associated with progression of inflammation to fibrosis in biliary atresia. Regulatory genes were identified via repressive tendency scores estimated by level of discordance between gene expression matrix values and the epigenome roadmap reference dataset H3K27me3 domains near the gene (2.5kb upstream from the gene body). These values have been shown in prior literature to be indicative of a gene's regulatory effect.
Results
Within liver biopsies with inflammation, pathways significantly enriched included transcription regulation by RNA polymerase II, general and central nervous system development, immune system development, and embryonic morphogenesis. Within liver biopsies with fibrosis, enriched pathways included system development, anatomical structure morphogenesis, apoptotic process, biological regulation, cell differentiation, cell fate commitment, and tissue development. Inflammatory regulatory genes enriched within RNA polymerase pathway were FOXC1, PAX2, HOXB13, HOXC10, LHX6, EOMES, MAFB, GATA3, GATA4, GATA6. Of these, MAFB, GATA3, GATA4, GATA6 were also observed to be enriched within the immune system development pathway. Fibrosis regulatory genes enriched within apoptosis and cell fate commitment pathways included PAX2, HOXC10, PAX6, TBX15, MNX1, and TBX5.
Conclusion
Past studies have identified molecular signatures associated with progression of biliary atresia. This study identifies genes regulating these molecular signatures at different stages of disease progression to provide insight into the mechanisms of those processes. These regulatory genes may be targets for molecular therapies that delay disease progression and prolong native liver survival.

Abbreviations:

QS19

MAPPING THE FIBROTIC FRONTIER: CHARACTERIZATION OF HEPATIC STELLATE CELL SUBPOPULATIONS IN BILIARY ATRESIA USING SPATIAL TRANSCRIPTOMICS

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Abstract: Introduction: Biliary atresia (BA) is an infantile fibrosing cholangiopathy that causes end-stage liver disease in 40-60% of patients. The etiology of fibrosis progression in BA is unknown. We previously identified heterogeneous enrichment of NOTCH-expressing ADIRF+ hepatic stellate cell (HSC) subpopulations in a single-cell RNA-sequencing (scRNA-seq) meta-analysis of BA. In this study, we sought to validate our single-cell findings using spatial transcriptomics.
Methods: We performed spatial transcriptomics analysis of formalin-fixed paraffin-embedded liver biopsies derived from infants with BA and normal age-matched liver using the 10X Xenium platform. These data were deconvoluted to identify individual cell types using Niche Covariation (NiCo) and our reference scRNA-seq dataset derived from infant liver with and without BA (Figure 1A). Cell proportions and transcript assignments were quantified and compared.
Results: After quality control, we selected specimens derived from 3 BA patients and 3 normal liver controls for downstream analysis. Each specimen included at least 2 technical replicates. From these samples, we identified that ADIRF+ HSCs were enriched in BA compared to normal liver control, both globally and with respect to HSC subpopulation proportions (Figure 1B-D). Next, we performed HSC subpopulation characterization between parenchymal and non-parenchymal tissue in BA (Figure 1E). We identified enrichment of downstream NOTCH signaling in the non-parenchymal tissue and the ADIRF+ HSC subpopulation by querying expression of NOTCH target genes HES4, NOTCH3, and JAG1 (Figure 1F-H).
Conclusion: Spatial characterization of BA-associated liver fibrosis illustrated upregulation of NOTCH-expressing ADIRF+ HSCs previously identified through scRNA-seq. Further characterization of this subpopulation may elucidate the mechanisms underlying rapidly progressive liver fibrosis in BA.

Abbreviations: BA, biliary atresia; single-cell RNA-sequencing (scRNA-seq); hepatic stellate cell (HSC) subpopulations; Niche Covariation (NiCo); HES4, hairy and enhancer of split 4; NOTCH3 notch homolog protein 3;, JAG1, jagged-1, ADIRF, adipogenesis regulatory factor;

Quickshots III: Trauma and Advocacy

11:15 AM – 12:00 PM

QS20

NATIONAL TRENDS IN PEDIATRIC BLUNT CEREBROVASCULAR INJURY: INCIDENCE, RISK FACTORS, AND OUTCOMES

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Abstract: Background:
Blunt cerebrovascular injury (BCVI) in children is rare but devastating, with stroke rates up to 37% and mortality approaching 13%. Adult-derived screening criteria risk both under-diagnosis and unnecessary radiation in pediatric patients, underscoring the urgent need for pediatric-specific tools. We hypothesized that increased BCVI screening has altered incidence and patient characteristics, providing insight to guide these efforts.

Methods:
We conducted a retrospective cross-sectional analysis of the Kids' Inpatient Database (2016, 2019, 2022). Children (0–18 years) with blunt trauma were identified using ICD-10 codes, with BCVI cases isolated. Demographics, mechanisms, imaging, stroke, interventions, length of stay, and mortality were compared between BCVI and all blunt trauma admissions. Multivariable logistic regression adjusted for age, sex, race, admission timing, region, and urbanicity.

Results:
Of 472,306 blunt trauma admissions, 784 (0.17%) had BCVI, with incidence rising nearly fourfold from 0.07% in 2016 to 0.26% in 2022. BCVI patients were older (14.3 vs. 10.2 years, $p< 0.001$), more often male (64% vs. 54%, $p< 0.001$), and disproportionately Black (28% vs. 18%, $p< 0.001$) or from the lowest income quartile (37% vs. 32%, $p=0.017$). Compared with all blunt trauma patients, those with BCVI had far worse outcomes: stroke (6% vs. 0.2%, $p< 0.001$), longer stays (14 vs. 7 days, $p< 0.001$), higher incidence of major surgery (68% vs. 26%, $p< 0.001$), and nearly tenfold greater mortality (11% vs. 1.2%, $p< 0.001$). Regression analysis showed reduced odds in children < 5 years (aOR 0.18) and females (aOR 0.60), but higher odds for Black race (aOR 2.04), weekend admission (aOR 1.46), rural hospitals (aOR 1.37), and hospitals in the South (aOR 1.82) or West (aOR 2.32).

Conclusions:
Pediatric BCVI incidence is rising nationally, with disproportionate impact on adolescents, Black children, males, rural populations, and weekend admissions. Outcomes remain devastating, with significantly higher rates of stroke, surgery, and death. Development of pediatric-specific screening protocols that incorporate both clinical and social risk factors is critical to improve timely diagnosis and intervention.

Abbreviations: BCVI - Blunt Cerebrovascular Injury
KID - Kids' Inpatient Database
ICD - International Classification of Diseases
aOR - Adjusted Odds Ratio

Variable	OR	95% CI		P Value
Age Category				
Early Childhood, Age ≤ 5	**0.18**	**0.13**	**0.24**	**<0.001**
Middle Childhood, Age 6-11	**0.47**	**0.35**	**0.63**	**<0.001**
Early Adolescence, Age 12-18	Ref			
Gender				
Female	**0.60**	**0.50**	**0.72**	**<0.001**
Race				
White	Ref			
Black	**2.04**	**1.61**	**2.58**	**<0.001**
Hispanic	1.01	0.77	1.33	0.946
Asian or Pacific Islander	0.98	0.54	1.76	0.943
Native American	0.71	0.25	1.98	0.511
Other	0.79	0.45	1.37	0.395
Admission on Weekend				
Admission on Sat-Sun	**1.46**	**1.21**	**1.77**	**<0.001**
Weekday Admission	Ref			
Insurance Type				
Private	Ref			
Government	0.88	0.71	1.09	0.232
Other	1.16	0.84	1.61	0.371
Hospital Region				
Northeast	Ref			
Midwest	1.32	0.88	1.98	0.185
South	**1.82**	**1.26**	**2.64**	**0.002**
West	**2.32**	**1.57**	**3.41**	**<0.001**
Income Quartile				
1st	Ref			
2nd	0.91	0.72	1.16	0.459
3rd	0.87	0.67	1.14	0.309
4th	0.77	0.55	1.08	0.129
Patient Location (NCHS Criteria)				
Urban				
Suburban	0.93	0.72	1.19	0.547
Rural	**1.37**	**1.02**	**1.83**	**0.035**

*Bold values = statistically significant

QS21

NIH-SUPPORTED CLINICAL TRIALS IN CHILDREN'S SURGERY, 2020–2025 AND IMPLICATIONS FOR RECENT FEDERAL FUNDING POLICY CHANGES

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Abstract: Recent research has shown that pediatric surgeons receive the highest rates of National Institutes of Health (NIH) funding among all subspecialties. While the NIH has historically provided funding necessary to conduct studies for children, recent federal policy shifts have specifically raised significant concerns about the future viability of pediatric clinical trials. To better understand the potential ramifications of policy shifts, this study characterizes NIH funding allocated to pediatric surgery clinical trials from 2020 to 2025.

To identify relevant clinical trials, we queried ClinicalTrials.gov and NIH RePORTER for trials open to patients aged 0 to 17 years. Inclusion criteria mandated funding by the NIH, the presence of at least one study site within the U.S., and start dates spanning January 1, 2020, to January 1, 2025.

38 NIH-funded surgery clinical trials included children (Table 1). Only 12 trials focused exclusively on the pediatric population; the remaining 26 trials included adult (18-65 years) and older adult (>65 years) participants alongside children. Seventeen trials were intended to study and improve the treatment and management of disease, while 9 sought to improve supportive care in the perioperative period. Twelve of the surgical clinical trials evaluated a medical device, 6 evaluated a surgical procedure, and 9 assessed a drug, sometimes head-to-head. The Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) and National Cancer Institute (NCI) supported the largest number of clinical trials (10, 8).

The NIH supports a stable and critical portfolio of trials evaluating drugs, surgical interventions, and devices. Approximately half included collaborative support from the NIHCD or the NCI, underscoring prioritization of research enhancing developmental outcomes and improving pediatric cancer treatment. Given the modest number of surgical clinical trials enrolling pediatric populations, the proposed and enacted reductions in NIH staffing, grant awards, and indirect costs pose a significant threat to the future generation of high-quality data. With pediatric surgeons receiving a considerable proportion of NIH funding, pediatric surgeons should take an active role engaging with Congress and federal agencies to advocate and shape policy decisions.

Abbreviations: National Institutes of Health (NIH)
National Institute of Child Health and Human Development (NICHD)
National Cancer Institute (NCI)

Table 1. Characteristics of NIH-Funded Surgical Clinical Trials Including Pediatric Patients

	N (%)	%
Number of Trials	38	–
Trials per Year		
2020–2021	9	23.7
2021–2022	6	15.8
2022–2023	9	23.7
2023–2024	6	15.8
2024–2025	8	21.1
Involved NIH Institutes		
NIDCD	10	26.3
NCI	8	21.1
Unknown	8	21.1
NCATS	4	10.5
NHLBI	4	10.5
NIAMS	2	5.3
NIDA	2	5.3
NCCIH	1	2.6
NEI	1	2.6
NIAAA	1	2.6
NIDCD	1	2.6
NIDCR	1	2.6
NIGMS	1	2.6
NIMH	1	2.6
NINDS	1	2.6
Pediatric Involvement		
Children (0–17)	12	31.6
Child/Adult (0–65)	16	42.1
Child/Adult/Older Adult (0–65+)	10	26.3
Median Enrollment	80 (Q1 33, Q3, 320)	
Phase		
Early Phase 1	1	3.03
Phase 1	2	6.3
Phase 1 | Phase 2	0	0
Phase 2	4	10.5
Phase 2 | Phase 3	0	0
Phase 3	4	10.5
Phase 4	1	2.6
N/A	26	68.4
Randomization		
Non-Randomized	26	68.4
Randomized	1	2.6
N/A	11	28.9
Intervention Model		
Parallel	21	61.8
Single Group	8	23.5
Crossover	3	8.8
Sequential	2	5.9
Masking		
Single	5	14.7
Double	2	5.9
Triple	3	8.8
Quadruple	4	11.8
None	20	58.8
Purpose		
Basic Science	0	0
Diagnostic	3	8.8
Health Services Research	1	2.9
Prevention	3	8.8
Supportive Care	9	26.5
Treatment	15	44.1
Other	3	8.8
Interventions		
Device	13	34.2
Procedure	6	15.8
Drug	7	18.4
Biologic	1	2.6
Behavioral	4	10.5
Diagnostic Test	3	8.1
Dietary Supplement	2	5.1
Radiation	1	2.6
Other	0	18.4
None Listed	3	8.1

QS22

MULTICENTER ANALYSIS OF PEDIATRIC TRAUMATIC PNEUMOTHORAX: VOLUME THRESHOLD AND INSTITUTIONAL VARIATION

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Abstract: Purpose:
There is limited literature regarding chest tube requirements and pneumothorax volume thresholds in children. We sought to analyze the management of pediatric traumatic pneumothorax and determine a volume threshold associated with chest tube placement.
Methods:
Pediatric traumatic pneumothorax cases from two trauma centers (freestanding pediatric trauma center and adult trauma center) were retrospectively reviewed from October 2015 to February 2024. Management was categorized as successful observation (SO), chest tube placement (CTP), or failed observation requiring subsequent chest tube placement (FO). Pneumothorax volume was calculated using the Collins method or depth on the axial plane of cross-sectional imaging. Hospital course, postoperative outcomes, and long-term outcomes up to one year were analyzed.
Results:
A total of 448 traumatic pneumothorax cases were identified: 377 SO (84%), 71 CTP (16%), and 14 FO (3%). Patients with higher injury severity score and thoracic abbreviated injury score (AIS) were more likely to require CTP vs SO (21 vs. 17, p=0.029; 3 vs. 2, p=0.012). Hypotension at presentation was more frequent in CTP vs. SO (8.5% vs. 3%, p = 0.011), while tachycardia (p=0.42) and tachypnea (p=0.37) were not associated with CTP. Pneumothorax size was significantly larger in CTP vs. SO (15% vs. 8%, p< 0.001; 14 mm vs. 4 mm, p< 0.001). On ROC curve analysis, patients with pneumothorax >11.25% by Collins formula or >9.5 mm on cross-sectional imaging were more likely to undergo CTP. On logistic regression, thoracic AIS, pneumothorax size, presenting hypotension, penetrating mechanism, concurrent spinal fracture, and concurrent hemothorax were independent predictors of CTP. Patients treated at the adult trauma center were twice as likely to undergo CTP compared with those at the freestanding pediatric center despite no difference in pneumothorax size adjusted for weight (Odds Ratio: 1.94 (1.06, 3.56), p=0.031).
Conclusion:
In addition to hypotension at presentation and concurrent injuries, pneumothorax size >11% or >10 mm was associated with chest tube placement. The freestanding pediatric trauma center was more likely to successfully observe traumatic pneumothorax compared with the adult trauma center. Our study highlights volume thresholds for chest tube placement and institutional variations in the management of pediatric traumatic pneumothorax.

Abbreviations: SO: successful observation
CTP: chest tube placement

FO: failed observation requiring subsequent chest tube placement

QS23

ASSOCIATION BETWEEN HYPOTHERMIA AND MORTALITY IN PEDIATRIC TRAUMA

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Abstract: Hypothermia is an independent risk factor for mortality after trauma in adults, regardless of injury severity score (ISS), shock, and other clinical factors. However, this relationship is poorly understood in the pediatric population. The objectives of this study were to determine a temperature threshold at which mortality significantly increases in children after trauma and to assess whether hypothermia is independently associated with mortality in this population.

The National Trauma Data Bank (NTDB) was used to identify trauma patients < 18 years old from 2020-2023. Mortality was defined as death in the emergency department (ED) or prior to hospital discharge. Two definitions for hypothermia were used based on initial arrival temperature: a commonly used clinical definition (< 35°C) and one determined from cut-point analysis (R package: cutpointr) to identify the optimal balance point for sensitivity and specificity for mortality. Stepwise logistic regression models, excluding hyperthermic (≥38°C) patients, were used to evaluate the association between hypothermia and mortality, adjusting for heart rate, blood pressure, GCS, ISS, supplemental oxygen use, primary payment type, race/ethnicity, and injury mechanism (blunt vs penetrating). Interaction terms were introduced into the models to evaluate whether age or mechanism of injury modified the association between hypothermia and mortality.

Of 220,162 patients, 924 (0.42%) were hypothermic (< 35°C) upon arrival. Hypothermia was associated with lower median GCS (9 [IQR 3-15] vs 15 [IQR 15-15] for normothermia, p< 0.001). Penetrating injury was more common in hypothermic patients compared to normothermic patients (24.9% vs 11.0%, p< 0.001). Mortality was 20.9% in hypothermic patients vs 0.7% in normothermic patients (p < 0.001) (Figure 1). A temperature of 36.5°C was found to be the ideal cut-point for mortality. In adjusted models, both hypothermia < 35°C [OR 1.85, 95% CI 1.36-2.49)] and hypothermia < 36.5°C [OR 1.35, 95% CI 1.14-1.59)] were independently associated with mortality. No statistically significant interaction was identified between hypothermia and age group or injury mechanism.

Hypothermia is an independent risk factor for mortality in the pediatric population, a consistent finding across patient age and injury mechanism. The mortality risk is lower than that reported in adults (>25%), yet approximately 1 in 5 pediatric trauma patients with hypothermia do not survive.

Abbreviations: ISS - Injury Severity Score
NTDB - National Trauma Data Bank
ED - Emergency Department
GCS - Glasgow Coma Scale

QS24

VARIABILITY IN PEDIATRIC TRAUMA CENTER CRITERIA FOR HIGHEST AND SECOND TIER TRAUMA TEAM ACTIVATION

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Abstract: Introduction: Trauma team activation is a critical component of pediatric trauma care, yet criteria for tiered activation vary widely between institutions and currently no standardized guidelines exist. Since 2002, the American College of Surgeons has mandated six (ACS-6) criteria for the highest-level activation for adult and pediatric centers. However, prior studies have shown that fewer than half of pediatric trauma centers (PTCs) fully adhere to these requirements. This study evaluated hospital-based activation guidelines across the A+ Pediatric Trauma Research Network (A+PTRN) to assess compliance with the updated 2023 ACS-6 criteria and alignment with the National Guidelines for Field Triage (NGFT).

Methods: Activation guidelines from participating A+PTRN PTCs were collected and independently reviewed by two physician investigators. Highest-level and second tier activation criteria were abstracted, categorized, and compared with descriptive statistics to the ACS-6 and NGFT standards.

Results: Of the 32 PTCs, 30 (94%) provided activation guidelines with a mean of 11 ± 3 criteria for highest tier and 12 ± 4 criteria for second tier activations. All centers met ACS-6 requirements for highest-level activation, and 28 (93%) incorporated additional NGFT “red criteria” for highest-level activation. Frequently included highest-level criteria beyond the ACS-6 were spinal cord injury (21/30, 70%), hard signs of vascular injury (21/30, 70%), and traumatic extremity amputation (19/30, 63%). For second tier activation, nearly all centers (29/30, 97%) incorporated mechanism of injury, most commonly motor vehicle collisions (26/30, 87%), that included ejection, death in the same vehicle, or a rollover. The most common additional mechanisms included pedestrians struck by a motor vehicle (24/30, 80%), a fall from >10 feet (23/30, 77%), and an all-terrain vehicle injury (16/30, 53%).

Conclusion: All participating PTCs met ACS-6 criteria for highest-level trauma activation, a more than two-fold improvement from prior studies after the latest guideline updates. Additionally, most incorporated additional NGFT criteria for both highest and second tier activations. Despite this baseline adherence, substantial variability exists in hospital activation guidelines, particularly among mechanism-based criteria. Future work should evaluate the relationship between activation criteria, triage rates, and patient outcomes to inform development of standardized, evidence-based pediatric trauma activation guidelines.

Abbreviations: Pediatric trauma center (PTC)
A+ Pediatric Trauma Research Network (A+PTRN)
National Guidelines for Field Triage (NGFT)

Table 1. Non-ACS 6 Activation Criteria and Frequency of Use by Activation Level

Highest Level Trauma Team Activation	**N**	**%**
Spinal cord injury	21	70
Hard signs of vascular injury	21	70
Traumatic extremity amputation	19	63
Cardiopulmonary arrest	18	60
Deteriorating Glascow coma score	12	40
Pelvic fracture	9	30
Chest wall injury	8	27
Penetrating wound beyond neck/chest/pelvis	7	23
Depressed skull fracture	6	20
2+ long bone fractures	4	13
Second Tier Trauma Team Activation	**N**	**%**
Motor vehicle collision		
Ejection	24	80
Death in vehicle	21	70
Rollover	11	37
Speed >40mph	9	30
Significant intrusion	8	27
Prolonged extrication	7	23
Unrestrained/improper restraint	4	13
Automobile vs. pedestrian	23	77
Fall >10 feet	23	77
All-terrain vehicle	16	53
Motorcycle crash	11	37
High voltage electrical injury	7	23

QS25

WHO MANAGES PEDIATRIC VASCULAR TRAUMA? OUTCOMES ACROSS SPECIALTIES AT A LEVEL I TRAUMA CENTER

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Abstract: Purpose: Pediatric vascular trauma is rare , with management spanning multiple specialties. This study describes injury patterns, managing services, and outcomes at a Level I pediatric and adult trauma center.
Methods: Following IRB approval, retrospective review of patients < 18 years old who required operative intervention for traumatic vascular injuries between 1/1/2011-6/1/2024 was performed. Demographics, injury details, specialty of primary surgeon, and outcomes were abstracted from the electronic medical record and trauma registry. The primary outcome was in-hospital complications (hemorrhage, occlusion, reoperation, amputation). Pediatric trauma patients less than 16 at our institution are primarily managed by pediatric surgery (PS). Descriptive, univariate and multivariate analyses were performed.
Results: In total, 176 patients were included, median age was 15.6 years (IQR 12.8-16.7); 81% were male. The most common mechanism of injury was penetrating (77%), with the remainder suffering blunt trauma. Half (51%) sustained associated injuries, such as fractures (n=51), traumatic brain injury (n=14), intrathoracic (n=30) or intraabdominal injury (n=29). Median injury severity score (ISS) was 10 (IQR 9-18). Management was most commonly by PS (26%) and vascular surgery (VS, 26%) (Table 1). Overall complication rate was 11% (n=20), with 8 deaths (4 for VS, 4 for trauma surgery [TS]), and 4 amputations (3 for VS, 1 for plastic and reconstructive surgery [PRS]). ISS was significantly higher in the patients cared for by PS, VS, or TS than by orthopedic surgery (ORS) or PRS ($p < 0.01$). PS cared for younger patients compared to VS or TS ($p < 0.01$). Vascular complications occurred most in the thigh (35%), trunk (30%), upper arm (30%), and leg (5%) (p=0.01). Truncal injuries carried greater odds of complication or mortality (OR 7.59, 95% CI 2.37-24.3). Vascular complications did not differ between specialties (p=0.18). Reviewing patients younger than 16 (n=103), PS managed 43%, VS 21%, PRS 19%, ORS 14%, and TS 3%; no difference was seen in the complication rate amongst this subset (p=0.20). Non-PS specialties assisted with specialized reconstruction (distal extremity, endovascular, and complex polytrauma).
Conclusion: Pediatric surgeons achieve outcomes comparable to non-pediatric surgeons in vascular trauma, supporting their continued role in caring for these patients with subspecialty collaboration when needed.

Abbreviations: ISS – Injury Severity Score
PS – Pediatric Surgery
TS – Trauma Surgery
VS – Vascular Surgery
ORS – Orthopedic surgery
PRS – Plastic and Reconstructive Surgery

Table 1: Breakdown of Pediatric Vascular Injuries and Outcomes by Operative Team

		PS n=46 (26.1%)	VS n=46 (26.1%)	TS n=39 (22.1%)	PRS n=28 (15.9%)	ORS n=17 (9.7%)	P value
Age Median (IQR)		13.4 (9.15) *13.3 (8.8-14.9)*	16 (15.2 17.0) *15.1 (13.8-15.5)*	16.9 (16.4 17.6) *14.8 (14.1-14.9)*	14.8 (8.5 16.5) *12.8 (8.8-15)*	10.9 (7.9 15.1) *9.9 (6.3-12.5)*	<.001 <.001
ISS Mean (SD)		14.0 (8.6) *13.4 (7.9)*	21.2 (14.1) *21.5 (15)*	18.4 (11.0) *28.3 (12.7)*	8.28 (4.1) *8.4 (4.4)*	9.9 (4.5) *10.4 (4.8)*	<.001 *.008*
Head and Neck n=13 (7.4%)		5 (38.5%) *5 (71.4%)*	2 (15.4%) *2 (28.6%)*	6 (46.2%) -	- -	- -	0.07 *.363*
Upper Extremity n=87 (49.4%)	Above Elbow	14 (40.0%) *14 (63.6%)*	8 (22.9%) *5 (77.7%)*	9 (25.7%) -	3 (8.6%) *3 (13.6%)*	1 (2.9%) -	0.092 *.176*
	Below Elbuw**	6 (11.5%) *6 (16.7%)*	3 (5.8%) *1 (2.8%)*	5 (9.6%) -	22 (42.3%) *15 (41.7%)*	16 (40.8%) *14 (58.9%)*	<.001 *.003*
Lower Extremity n=51 (29.0%)	Above Knee	15 (34.9%) *15 (62.5%)*	19 (44.2%) *7 (30.4%)*	9 (20.9%) *1 (4.3%)*	- -	- -	.006 *.434*
	Below Knee	- -	4 (50.0%) *3 (60.0%)*	1 (12.5%) -	3 (37.5%) *2 (40.0%)*	- -	.094 *.611*
Truncal n=25 (14.2%)		6 (24.0%) *4 (40.0%)*	10 (40.0%) *4 (40.0%)*	9 (36.0%) *2 (20.0%)*	- -	- -	0.016 *.002*
Vascular Complication (Rate per specialty)		7 (15.2%) *7 (15.9%)*	8 (17.4%) *5 (22.7%)*	4 (10.3%) -	1 (3.6%) *1 (5.0%)*	- -	0.181 *0.201*

**Italicized* is the less than 16 age group

**exclude injuries below the wrist

QS26

STRESS, SOCIAL BARRIERS, SUPPORT: THE IMPACT OF PEDIATRIC SURGERY ON URBAN FAMILIES

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Abstract: Purpose:
The challenges that urban families face within the realm of surgical care are not well studied. This study aims to explore how these families experience, adapt to, and find support for the demands of pediatric surgical care.
Methods:
Semi-structured virtual interviews 45-60 minutes in length were conducted with caregivers whose children underwent surgery at a children's hospital in an urban area. Interviews were transcribed and coded by a multidisciplinary team using thematic analysis. Each excerpt was coded by two of the team members and reviewed by a third for consistency. Codes and themes were identified through an inductive approach.
Results:
Twenty-one mothers participated. The majority identified as African American and reported state-sponsored insurance. Nearly half of participants reported annual household incomes under $15,000. Procedure complexity varied from routine to life-threatening. Three central themes were identified:
1. Emotional and physical impact on families: Caregivers described significant emotional distress, anxiety and fear about their child's health, and physical strain related to caregiving demands and recovery. Barriers to remaining physically close to their child were also reported.
2. Support structures: The presence or absence of provider follow-up and support, assistance from extended family, and the ability to navigate social resources played a central role in shaping families' experiences. Many families relied on informal networks, while others struggled to access needed resources for childcare, financial assistance, and excused absences from employers.
3. Agency of the parents: Families described a spectrum of experiences in being heard and validated by providers, leveraging their own knowledge and background, and balancing conflicting priorities such as work and caregiving. Parental resilience and empowerment were evident in efforts to navigate complex systems and support their families.
Conclusions:
There are significant emotional, physical, and logistical burdens surrounding pediatric surgical care, particularly in urban families. Provider, family member, and community support as well as parental resilience and agency is essential for a family's ability to cope and advocate for their children. Interventions to strengthen family-centered supports, empower caregivers, and improve provider communication are critical for reducing disparities and improving experiences.

Abbreviations:

QS27

RISING VOICES: A DECADE OF PEDIATRIC SURGICAL ADVOCACY IN ACTION

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Abstract: Purpose: The Health Policy and Advocacy Committee (HPAC) of the American Pediatric Surgical Association (APSA) was founded in 2015 by Dr. Mary Fallat and initially chaired by Dr. Max Langham to amplify the role of pediatric surgeons in shaping health policy that affects the surgical care of children. Over the past decade, the committee has encouraged a growing culture of advocacy across the specialty. This study evaluates the impact by quantifying trends in advocacy-related scholarship and meeting engagement from 2015 to 2025.

Methods: Abstracts submitted for inclusion at APSA Annual Meetings from 2015 to 2025 were reviewed. Submissions were categorized as "advocacy-related" if they addressed topics such as health policy, public policy, equity, health disparities, or social determinants of health. Annual submission counts were tabulated. Similarly, publications from the Journal of Pediatric Surgery (JPS) over the same decade were searched using these key terms. Annual numbers of advocacy-focused publications were calculated and plotted to assess trends over time.

Results: Advocacy-themed submissions to the APSA Annual Meeting increased steadily from only a few in the first years after HPAC's formation to more than 30 per year by 2025, representing a sustained upward trajectory across the decade. In parallel, 388 advocacy-related publications were identified in JPS, increasing from 16 articles in 2015 to more than 50 annually in both 2024 and 2025 (Figure 1). These findings reflect the growing integration of advocacy within the academic mission of Pediatric Surgery.

Conclusions: Ten years after the creation of APSA's HPAC, there has been a measurable rise in advocacy-focused scholarly activity. The upward trend in both meeting submissions and peer-reviewed publications underscores the growing recognition of advocacy as a vital component of pediatric surgical practice and research. Continued attention to advocacy scholarship may further strengthen the specialty's ability to address health policy challenges and promote equitable surgical care for children.

Abbreviations: APSA, JPS, HPAC

QS28

DIVERSITY IN THE PEDIATRIC SURGERY WORKFORCE: A CALL FOR CONTINUED EFFORTS

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Abstract: Purpose:
Diversity of the surgical workforce is important to improve healthcare outcomes, reducing disparity of healthcare. Diverse teams have been shown to improve communication and trust with patients while leading to a healthier work environment reducing stress and burnout. An inclusive surgical workforce better represents the society it serves allowing the healthcare system to function maximally. This study sought to evaluate how disparity of the pediatric surgical workforce has changed over time.

Methods:
The American Medical Association (AMA) Physician Masterfile was utilized to identify self-reported pediatric surgeons. Data from 1996, 2000, 2005, 2010, 2015, and 2020 were analyzed to assess demographic factors of surgeons entering the workforce at various times over the last 3 decades. Demographic data including age and gender were obtained. Medical school and residency training including whether an individual trained at a Historically Black College or University (HBCU) or Doctor of Osteopathic Medicine (DO) training program were included.

Results:
Of 1,114 pediatric surgeons who completed medical school in the United States, only 6 (0.5%) graduated from a HBCU medical school and 5 (0.4%) graduated from an osteopathic medical school. The total proportion of women in pediatric surgery steadily increased over time, rising from 16.9% of the workforce in 1996 to 28.0% in 2020. The average age at completion of training has also risen over time, from 35.0 years in 1996 to 36.8 years in 2010. An additional 92 pediatric surgeons completed medical school internationally. There was an increase in the number of international medical graduates joining the workforce between 2000 and 2010.

Conclusion:
The pediatric surgery workforce in the United States reflects limited educational diversity, with minimal representation of graduates from HBCU and osteopathic medical schools. The proportion of women in the field has increased, mirroring broader trends toward gender diversity in surgical training. The average age at completion of training has risen over time, potentially reflecting longer training pathways. These findings indicate that pathways into pediatric surgery remain restricted for certain groups, underscoring the need for targeted initiatives to enhance diversity within the pediatric surgical workforce.

Abbreviations: AMA - AMERICAN MEDICAL ASSOCIATION
HBCU - HISTORICALLY BLACK COLLEGE OR UNIVERSITY
DO - DOCTOR OF OSTEOPATHIC MEDICINE

QS29

ADVOCACY IN ACTION: A CENTURY OF PEDIATRIC SURGEONS ADVANCING CHILD HEALTH

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Abstract: Abstract
Purpose: Over the last century, pediatric surgeons have advanced not only operative techniques but also the institutional policies and societal frameworks essential to children's health. Advocacy has evolved in tandem with the specialty, reflecting themes that continue to shape the delivery of surgical care.

Methods: A historical review was conducted using APSA archives, policy briefs, meeting proceedings, and other gray literature, supplemented by interviews and archival research to identify milestones and policy outcomes.

Results: Pediatric surgery advocacy has advanced through overlapping eras. Professionalization was driven by leaders such as Coe and Beardmore, the creation of training programs by Clatworthy, the establishment of the Journal of Pediatric Surgery by Gans, and the founding of APSA in 1970. Institutional advocacy secured neonatal intensive care units, specialized anesthesia, and child-centered surgical environments. Public health engagement broadened the surgeon's role to include injury prevention, car seat legislation, helmet use, and newborn screening. Access advocacy aligned with Medicaid and CHIP expansion, ensuring care for vulnerable populations. Data-driven advocacy became foundational through ACS NSQIP-Pediatric and specialty registries that support quality improvement and resource justification. Innovation advocacy accompanied the adoption of fetal surgery, minimally invasive approaches, and the development of ethical frameworks for emerging technologies. Global advocacy expanded significantly over the last two decades, with pediatric surgeons contributing to the Global Initiative for Children's Surgery and advancing surgery as a vital child health service. Persistent challenges include workforce distribution, sustainability of practice models, and the risk of decreased access due to funding constraints.

Conclusions: For over a century, pediatric surgeons have been unwavering advocates for children at institutional, national, and global levels. Core themes include professional recognition, access to care, public health, quality and safety, ethical innovation, and international equity. As the specialty enters its second century, sustained advocacy will remain vital to ensure that every child receives safe, timely, and equitable surgical care.

Abbreviations:

Quickshots IV: History, Global, and General Surgery

11:15 AM – 12:00 PM

QS30

OUTCOMES AND DELAYS IN PEDIATRIC INTESTINAL ATRESIA SURGERY IN SOUTHERN IRAQ: A MULTICENTER QUALITY & SAFETY ANALYSIS

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Abstract: Background:
Neonatal intestinal atresia requires prompt surgical correction, but in resource-limited settings, delays in diagnosis and referral can worsen morbidity and mortality. The aim is to assess timing, complications, and outcomes of pediatric intestinal atresia repairs across hospitals in southern Iraq, and to identify modifiable delay factors for quality improvement.

Methods:
We performed a retrospective multicenter review of neonates (n = 88) undergoing surgical correction of intestinal atresia from 2018–2024 in three pediatric centers in Basra, Najaf, and Maysan. Data collected included demographics, referral time (hours from birth to admission), timing to surgery (hours from admission), type of atresia, surgical technique (primary anastomosis, stoma, etc.), perioperative complications, length of stay, and survival to discharge. Multivariate logistic regression identified predictors of complications and mortality. A subset (n = 20) of caregivers and referring clinicians were interviewed to explore system-level delays.

Results:
• Median referral delay was 36 hours (IQR 24–60 h). Median delay to surgery after admission was 18 h (IQR 12–30 h).
• Overall mortality was 21% (n = 19). Complication rate (e.g. anastomotic leak, sepsis) was 32%.
• Independent predictors of mortality included referral delay >48 h (OR 3.2, 95% CI 1.4–7.4, p = 0.005), low birth weight (< 2.5 kg) (OR 2.8, 95% CI 1.1–6.9, p = 0.03), and postoperative sepsis (OR 4.5, 95% CI 1.8–11.3, p = 0.001).
• Qualitative interviews revealed key delay factors: lack of neonatal transport, delayed recognition at peripheral hospitals, and financial barriers for referral.

Conclusion:
In southern Iraq, significant delays in referral and surgical intervention contribute to high mortality and complications in neonates with intestinal atresia. Addressing neonatal transport systems, early recognition protocols at peripheral centers, and financial referral support may improve outcomes.

Abbreviations:

QS31

SAFE EARLY DISCHARGE AFTER SUCCESSFUL PNEUMATIC REDUCTION OF INTUSSUSCEPTION IN CHILDREN: EXPERIENCE FROM A RESOURCE LIMITED SETTING

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Abstract: Purpose: Admission for observation after successful pneumatic reduction of intussusception remains common practice despite limited evidence supporting its necessity. We aimed to evaluate whether children could be safely discharged directly from the emergency department following successful reduction in a resource limited setting.

Methods: We reviewed medical records of all children with intussusception who achieved successful pneumatic reduction between 2020 and 2024 at our center. Patients were categorized into two groups: those discharged directly from the emergency department (ED, n=16) and those admitted for inpatient observation (n=35). ED observation time was compared with the duration of nil per oral (NPO) status among admitted patients as a surrogate for the postoperative monitoring period. Demographic, clinical, and laboratory characteristics were compared between groups using the Wilcoxon rank–sum and Fisher's exact tests. A p-value ≤0.05 was considered statistically significant.

Results: 51 children were included in the analysis, of whom 30 (59%) were male. There was no difference in mean age (ED: 20 ± 13 months vs inpatient: 17 ± 13 months, p=0.2) or weight (10.8 ± 3.7 vs 9.7 ± 3.0 kg, p=0.3) between groups. The duration of symptoms before presentation was similar at a median of 2 days in both cohorts. The most frequent presenting symptoms were abdominal pain (69% vs 66%, p=0.8), vomiting (56% vs 69%, p=0.4), and blood in stool (38% vs 49%, p=0.5). Laboratory parameters, including mean hemoglobin (10.8 ± 0.9 vs 10.9 ± 1.2 g/dL, p=0.8), white blood cell count (12.8 ± 4.1 vs 13.7 ± 4.8 ×10⁹/L, p=0.5), and serum electrolytes, were comparable between groups. The mean observation time in the ED was 9 ± 5 hours, compared with 13 ± 9 hours of NPO status among admitted patients (p=0.017). Recurrence occurred in one patient from the inpatient group within 48 hours, with no other differences in outcomes noted.

Conclusion: Our findings suggest that post-reduction hospital admission provided no additional clinical benefit. These results support the safety and feasibility of discharging patients directly from the emergency department following successful intussusception reduction.

Abbreviations: ED: Emergency department
NPO: Nil per oral

QS32

A PILOT INTERVENTION TO REDUCE STIGMA AND EMPOWER CAREGIVERS OF CHILDREN WITH STOMAS IN SOUTHWEST UGANDA

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Abstract: Purpose
Children with stomas and their caregivers often face severe stigma in low- and middle-income countries— limiting social support, healthcare-seeking, education access, and mental well-being. Beyond understanding these experiences, there is a need for interventions that reshape such narratives. Combining medical education and counseling can help caregivers challenge misconceptions, reduce stigma, and feel empowered to reintegrate into their communities, especially after stoma reversal.
Methods
We piloted a narrative reflection and education intervention at a regional referral hospital in southwestern Uganda with 20 participants, including caregivers and children with stomas. The intervention followed in-depth interviews on lived experiences. Sessions began with medical education led by a nurse, explaining the clinical causes of stomas and addressing misconceptions rooted in stigma. A certified mental health counselor then facilitated reflective discussions, encouraging participants to reframe their stories, share takeaways, and set empowerment goals. Sessions were recorded, translated into English, and transcribed using online transcription software. Transcripts were analyzed thematically to identify key patterns and common themes.
Results
Across six group sessions, caregivers described a transformation in how they understood and shared their experiences. Many rejected community misconceptions—such as witchcraft or ancestral curses—and instead reframed their children as “gifts from God” and sources of strength. Mothers expressed relief and greater understanding after learning about the medical causes of these conditions, which eased fear and uncertainty. They also reported renewed confidence in caregiving, a desire to return to work, and plans to support their children’s education. Participants highlighted growing emotional resilience and pride, often drawing strength from faith and perseverance. Several shared intentions to help other families by encouraging early medical care, offering support, and sharing affordable stoma care strategies. Many highlighted their optimism about reintegrating in their communities, publicly celebrating successful stoma reversals, and using their stories as tools to challenge stigma.
Conclusion
We conclude that integrating health education with psychosocial counseling positively supports

a transformation of stigmatized experiences into narratives of resilience and hope. This study highlights the potential of narrative-based interventions to reduce stigma and strengthen psychosocial well-being for families of children with stomas.

Abbreviations:

QS33

TIME TO SPARE: 2-MINUTE VS 1-MINUTE INTERCOSTAL NERVE CRYOABLATION DURING MINIMALLY INVASIVE REPAIR OF PECTUS EXCAVATUM

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Abstract: Background:
Intercostal nerve cryoablation (INC) during minimally invasive repair of pectus excavatum (MIRPE) has been shown to reduce hospitalization length and opioid use. However, the optimal duration of INC for effective pain control is unclear given the next generation cryoprobes. This study aimed to compare 2-minute versus 1-minute INC during MIRPE with respect to postoperative pain outcomes.
Methods:
We conducted a single-center retrospective study of patients aged ≤21 years who underwent MIRPE with INC between 2023 and 2025. INC to ≤ -40oC was performed under thoracoscopic guidance for 2 minutes or for 1 minute when the next generation cryoprobe became available. Demographic and clinical characteristics, operative details, and postoperative outcomes—including opioid use, length of stay (LOS), and discharge prescriptions—were compared.
Results:
A total of 146 patients were included: 90 (61.6%) in the 2-minute group and 56 (38.4%) in the 1-minute group. The groups were similar in age, gender distribution, weight, and BMI. There was no significant difference in Haller Index (2-minute: 4.45 [3.84, 5.21] vs 1-minute: 4.65 [3.90, 6.25], p=0.231), though the Correction Index was less severe in the 2-minute group (2-minute: 31.5% [22.00, 39.95] vs 1-minute: 36.0% [28.0, 46.0], p=0.008). Most patients had two pectus bars implanted, and both groups had a median of five intercostal nerves treated per hemithorax, Table 1.
Median operative time was 21.5 minutes longer in the 2-minute group ($p < 0.001$). Median LOS and inpatient opioid use were similar between groups. However, the 2-minute group received significantly higher opioid prescriptions at discharge, both in oral morphine equivalents per kg and number of doses ($p < 0.001$). There was no significant difference in the need for opioid refill prescriptions between groups. Furthermore, no differences were observed in 30-day emergency room visits or readmissions between groups.
Conclusion:
Reducing the duration of INC from 2 minutes to 1 minute does not adversely impact postoperative analgesic outcomes following MIRPE. A 1-minute INC significantly reduces operative time.

Abbreviations: INC: intercostal nerve cryoablation
MIRPE: minimally invasive repair of pectus excavatum

Table 1: 2-Minute vs 1-Minute INC During MIRPE

	2-minute N=90 (61.6%)	1-minute N=56 (38.4%)	*p-value*
Intercostal nerves treated/hemichest median [IQR]	5.0 [5.0, 5.0]	5.0 [5.0, 5.0]	0.501
Operative time (min) median [IQR]	159.50 [138.00, 203.04]	138.0 [104.0, 171.0]	**<0.001**
LOS (days) median [IQR]	1.0 [1.0, 2.0]	1.0 [1.0, 2.0]	0.857
Inpatient OME/kg/day; median [IQR]	0.17 [0.07, 0.27]	0.18 [0.08, 0.27]	0.806
DC OME/kg	1.39 [1.16, 1.64]	0.68 [0.53, 0.81]	**<0.001**
DC opioid doses	10.0 [10.0, 10.0]	5.0 [5.0, 5.0]	**<0.001**
Opioid refill	14 (17.7%)	10 (18.5%)	0.907
30 day ED	10 (11.5%)	4 (7.3%)	0.411
30 day readmission	3 (3.4%)	1 (1.8%)	1.000

QS34

SURGICAL ANTIBIOTIC PROPHYLAXIS UTILIZATION FOR PEDIATRIC THYROID SURGERY: A NSQIP-PEDIATRIC ANALYSIS

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Abstract: Purpose: Thyroid surgery is generally considered a clean procedure when performed for common pathologies such as thyroid nodules, malignancy, and thyroiditis. Currently, there are no clear pediatric-specific guidelines regarding the use of surgical antibiotic prophylaxis (SAP) for thyroid surgery. This study aims to understand the current utilization of SAP in pediatric thyroid surgery and its association with surgical site infection (SSI).

Methods: Pediatric patients (age < 18 years) who underwent thyroid lobectomy or total thyroidectomy between 2021-2023 were identified by CPT codes in the National Surgical Quality Improvement Program-Pediatric (NSQIP-P) database. Patients with ICD-10 codes concerning for pre-existing infection and other/concurrent procedures aside from laryngoscopy, laryngeal nerve monitoring, and parathyroid exploration were excluded. SSI, readmission, and reoperation were compared between those who did and did not receive SAP.

Results: Among 1,040 patients, 653 (62.8%) underwent total thyroidectomy, and 387 (32.7%) underwent thyroid lobectomy. 469 (45.1%) patients received SAP, and 571 (54.9%) did not. There was a higher percentage of urgent cases (49.3% vs 37.7%, p< 0.001) and inpatient surgeries (3.2% vs 0.2%, p< 0.001) in the SAP group compared to the No-SAP group. SAP was administered more commonly by pediatric otolaryngologists (68.9%) and adult otolaryngologists (48.6%) than pediatric surgeons (30.0%) and adult general surgeons (16.5%, p< 0.001). The overall rate of surgical SSI was 0.6% (n=6), with all SSIs occurring in the No-SAP group (1.1%, p=0.035) (Table 1). There was no difference in readmissions or reoperations between groups. All patients with SSI underwent total thyroidectomy. Of the six patients with SSI, 83.3% (n=5) had thyrotoxicosis, 83.3% (n=5) patients had a BMI >85th percentile, and 66.7% (n=4) were classified as ASA III. The number needed to treat for SAP administration was 95.2 to prevent one SSI.

Conclusions: SSI risk following pediatric thyroid surgery is extremely low. Patients undergoing total thyroidectomy for thyrotoxicosis and those with BMI >85th percentile, or ASA Class ≥III may be subgroups in which SAP should be considered. Others warrant appropriate antibiotic stewardship and are unlikely to benefit from SAP. The role of SAP for thyroid surgery may continue to evolve with additional data collection.

Abbreviations: SAP: Surgical Antibiotic Prophylaxis
SSI: Surgical Site Infection
CPT: Current Procedural Terminology
NSQIP-P: National Surgical Quality Improvement Program-Pediatric
ICD: International Classification of Diseases

BMI: Body Mass Index
ASA: American Society of Anesthesiologists

Table 1. Outcomes for pediatric patients undergoing thyroid surgery by SAP vs No-SAP.

	Overall[1] (n=1040)	SAP[1] (n=469)	No-SAP[1] (n=571)	p value[2]
Superficial SSI	6 (0.6%)	0 (0%)	6 (1.1%)	0.035
Readmission	9 (0.9%)	5 (1.1%)	4 (0.7%)	0.74
Reoperation	6 (0.6%)	2 (0.4%)	4 (0.7%)	0.70

[1] N (%)
[2] Fishers exact test, Wilcox rank sum test

QS35

INEQUITIES IN SURGICAL APPROACH: LAPAROSCOPIC VS OPEN PROCEDURES IN PEDIATRIC PATIENTS

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Abstract: Purpose:
The aim of this study is to investigate disparities in the utilization of laparoscopic versus open surgery among pediatric patients. Differences in resource use, clinical outcomes, and charges in laparoscopic versus open surgery were evaluated.

Methods:
The 2016-2022 HCUP KID database identified patients < 18 years who underwent common abdominal surgical procedures (Table 1). We described patient and hospital characteristics by surgical approach (laparoscopic vs open) and by using survey-weighted methods which incorporated discharge-level weights, hospital-level clustering, and stratification. We used propensity score methods to improve group comparability. Inverse probability treatment weights (IPTW) were created based on race, hospital setting, teaching status, and surgical approach to balance these groups. We then examined the relationship between surgical approach and predictors of laparoscopic surgery, resource use variables (LOS, charges), and clinical outcome variables (mortality, risk of mortality) using double robust adjusted regression models.

Results:
Among 172,516 patients, 28,007 (16.2%) underwent an open procedure. Black patients were found to have 15% lower odds of receiving laparoscopic surgery compared to White patients (OR 0.85, 95% CI: 0.78-0.92, p 0.0001), while Hispanic patients have 25% higher odds (OR 1.25, 95% CI: 1.12-1.29, p< 0.0001). Patients in rural settings have 50% lower odds of receiving laparoscopic surgery compared to those in urban areas (OR 0.50, 95% CI: 0.37-0.68, p< 0.0001). Patients at teaching hospitals have 40% higher odds of receiving laparoscopic surgery vs non-teaching (OR 1.41, 95% CI: 1.19-1.65, p< 0.0001). Laparoscopic procedures are associated with a 1.6-day shorter length of stay (MD -1.60, 95% CI: -2.01- -1.18, p< 0.0001). The average charges for laparoscopic procedures are $15,779 less than open procedures (MD -15779, 95% CI: -23257- -8300, p< 0.0001). The odds of in-hospital mortality for patients undergoing laparoscopic procedures are 0.383 times the odds for those undergoing open (OR 0.38, 95% CI: 0.32-0.45, p< 0.0001). Laparoscopic procedures have 1.157 times the odds of being in a lower APR-DRG risk of mortality group compared to undergoing open procedures (OR 1.16, 95% CI: 1.09-1.23, p< 0.0001).

Conclusion:
We conclude that laparoscopic surgery is associated with reduced hospital stays, lower costs, and improved outcomes and that significant disparities exist in its utilization among pediatric patients.

Abbreviations:

QS36

FROM SCHOOL TO SCALPEL: THE PEDIGREE AND PATHWAY OF THE PEDIATRIC SURGEON

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Abstract: Purpose:
Pediatric surgeons train across multiple institutions before entering fellowship, influenced by factors such as acceptance, cost, location, and program fit. This study examined how the training pathways of pediatric surgeons have evolved over the past three decades, focusing on the quality and ranking of training institutions.

Methods:
The American Medical Association (AMA) Physician Masterfile was utilized to identify individuals self-reporting as pediatric surgeons at six time points (1996, 2000, 2005, 2010, 2015, 2020). Data included demographics, medical school, general surgery residency, other fellowship training sites, as well as exposure to pediatric surgery fellowship programs. Medical school rankings were based on Admit.org rankings, while residency rankings were derived from Doximity reports. Physicians with incomplete training histories (< 4 years medical school or < 5 years surgical training) were excluded.

Results:
A total of 1,114 pediatric surgeons were identified, of whom 72% were male and 28% female. Nearly half (48.5%) graduated from a top-quartile medical school, and 17.5% (n=195) trained at a top 10 institution. Among those from top 10 medical schools, 76.9% were male and 23.1% female. During general surgery residency, 510 surgeons (45.8%) trained at a top 50 program and 170 (15.3%) at a top 10 program, with males comprising 71.8% and females 28.2%. Overall, 59.2% (n=660) had prior exposure to a pediatric surgery fellowship during medical school or residency. Additional fellowship training was common, with 8.8% reporting completion of a critical care fellowship prior to pediatric surgery.

Conclusion:
Over the past three decades, pediatric surgeons have predominantly trained at highly ranked medical schools and residency programs. This pattern underscores the central role of institutional reputation in shaping surgical careers and indicates that the pedigree of a pediatric surgeon is closely linked to prestigious institutions. More than half spent time at an institution with a fellowship highlighting the benefits of mentorship and exposure. Additionally, women remain underrepresented across all training levels, highlighting ongoing gender disparities within the field.

Abbreviations: American Medical Association (AMA)

QS37

THE RING OF FIRE: A HISTORICAL REVIEW OF CONTROVERSIES IN PEDIATRIC INGUINAL HERNIA REPAIR

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Abstract: Purpose: Inguinal hernias were described by ancient Egyptians, and surgical repair was first advocated for by the French surgeon Guy de Chauliac in the 14th century. With greater anatomic understanding and technological advances, surgical inguinal hernia repair (IHR) became more widespread in the late 19th century and is now among the most common pediatric operations worldwide. Nonetheless, controversies persist regarding optimal technique and timing, particularly in infants.

Methods: Current and historic literature was reviewed, focusing on the evolution of surgical pediatric inguinal hernia management.

Results: Sir William Banks (1882) first described a herniotomy technique involving ligation of the hernia sac without opening the external ring, favored in young children due to their short inguinal canals. Despite Bassini's description of suture reinforcement of the pelvic floor in adults, Ferguson and Potts (1899) endorsed high ligation alone as curative in pediatric hernias. Open high ligation remains the gold standard in pediatric IHR but has recently been challenged by the emergence of newer techniques.

Pediatric laparoscopic IHR was introduced by Montupet in the 1990s and was initially adopted by European pediatric surgeons. Over the past decade, laparoscopic IHR has grown rapidly in popularity in the United States, particularly in infants, despite limited long-term outcomes data in this age group. Several different laparoscopic strategies have been described but there is no current consensus regarding optimal approach. Additionally, few studies have focused on specific age groups or measured the impact of technical strategies (such as internal ring cauterization or permanent versus absorbable suture placement) during laparoscopic repair. With its inherent visualization of the contralateral internal ring, laparoscopic IHR has renewed questions about the benefits and risks of repairing the asymptomatic patent processus vaginalis and the utility of performing diagnostic laparoscopy during open IHR. Lastly, the timing of inguinal hernia repair in premature infants remains a matter of debate, with recent evidence challenging the dogma that IHR should be performed before neonates are discharged from the hospital.

Conclusions: Despite its nearly 150-year history, pediatric IHR continues to evolve, emphasizing the need for continued evaluation and refinement of surgical strategies to optimize outcomes in specific age groups.

Abbreviations: IHR: inguinal hernia repair

QS38

HISTORY OF FETAL INTERVENTION FOR CONGENITAL DIAPHRAGMATIC HERNIA

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Abstract: Congenital diaphragmatic hernia (CDH) is characterized by agenesis of the diaphragm leading to herniation of abdominal viscera into the thoracic cavity and concomitant hypoplasia of the lungs. Attempted surgical repair dates to the late 1800s, but the first reported surgical procedure to treat CDH in an infant who survived was performed in 1902. In 1946, the first successful repair of CDH within the first 24 hours of life was performed by Dr. Robert Gross who founded pediatric cardiac surgery. With this, the standard of care became emergent postnatal repair. However, mortality rates remained above 50% due to the pulmonary hypoplasia and pulmonary hypertension that are hallmarks CDH pathophysiology; therefore, the treatment paradigm shifted to physiologic stabilization prior to repair. In the 1970s, Dr. Michael Harrison, a surgical intern in Boston, assisted pediatric surgeon, Dr. W. H. Hendren with a CDH repair. Unfortunately, that patient passed from respiratory failure which Harrison noted was a consequence of pulmonary hypoplasia and not corrected through anatomic repair of the diaphragm. This notion sparked Harrison's interest in prenatal repair of CDH that fueled a career and ultimately the creation of the modern field of fetal surgery. While on sabbatical in Norway, he studied the national registry to find the true incidence of CDH and coined the term 'hidden mortality' which would underscore the importance of prenatal diagnosis that underlies all fetal intervention. In the 1980s, at UCSF, Harrison pioneered fetal surgery first through animal models at the UC Davis California National Primate Research Center. These studies were the foundation for prenatal repair of assuredly fatal conditions like severe CDH, and in 1986, the Fetal Treatment Program (FTP) at UCSF led by Harrison performed the first open fetal surgery for CDH. Based on its success, the FTP began the first NIH funded trial for fetal surgery in 1993. The results of the trial were pivotal for the future of treatment of CDH and the field of fetal surgery. This review details the history of fetal intervention for CDH, underscores the ethics of fetal intervention, discusses current therapy and research in the field, and future directions.

Abbreviations: CDH - congenital diaphragmatic hernia
UCSF - University of California, San Francisco
UC Davis - University of California, Davis
FTP - Fetal Treatment Program
NIH - National Institutes of Health

QS39

AN IMPROVEMENT IN CARE: THE HISTORY AND CURRENT MANAGEMENT OF BLUNT RENAL TRAUMA

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Abstract: Purpose: Although renal injuries only account for 3-4% of all pediatric trauma, current management is often patient and facility dependent. The historical standard of care was emergent operative intervention with nephrectomy. Imaging advancements and increased utilization of interventional radiology have made non-operative management the preferred treatment in the pediatric renal trauma population. We seek to explore the history of pediatric renal trauma management and contrast it with the current literature.
Methods: We reviewed current and historical literature regarding the management of blunt renal trauma including operative, non-operative, and intravascular interventions.in the pediatric population.
Results: Pediatric blunt renal injury prior to 1980 was treated with nephrectomy in most cases. Early studies noted severe renal injury most often occurred simultaneously with other operative intra-abdominal injuries. Post 1980, improvement in imaging techniques allowed for better staging and an increased emphasis on supportive and nonoperative treatment. Guidelines at this time were developed by the American Urologic Association and the Eastern Association for the Surgery of Trauma. Current management in the 21st century places an emphasis on nonoperative management as the standard of care for pediatric renal trauma. Angioembolization for hemodynamically stable patients with high grade (III, IV, V) blunt renal trauma and ongoing or delayed bleeding. Current management also places an emphasis on routine blood pressure checks to prevent post traumatic renal hypertension as no current studies exist tracking these patients long term. As with all pediatric blunt solid organ injuries, the primary aim is to manage blunt renal trauma conservatively with escalation to intervention based on clinical stability.
Conclusion: The management of pediatric blunt renal trauma remains institution dependent. Traumatic renal injury in the pediatric population previously was treated with emergent nephrectomy, however the priority now is organ preservation with conservative management or embolization. For pediatric patients requiring embolization or nephrectomy, further studies are needed on the incidence and severity of hypertension long-term. Additionally, implementation of conservative or intravascular management is limited by institutional pediatric interventional radiology capabilities. Further development of consensus pediatric blunt renal guidelines is necessary to improve organ preservation at non-tertiary centers and inform long-term care of patients requiring intervention.

Abbreviations:

Scientific Session 13: General/Thoracic

1:30 PM – 3:00 PM

S118

TO CUT OR TRANSFER? DELIVERY OF PEDIATRIC SURGICAL CARE TO OUTLYING NEONATAL INTENSIVE CARE UNITS – A NATIONAL SURVEY

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Abstract: Background: We aimed to describe the current landscape of pediatric surgical coverage provided to outlying neonatal intensive care units (NICUs) across the US.

Methods: The AAP Delivery of Surgical Care Committee administered a web-based survey regarding NICU coverage to 180 pediatric surgery division chiefs at Children's Hospital Association practices. Survey invitations were sent via email with two reminders. Descriptive statistics were calculated.

Results: Forty-nine division chiefs responded (response rate 27.2%); twenty-five (51%) cover additional NICUS (N=11 one; N=14 more than one) with 48% receiving supplemental pay. Reported motivations included to provide care to the community (44%), healthcare system referrals (32%), competition (32%), and hospital agreements (28%). If coverage ceased, infants would be transferred to the primary NICU (52%), transferred to a competing hospital (24%), or covered by another group (20%).

Twenty-two chiefs described coverage at 32 outlying NICUs, 76% of which were level III NICUs. Half have no affiliation with the primary hospital, 33% were in the same hospital system (9% for profit; 25% not-for-profit), and 15% in the same medical school. Outlying NICUs are a median of 9 miles from the primary center (IQR 2-14.25). Availability of consulting services is limited (Figure 1).

Only seven centers (22%) performed more than 10 neonatal cases annually; among these, half performed 1-10 index cases/year and one performed >10 index cases/year. Surgeons rounded at most sites (59%), usually daily or until the infant was stable (72%); two sites had no surgical rounds. For postoperative complications requiring operations, 53% would transfer to the primary NICU, 25% would operate locally, and the remainder reported decisions dependent on circumstances. Outpatient follow-up occurred at the primary center in 50% of cases, with subsequent operations there in 75%.

Conclusion: Half of pediatric surgery groups provide coverage to one or more outlying NICUs, but with low institutional case volume and high reliance on transfer to the primary center for complications. These findings underscore the need for regionalized strategies to optimize surgical care of these infants.

Abbreviations: AAP - American Academy of Pediatrics
NICU - neonatal intensive care unit
US - United States

S119

ROBOTICS TO THE RESCUE: STREAMLINING CARE FOR KIDS WITH MEDIAN ARCUATE LIGAMENT SYNDROME

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Abstract: Purpose: Median arcuate ligament syndrome (MALS) is a rare but lifestyle-limiting process for affected children. Despite 60 years of research, a standardized approach to care is lacking. This work aimed to 1) describe our institution's protocolized approach to MALS including pre-operative assessment and technique for robotic MAL release and 2) characterize post-operative outcomes of our population.

Methods: Adolescent patients at a quaternary care center who underwent robotic-assisted MAL release were included. Patients followed a standardized clinical pathway from pre-operative evaluation to post-operative follow-up. Fluoroscopic-guided celiac plexus block was performed by a single anesthesiologist. All robotic MAL operations were performed by two pediatric surgeons using a single robotic platform. Demographic, operative, and outcome data were collected.

Results: Nine patients (4 male, 5 female; median age of 15 years, IQR 14-16) underwent robotic MAL release. Eight received fluoroscopic-guided bilateral celiac plexus blocks with a mixture of ropivacaine, lidocaine, and dexamethasone with transient symptom relief (median duration 1.5 days, IQR 1.0–3.3); one patient did not undergo block due to insurance limitations. Median time from initial clinic visit to surgery was 28 days (IQR 15-48). The attached video is representative of our 2-surgeon, robotic approach. Median estimated blood loss was 5ml (IQR 2.5-3.5), and mean operative time was 2.1 ± 0.60 hours. Seven patients received a pre-operative truncal block. All patients were advanced to a regular diet and discharged on postoperative day 1, with one readmission for incisional pain requiring additional analgesia. Seven patients received short-course opioids postoperatively (mean 1.9 ± 1.3 days). At first follow-up (median 30 days), all patients reported complete resolution of preoperative symptoms, with one describing occasional nausea, although with improved celiac artery velocities on Doppler ultrasound. Three patients experienced self-limited intermittent diarrhea, and seven demonstrated weight gain at follow-up.

Conclusion: Implementation of a standardized, multidisciplinary protocol for pediatric MALS – including diagnostic celiac plexus block and robotic MAL release – resulted in uniformly short hospital stays and excellent symptom resolution. Our institutional experience underscores the value of a structured pathway, collaborative care, and the application of robotic technology in optimizing outcomes for this challenging and understudied pediatric condition.

Abbreviations:

S120

INTRAOPERATIVE CRYONEUROLYSIS IN CONJUNCTION WITH ERECTOR SPINAE PLANE BLOCKS DECREASE OPIOID USE AFTER ELECTIVE THORACOTOMY OR STERNOTOMY IN PEDIATRIC PATIENTS

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Abstract: Introduction: Cryoneurolysis is a growing post-operative pain management strategy, but pediatric literature focuses on chest wall deformities. Recently, cryoneurolysis has been shown to decrease post-operative opioid use in pediatric oncology patients undergoing thoracotomy. We investigated whether these findings extended to pediatric patients undergoing elective thoracotomy or sternotomy.

Methods: A single-institution retrospective review of 40 pediatric patients between 2015-2025 who underwent elective thoracotomy or sternotomy with or without intraoperative cryoneurolysis was performed. The primary outcome was post-operative morphine equivalents per kilogram (MME/kg). Secondary outcomes were opioids prescribed at discharge, 30-day readmission for pain, and pain medication requirement at follow-up. Inpatient pain management regimen descriptive statistics were collected. Multivariable linear regression assessed associations between the primary outcome and select factors.

Results: 23 patients received cryoneurolysis (17 thoracotomies, 6 sternotomies) and 17 did not (13 thoracotomies, 4 sternotomies). Patients who received cryoneurolysis were more likely to receive a concomitant ES block compared to control (74% vs 24%; p = 0.001). Patients who received cryoneurolysis and an ES block (n = 17) had significantly lower average MME/kg than patients who did not receive cryoneurolysis (0.56 MME/kg and 1.63 MME/kg, respectively, p = 0.03). Significantly fewer cryoneurolysis patients were discharged with opioid prescriptions (17% vs 70%; p = 0.0006). No difference was seen in 30-day readmission for pain (6% vs 4%; p = 0.83) or pain medication requirement at follow-up (12% vs 13%; p = 0.91) between the control and cryoneurolysis groups, respectively. Significant predictors of lower MME/kg were cryoneurolysis (p = 0.02) and ES blocks (p = 0.03).

Conclusion: Cryoneurolysis with ES block in combination was associated with lower MME/kg post-operatively, and cryoneurolysis alone was associated with significantly fewer opioid prescriptions at discharge. These results bolster the growing body of evidence that cryoneurolysis is an effective pain adjunct in pediatric patients undergoing thoracotomy or sternotomy. Furthermore, these results underscore the importance of multimodal pain control and a multidisciplinary approach to non-narcotic pain management as the combination of cryoneurolysis and ES blocks appear to have a synergistic effect on post-operative analgesia in this population.

Abbreviations: MME - morphine milliequivalents
kg - kilogram
ES - erector spinae

S121

ASSESSING PEDIATRIC FRAILTY: USE OF THE SURGICAL COMPLICATION INDEX FOR PEDIATRIC PATIENTS (SCIPP) SCORE TO PREDICT ADVERSE OUTCOMES FOLLOWING THORACIC SURGERY

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Abstract: Purpose: Frailty indices are used to assess risk of postoperative complications in the adult population, however similar scores in pediatric patients are lacking in supporting evidence or cumbersome for practical use. The Surgical Complication Index for Pediatric Patients (SCIPP) score, validated for use in pediatric neurosurgery patients, assesses seven components of frailty to produce a composite score: independence in performing activities of daily living (ADLs), autonomic function, body mass index (BMI), continence, previous admissions, mobility, and polypharmacy. This study aimed to understand the predictive performance of the SCIPP score in pediatric patients undergoing thoracic surgery.

Methods: A single center retrospective review of patients undergoing thoracic surgery from 2022-2025 was conducted. Patients with missing components of the SCIPP score, neonates, and those ≥18 years at time of surgery were excluded. Past medical history, functional status, operative details, and postoperative outcomes with 6 months follow-up were collected. Univariate logistic regression was used to determine the association between SCIPP scores and surgical complications. Poisson regression modeling assessed the relationship between hospital length of stay (LOS) and SCIPP scores.

Results: There were 374 patients in the cohort, with the most frequent indication for surgery being chest wall deformity (38.8%), followed by oncologic resection (13.9%) and congenital lung malformation (12.8%). The median age at time of surgery was 14.3 years (IQR: 5.9, 16.4). SCIPP scores were 0-1 in 69.3%, 2-3 in 19.8% and 4+ in 11.0% of patients. Logistic regression found that for every 1-point increase in SCIPP score, patients were 2.18 times more likely to have at least one surgical complication (95% CI 1.81, 2.64; $p< 0.0001$), including admission to the intensive care unit (ICU), need for postoperative intubation and unplanned re-operation. Similarly, length of stay (LOS) increased by 52% for each point greater in SCIPP score (95% CI 1.44, 1.60; $p< 0.0001$).

Conclusion: Use of the SCIPP score, a composite pediatric frailty index, can predict a patient's risk of postoperative complication and likelihood of increased hospital LOS following thoracic surgery. There is a role for SCIPP score utilization in the preoperative setting to optimize parental counseling, risk assessment and determination of prehabilitation needs.

Abbreviations: SCIPP- Surgical Complication Index for Pediatric Patients
ADL- activity of daily living
LOS- length of stay
ICU- intensive care unit

Table 1. Univariate logistic regression and Poisson regression evaluating the association between Surgical Complication Index for Pediatric Patients (SCIPP) score and postoperative complications, length of stay following thoracic surgery.

	OR[1]/IRR[2]	95% CI	p-value
All complications[1]	2.18	1.81, 2.64	*<0.0001*
ICU admission	2.20	1.82, 2.67	*<0.0001*
Postoperative intubation	2.25	1.81, 2.80	*<0.0001*
Unplanned reoperation	1.98	1.66, 2.36	*<0.0001*
Length of stay for all patients[2]	1.52	1.44, 1.60	*<0.0001*
Length of stay for patients undergoing oncologic resection[2]	1.18	1.03, 1.34	*0.0177*

(OR- odds ratio; IRR- incidence rate ratio; CI- confidence interval; ICU- intensive care unit)

[1]Postoperative complications were assessed using logistic regression and OR. [2]Length of hospital stay was assessed by Poisson regression modeling and IRR.

S122

OPERATIVE DECISION-MAKING IN ESOPHAGEAL ATRESIA WITH RIGHT ARCH-BASED VASCULAR RINGS: IMPACT OF LATERALITY, MULTIDISCIPLINARY REPAIR, AND PREVENTION OF REOPERATION

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Abstract: Purpose:
In esophageal atresia (EA) with a right aortic arch, the operative side and vascular anatomy can influence outcomes. A right-sided approach can risk entrapment of the EA anastomosis medial to the right arch, especially when an aberrant left subclavian artery and left ductal ligament form a complete vascular ring (VR). Because many infants undergo only echocardiography, incomplete imaging may miss this anatomy and contribute to complications. We reviewed our experience to assess how surgical laterality and repair strategy affect outcomes and reoperation rates.

Methods:
Single-center retrospective review of children with EA and VR (2007–2025). Demographics, anatomy, operative approach, and outcomes were analyzed, focusing on surgical laterality, concurrent versus sequential repair, and reasons for reoperation.

Results:
Twenty-three children were identified (83% type C EA). VR subtypes included right arch with aberrant left subclavian (70%), double arch (17%), and right arch with left ductal ligament (13%). Five (22%) underwent primary concurrent EA + VR repair at our center; 18 (78%) were referred for complications or persistent symptoms after prior EA and/or VR repair elsewhere. Among referrals, initial EA repair was left-sided in 11 and right-sided in 7; 9 (50%) had concurrent EA + VR repair, 6 (33%) sequential EA + VR repairs, and 3 (17%) EA-only repairs. Referral patients had high complication rates: leak 47%, refractory stricture 31%, recurrent fistula 27%, vocal fold immobility 56%, and 94% required reoperation. Indications included unresolved tracheomalacia or residual airway vascular compression (n=8), EA-related complications (n=5; leak, stricture, fistula), residual esophageal compression (n=4), and incomplete EA repair (n=4). Three reoperations were related to an anastomosis left medial to the right arch (“trapped esophagus”). In contrast, all primary concurrent multidisciplinary left-sided repairs had no leaks, strictures, or reoperations.

Conclusion:
EA + VR is a complex subset in which preoperative imaging, laterality choice, and repair strategy directly affect outcomes. Limiting the operation to the esophagus and attempting repair from the familiar right side can lead to persistent compression or reoperation. A comprehensive, multidisciplinary approach that addresses the airway, vascular ring, and esophagus together, often via a left-sided concurrent repair, optimizes exposure, ensures complete decompression, and minimizes complications.

Abbreviations: EA – Esophageal atresia

VR – Vascular ring

S123

RISK BEYOND REPAIR: CHARACTERIZING RESPIRATORY MORBIDITY FOLLOWING ESOPHAGEAL ATRESIA AND TRACHEOESOPHAGEAL FISTULA REPAIR

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Abstract: Background

Esophageal atresia with or without tracheoesophageal fistula (EA/TEF) is a rare congenital anomaly managed with early surgical repair. Despite improved survival, long-term respiratory morbidity remains a persistent challenge into adulthood for some patients. Multidisciplinary follow-up is recommended, however data to guide risk-based care remain limited. This study aims to evaluate respiratory morbidity in a large EA/TEF cohort and characterize high-risk subgroups.

Methods

We conducted a retrospective cohort study using the TriNetX research network, which includes over 152 million patients across 111 healthcare organizations. Patients aged 35 years or less with a diagnosis of EA/TEF (ICD-10 codes Q39.0–Q39.2) were identified and compared to a propensity score-matched control cohort without congenital anomalies and at least one well visit before the age of 18. Individuals with comorbid conditions known to independently affect respiratory outcomes were excluded. The primary outcome was composite respiratory morbidity, defined by ICD-10 codes for chronic symptoms, infections, structural airway anomalies, and ventilatory dependence. Prevalence, risk estimates, and Kaplan-Meier morbidity curves were calculated for the matched EA/TEF cohort and clinical subgroups.

Results

A total of 6,735 patients with EA/TEF were matched 1:1 to controls by age, sex, race, and ethnicity. EA/TEF patients had markedly higher rates of airway malacia (28.0% vs. 0.15%), respiratory support dependence (11.0% vs. 0.30%), and respiratory failure or distress (21.1% vs. 1.4%) (all $p < 0.0001$). Acute lower respiratory tract infection (28.7% vs. 11.8%), obstructive lung disease (28.0% vs. 10.9%), and recurrent pneumonia (7.0% vs. 0.15%) were also significantly more prevalent. Composite respiratory morbidity affected 58.4% of EA/TEF patients versus 32.8% of controls ($p < 0.0001$), with early and sustained divergence in Kaplan-Meier curves. The highest morbidity burden was observed in patients with secondary laryngotracheal anomalies (87.7%, $p < 0.0001$).

Conclusion

Despite early repair, patients with EA/TEF experience a substantial and enduring burden of respiratory morbidity. Persistent airway malacia, infection burden, and recurrent respiratory exacerbations are major drivers of progressive complications, including bronchiectasis, in adulthood. These findings highlight the need for coordinated longitudinal surveillance across pediatric and adult care to enable early detection and prevention of long-term pulmonary decline.

Abbreviations: EA/TEF = Esophageal atresia with or without tracheoesophageal fistula

S124

TRACHEOPEXY IN CHILDREN WITH BRONCHOPULMONARY DYSPLASIA AND SEVERE TRACHEOBRONCHOMALACIA: DEFINING CLINICAL PHENOTYPES AND OUTCOMES

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Abstract: Purpose
To define clinical phenotypes and outcomes following tracheopexy in children with bronchopulmonary dysplasia and severe tracheobronchomalacia.

Methods
We retrospectively reviewed all children with BPD (< 32 weeks' gestation and respiratory support at 36 weeks) undergoing tracheopexy for severe TBM (≥90% collapse on dynamic bronchoscopy) from December 2015 to January 2024. BPD severity was classified using Jensen criteria (grade 1: nasal cannula < 2 L; grade 2: HFNC, CPAP, or noninvasive ventilation; grade 3: invasive ventilation). Clinical and operative outcomes were analyzed. Phenotypes were defined by presenting symptoms.

Results
Twenty-four children met criteria (91.7% male). Median gestational age was 26 weeks (IQR 25.1–27), birth weight 0.7 kg (IQR 0.5–1), and age at surgery 1.1 years (IQR 0.6–1.5). Most had grade 3 BPD (79.2%). Preoperatively, 70.8% required invasive ventilation, 16.7% noninvasive support, and 12.5% room air; 66.7% had a tracheostomy. Pre-operatively, median airway collapse was 90% (IQR 77.5–100). Posterior tracheopexy was performed in all, via thoracotomy in 79.2%, adjunct bronchopexy in 91.6%, descending aortopexy 29.2%, and 1 patient (4.2%) underwent anterior tracheopexy. Complications included one esophageal stricture, one vocal cord dysfunction, and three others (seroma, post-pericardiotomy syndrome, cardiac arrest without mortality). One child required supplemental pexy.

Four phenotypes emerged: (1) severe respiratory events (cyanotic spells) n=13 (54.2%), (2) positive-pressure dependence (failure of extubation/noninvasive support with intent to avoid tracheostomy) n=4 (16.7%), (3) ventilator/tracheostomy dependence with high settings n=5 (20.8%), and (4) transition-phase (recurrent infections or to aid decannulation) n=2 (8.3%). Postoperative bronchoscopy showed improved collapse in 93.8%. Symptomatic improvement was documented in 19 of 24 children (79.2%). Improvement was highest in the respiratory-event group 84.6%, 60% in ventilator-dependent, and 50% in positive-pressure and transition-phase groups. Of those patients in the positive-pressure group 3 out of 4 avoided a tracheostomy. In the ventilator-dependent phenotype, median PEEP decreased from 12.0cmH_2O (IQR 11.0, 14.0) to 11.0 (IQR 9.0–14.0) at 1 month.

Conclusions
Tracheopexy in children with bronchopulmonary dysplasia and tracheobronchomalacia was safe and facilitated weaning of respiratory support. Outcomes varied across phenotypes, suggesting phenotype-based stratification may guide preoperative decision-making and

counseling. Prospective multicenter studies are needed to refine patient selection and compare surgical approaches.

Abbreviations: bronchopulmonary dysplasia (BPD); tracheobronchomalacia (TBM); high flow nasal cannula (HFNC), continuous positive airway pressure (CPAP)

Table 1 – Tracheopexy in Children with Bronchopulmonary Dysplasia and Severe Tracheobronchomalacia

Phenotype (n, %)	Median Age at Surgery (years, IQR)	% Lower Trachea Collapse Preop	Preop PEEP (cm H_2O [IQR])	Postop PEEP (cm H_2O [IQR])	Discharge Disposition (%)
Respiratory events 13 (54.2%)	0.9 [0.7, 1.1]	90.0 [70.0, 100.0]	12.5 [9.5, 16.2]	9.5 [6.0, 13.2]	23.1% home 30.8% rehab 46.2% retro-transfer
Positive-pressure dependence 4 (16.7%)	0.5 [0.5, 0.8]	95.0 [67.5, 100.0]	6.0 [6.0, 6.0]	0.0 [0.0, 0.0]	100% home
Ventilator-dependent 5 (20.8%)	1.4 [1.3, 1.6]	90.0 [80.0, 100.0]	12.0 [11.0, 14.0]	11.0 [9.0, 14.0]	20% home 60% rehab 20% retro-transfer
Transition-phase 2 (8.3%)	5.1 [5.0, 5.2]	90.0 [85.0, 95.0]	–	–	100% home

Median [IQR] displayed for continuous variables, n (%) displayed for categorical variables

S125

OPTIMIZING MANAGEMENT OF PEDIATRIC PRIMARY SPONTANEOUS PNEUMOTHORAX: A PHIS ANALYSIS (PHASE 1 OF 4)

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Abstract: Purpose: Presently, the optimal management strategy of primary spontaneous pneumothorax (PSP) is unclear. Some recommend observation while others favor surgical intervention, resulting in wide practice variation across the country. We aim to determine the best strategy for these patients, through a planned series of four studies, each building on data provided by the previous step.

In phase 1, using a large, national database, we establish a broad cohort of patients with PSP and compare short-term outcomes of those who underwent immediate surgical intervention (ISI) versus those who underwent observation (OBS).

Methods: This is a retrospective cohort study using the Pediatric Health Information System (2016-2022) identifying patients aged 11-19 years old at any U.S. hospital with a primary spontaneous pneumothorax encounter (ICD-10 J93.11). Patients were stratified into the ISI group if they underwent thoracoscopic resection-plication of bullae, including any pleural procedure (CPT 32655 and equivalent ICD-10-PCS code) during the index hospital encounter; those who did not were considered OBS. Group demographics and key outcome variables were compared using descriptive and inferential statistics.

Results: 1,364 patients were identified; 462 (34%) were classified as ISI while 902 (66%) patients were OBS. The ISI group had longer lengths of index hospital stay (median 6 vs. 2 days, $p< 0.0001$). Compared to the ISI group, the OBS group had higher rates of return to ED within 30 days (14.86% vs. 11.04%, $p=0.05$), readmission within 30 days (11.86% vs. 6.06%, $p=0.0007$), operation within 30 days (9.09% vs. 2.81%, $p< 0.0001$) and operation any time after index hospitalization (25.28% vs. 18.4%, $p=0.0042$). In the ISI group, operation of the contralateral lung was 1.58% within 30-days and 12.44% anytime.

Conclusion: Thoracoscopic intervention of primary spontaneous pneumothorax during initial hospitalization was associated with fewer ED return visits, 30-day readmissions, and subsequent operation. These findings suggest that surgical intervention may be a more effective initial strategy than observation for these patients.

Abbreviations: PSP: primary spontaneous pneumothorax
ISI: immediate surgical intervention
OBS: observation
PHIS: Pediatric Health Information System

Table 1. Comparison of Outcomes in Primary Spontaneous Pneumothorax for Non-operative versus Operative Groups

	Non-Operative (N = 902)	Operative (N = 462)	*p*-value
Index length of stay	2, 1-3	6, 4-9	**<0.0001**
ICU use	50 (5.54%)	28 (6.06%)	0.7
Ventilator use	20 (2.22%)	2 (0.43%)	**0.01**
ED revisit within 30 days of index hospitalization	134 (14.86%)	51 (11.04%)	**0.05**
Readmission within 30 days of index hospitalization	107 (11.86%)	28 (6.06%)	**0.0007**
Operation within 30 days of index hospitalization	82 (9.09%)	13 (2.81%)	**<0.0001**
Operation any time after index hospitalization	228 (25.28%)	85 (18.40%)	**0.0042**

S126

DOES THE RESECTION MARGIN MATTER? THE RELATIONSHIP BETWEEN HISTOLOGIC FINDINGS AND RECURRENCE IN CHILDREN WITH SPONTANEOUS PNEUMOTHORAX

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Abstract: Background
There has been increasing evidence supporting a surgery-first approach for the treatment of pediatric primary spontaneous pneumothorax (sPTX) for the prevention of recurrence. Apical wedge resection is commonly performed, but the recommended volume of parenchyma removed has yet to be defined. This study sought to correlate clinical recurrence with pathologic findings at the resection margin.
Methods
A retrospective review was conducted of children undergoing apical wedge resection for sPTX at a free-standing children's hospital from 2018 to 2022. The primary outcome was ipsilateral recurrence. Histologic variables assessed were resection volume, presence of diseased pleura/parenchyma at the resection margin, and distance from the staple line to the nearest bleb.
Results
This cohort included 30 patients with a total of 41 sPTX events. Patients were predominantly male (90%, n= 27) with a median age of 16 years and BMI of 18.5 (IQR 16.0-19.9). There were six (15%) episodes of ipsilateral recurrence.
The mean distance from the closest bleb to the staple line was significantly shorter in the recurrence group compared to those without recurrence (6.8mm vs. 3.3mm, p=0.04). All patients (100%) with recurrence had abnormal pleura at the initial resection margin, compared to 40% without recurrence (p=0.007). Similarly, patients with recurrence were more likely to have abnormal parenchyma at the margin compared to those without (83% vs 43%, p=0.03). There was no difference in the volume of resection. Five patients underwent repeat surgery for recurrence with a larger average resection margin on their second surgery (8.0mm vs 3.3mm). Three (60%) of these patients had persistently abnormal pleura or parenchyma at the resection margin. Only 20% (n=1) had a subsequent recurrence. There was no difference in margin size between patients with and without a postoperative air leak (5.6mm vs 6.4mm, p=0.64)
Conclusion
Histologic findings at the resection margin appear to have clinical relevance. The presence of abnormal pleura/parenchyma at the resection margin and decreased distance between the staple line and nearest bleb were associated with ipsilateral pneumothorax recurrence. To avoid recurrence, surgeons may consider seeking a wider margin of normal lung tissue.

Abbreviations: sPTX- spontaneous pneumothorax

	Ipsilateral Recurrence (n=6)	No Ipsilateral Recurrence (n=35)	*p-value*
Total	6	35	
Distance from bleb to staple line, mean (mm)	3.3	6.8	0.04
Abnormal pleura at margin (n, %)	6 (100%)	14 (40%)	0.007
Abnormal parenchyma at margin (n, %)	5 (83%)	15 (43%)	0.03
Volume of resection (cm^3)	11.2	17.7	0.3

Table: Pathologic findings of specimens in patients with and without ipsilateral recurrence of pneumothorax

S127

A MULTI-INSTITUTIONAL EVALUATION OF DISCHARGE OPIOID PRESCRIBING PRACTICES FOLLOWING MINIMALLY INVASIVE REPAIR OF PECTUS EXCAVATUM: ROOM FOR IMPROVEMENT

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Abstract: Purpose:
Minimally invasive repair of pectus excavatum (MIRPE) is often associated with significant postoperative pain. In 2024, clinical practice guidelines on opioid prescribing for acute pain were published by the American Academy of Pediatrics (AAP). The guidelines included avoiding opioid monotherapy, limiting prescriptions to < 5 days, co-prescribing naloxone, and avoiding co-prescribing sedating medications. We sought to evaluate discharge opioid practices in pediatric patients following MIRPE across 10 children's hospitals prior to the guideline release.

Methods:
Patients ≤ 21 years of age who underwent MIRPE (January 2022- October 2023) were retrospectively reviewed. Patients who underwent MIRPE for recurrent disease or had an open repair were excluded. Data collected included patient demographics, perioperative details and discharge prescriptions. Findings were summarized using descriptive statistics.

Results:
A total of 528 patients underwent MIRPE. Median age was 15.6 years [IQR 14.5, 17.0] and median weight was 56.8 kg [IQR 50.5, 64.0]. Majority of patients were male (86.3%), white (77.5%) and non-Hispanic/Latino (67.6%). Median preoperative Haller index was 4.5 [IQR 3.8, 5.7] and Correction index was 33.0% [IQR 26.2%, 43.2%]. One bar was placed in 50% of patients, two bars in 47.5% and three bars in 2.5%. Cryoablation was used in 90% of patients while only 3.6% of patients used On-Q pumps. Median hospital length of stay was 1 day [IQR 1.0, 2.0]. Most patients were discharged with non-opioids, such as acetaminophen (98.9%) and

NSAIDs (97.9%), and about one third (31.8%) were prescribed a neuropathic pain medication. Opioids were prescribed in 494 (93.6%) patients; 95.5% were for < 5 days (Table 1). No patients received tramadol, codeine or long-acting opioids. The median number of doses of opioids prescribed was 10.0 [IQR 6.7, 15.0]. Naloxone was prescribed for 36 (7.3%) patients discharged with opioids. No patients were discharged with opioids as monotherapy. Benzodiazepines were prescribed for 76.9% of patients and muscle relaxants for 24.1% of patients. Co-prescription of opioids, benzodiazepines and/or muscle relaxants occurred in 79.8% of cases.

Conclusion:
Analgesic prescribing practices following MIRPE met some but not all current AAP opioid prescribing guidelines. Improvement efforts should prioritize naloxone prescription with opioids and minimizing co-prescription of sedating medications.

Abbreviations: MIRPE: Minimally invasive repair of pectus excavatum
AAP: American Academy of Pediatrics

Table 1: Discharge Opioid Prescribing Practices' Alignment with Select 2024 AAP Acute Pain Clinical Practice Guidelines

AAP Guideline Recommendation	Alignment with Guidelines
No opioid monotherapy	528/528 (100%)
<5 days opioids	504/528 (95.5%)
No codeine or tramadol	528/528 (100.0%)
No long-acting opioids	528/528 (100.0%)
Naloxone prescription if opioids prescribed	36/494 (7.3%)
No co-prescription with sedating meds	107/528 (20.3%)

S128

NON-OPERATIVE MANAGEMENT OF PEDIATRIC EMPYEMA

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Abstract: Introduction: Primary chemical fibrinolysis is standard treatment for pediatric empyema at our institution. In 2009, we published a randomized trial showing no clinical benefit to video-assisted thoracoscopic surgery (VATS) compared to fibrinolysis alone. After garnering more experience we abandoned traditional criteria for failure. This resulted in our 2019 report where only 4.5% of fibrinolysis patients went to VATS. We are now reporting our contemporary experience since the last update.
Methods: A retrospective chart review study was performed for patients aged less than 18 years old diagnosed with empyema from March 1, 2019 to July 1, 2025. Our protocol includes placing a 12Fr or smaller drain with three doses of tissue plasminogen activator (tPA) (4mg/40ml NS) administered once daily. Exclusion criteria included immunocompromised status, alternative indications for thoracostomy tube and those with known contraindications to VATS, namely necrotizing pneumonia, bronchopleural fistula or lung abscess.
Results: A total of 70 patients met inclusion criteria. Median age was 4.6 years [IQR 2.1 - 7.4]. Median length of stay was 8 days [IQR 5-11]. All patients were initially treated with fibrinolysis. No patients subsequently required VATS. Median days with thoracostomy tube was 5 days [IQR 4-7]. Median number of tPA doses was 3 [IQR 3-3]. Fifteen patients (21%) underwent more than one course of tPA, defined as three doses. Interventional radiology (IR) placed chest tubes in 62 (88.6%) patients. Chest tube replacement was required in 23 patients (32.9%), either due to tube dislodgement or to target residual undrained collections. There were no 30-day readmissions. There was one emergency department visit within 30 days unrelated to this disease process.
Conclusions: Thoracoscopic decortication appears unnecessary in the treatment of pediatric empyema. The establishment of a standardized treatment protocol facilitated multidisciplinary alignment between infectious diseases, IR and surgery. This, in addition to the implementation of primary and repeated chemical fibrinolysis, enabled universally effective non-operative management.

Abbreviations: video-assisted thoracoscopic surgery (VATS), tissue plasminogen activator (tPA), normal saline (NS), interventional radiology (IR)

Scientific Session 14: General

1:30 PM – 3:00 PM

S129

IMPACT OF SURGICAL APPROACH ON EARLY GROWTH IN PRETERM INFANTS WITH SPONTANEOUS INTESTINAL PERFORATION

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Abstract: Purpose

Previous studies showed peritoneal drain placement and laparotomy for spontaneous intestinal perforation (SIP) are equivalent in mortality, short-term outcomes, and neurodevelopmental progression; however the impact on growth and nutrition remains unclear. We hypothesized that neonates with SIP undergoing laparotomy will exhibit a greater decline in normalized weight during NICU hospitalization compared to drain placement.

Methods

Infants with SIP treated at our quaternary referral center from 2017 to 2025 were analyzed as a retrospective cohort. Patients with necrotizing enterocolitis or those that expired before six weeks of life were excluded. The laparotomy group included neonates undergoing primary laparotomy and laparotomy following drain placement. Nutritional intake and growth parameters (weight, length, and normalized weight: z-score derived from the Fenton curve) were collected. Wilcoxon's rank sum test was used to analyze continuous variables, and Chi-square or Fisher's test ($n < 5$) for categorical variables, with $p < 0.05$.

Results

52 neonates (54% male) were included; 23 were treated with peritoneal drain alone and 29 with laparotomy (6 primary, 23 drain followed by laparotomy). Groups were similar in gestational age at birth, birth weight, age at SIP, risk factors, and comorbidities.

Compared to drain, the laparotomy group experienced a significantly worse decline in normalized weight (z-scores -0.405 vs –0.730, p=0.036), falling off their respective growth curve. However, there was no difference in absolute weight change during the immediate 6-week period post-therapy (+0.72kg drain, +0.80kg laparotomy, p=0.54). The laparotomy group took significantly longer to reach full enteral feeds without TPN support (37.5d vs 95.0d, $p < 0.0001$) but they had equivalent caloric intake (108.5 vs 108.0 kcal/kg/day). 41% (12) of the laparotomy group required TPN support through ostomy reversal surgery for growth.

There was no difference in NICU length of stay post-therapy (102d vs 110.5d, p=0.34). The laparotomy group had more operations (1 vs 3, $p < 0.001$) and were more likely to have G tube placement (13% vs 59%, p=0.002).

Conclusion

Patients with SIP treated with drain placement alone demonstrated superior short-term growth. These results suggest an initial trial of management with drain placement may provide neonates with SIP the best chance for growth in the critical early weeks of life.

Abbreviations: SIP (spontaneous intestinal perforation)
NICU (neonatal intensive care unit)
TPN (total parenteral nutrition)

S130

POSTOPERATIVE ANTIBIOTIC CONTINUATION DOES NOT REDUCE INFECTIOUS COMPLICATIONS AFTER ELECTIVE PEDIATRIC OSTOMY REVERSAL: A NSQIP PEDIATRIC ANALYSIS

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Abstract: Introduction: The optimal duration of perioperative antibiotic prophylaxis for elective colostomy reversal in children remains unclear. With no clear consensus regarding length of treatment, antibiotic regimens vary widely among clinicians despite limited evidence supporting extended use. This study aimed to evaluate whether continuation of perioperative antibiotics beyond surgery completion reduces post-operative infectious complications in pediatric ostomy reversal.

Methods: A retrospective cohort study was conducted using the NSQIP pediatric database and the Pediatric Surgical Antibiotic Prophylaxis files from 2021-2023. Children < 18 years undergoing elective ostomy reversals were identified by CPT codes 44620, 44625, and 44626. Exclusion criteria included immunodeficiency, prior transplantation, malignancy, age < 28 days old, outpatient surgery, and missing antibiotic data. Patients were categorized as receiving antibiotics intraoperatively versus continued postoperatively. The primary outcome was wound infection (superficial, deep, and organ/space). Secondary outcomes included pneumonia, urinary tract infections (UTI), hospital length of stay (LOS), and days from operation to discharge. Logistic regression and Wilcoxon rank-sum tests were used for analysis.

Results: A cohort of 2,064 patients (median age of 331 days) were included; 60.4% continued antibiotics postoperatively. Groups differed by race, wound class, transfusion, minimally invasive surgical approach, cardiac risk factors, and preoperative albumin levels. On multivariate analysis, post-operative antibiotic continuation was not associated with lower odds of wound infection. Higher preoperative albumin correlated with reduced wound infection risk. No differences were observed in wound infection subtype, UTI, pneumonia, LOS, or days to discharge between groups. Hypoalbuminemia (< 3.0 g/dL) was associated with prolonged hospitalization (OR 19.29, 95% CI 7.52-31.06, p-value 0.001). Among children < 1 year, post-operative antibiotic continuation was not protective, while term birth was associated with increased risk of wound infection (OR 2.58, 95% CI 1.24-5.36, p-value=0.011).

Conclusion: Continuation of antibiotics beyond the perioperative period after elective ostomy reversal in children was not associated with reduced rates of wound or other infections. Higher preoperative albumin levels were protective against postoperative wound infection, whereas hypoalbuminemia predicted longer hospitalization. These findings suggest that extended postoperative antibiotic use may not confer additional benefit and optimizing preoperative nutritional status may play a greater role in reducing infectious complications.

Abbreviations: Urinary tract infections = UTI
Total Length of stay = LOS

S131

A MULTI-INSTITUTIONAL ANALYSIS OF FACTORS ASSOCIATED WITH EARLY ILEOCECECTOMY IN PEDIATRIC CROHN'S DISEASE

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Abstract: Introduction

Up to one-third of patients with Crohn’s disease (CD) will require surgery, most commonly ileocecectomy for terminal ileal disease. Given limitations of prior single-institution studies and emerging adult data suggesting benefits to early surgery, we explored factors associated with early ileocecectomy in a multi-institutional pediatric CD cohort.

Methods

We conducted a retrospective cohort study using data from four academic institutions collected via an anonymized REDCap database. Patients < 22 years with CD who underwent ileocecectomy between 2010-2022 were included. Early surgery was defined as ileocecectomy within 6-months after diagnosis. Demographics, disease progression (abscess, perianal disease, stricture, fistula), CD-related medication exposure (e.g., 5-aminosalicylic acid [5-ASA], corticosteroids, immunotherapy, anti-TNF therapies), and outcomes were collected. Multivariable logistic regression evaluated associations between early surgery and pre-operative and post-operative factors.

Results

Among 192 pediatric patients, 45 (23.4%) underwent surgery within 6 months of diagnosis. Median time to surgery was 0.2 years (interquartile range [IQR]: 0.1-0.3) in the early group and 3.6 years (IQR:1.9-6.4) in the late group. Compared to those undergoing later surgery, early surgery patients were older at diagnosis (15.1 [IQR:13.7–17.4] vs 13.0 years [IQR:10.2–15.4], p=0.001), received fewer pre-operative medications (2 [IQR:1–2.25] vs 3 [IQR:2–4], p< 0.001), and were less likely to have stricturing disease (62.2% vs 79.6%, p=0.03). Pre-operative use of 5-ASA (aOR 0.33, 95%CI 0.13–0.77), anti-TNF therapy (aOR 0.38, 95%CI 0.16–0.92), immunotherapy (aOR 0.25, 95%CI 0.09–0.63), and a higher number of pre-operative medications (aOR 0.49, 95%CI 0.33–0.68) were associated with lower odds of early surgery after adjusting for age, sex, race, institution, and progression of disease. Corticosteroid use was not significantly associated with surgery timing. Early surgery was not associated with 30-day reoperation, post-operative medication use (5-ASA, corticosteroids, immunotherapy, anti-TNF), or CD-related ED/hospital visits within two years.

Conclusion

In this multi-institutional cohort of pediatric CD patients who underwent ileocecectomy, use of 5-ASA, anti-TNF therapy, immunotherapy, and more pre-operative medications was associated with lower odds of early surgery. These associations held after adjusting for disease progression, suggesting variation in pre-operative treatment strategies among those who underwent early surgery. Ongoing efforts should focus on prospective risk stratification and guidance for timely surgical referral.

Abbreviations: Crohn's disease (CD)
5-aminosalicylic acid [5-ASA]
interquartile range [IQR]
adjusted Odds Ratio (aOR)

S132

MANAGEMENT OF INTRA-ABDOMINAL ABSCESSES IN PEDIATRIC CROHN'S DISEASE

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Abstract: Purpose:
Intra-abdominal abscess (IAA) is a complication of Crohn's disease (CD), with a cumulative incidence of 16% by age 10. Management of IAA in pediatric CD is not well described. This study describes the clinical characteristics, treatment strategies, and outcomes of children with CD and IAA.
Methods:
We conducted a retrospective cohort study of pediatric CD patients with IAA from 2009-2024. Our treatment algorithm prioritized antibiotic therapy and drainage (if possible) prior to surgical intervention. Descriptive statistics and comparative analyses were performed according to treatment modality.
Results:
Sixty-two patients (mean age 14.6 years) were included; 42% were newly diagnosed with CD at IAA presentation. Mean abscess size was 4.1 ± 2.1 cm (median volume 10.3cm³, IQR 5.7-33.1). Larger abscesses (median ≥5.0 cm) were more frequently managed with interventional radiology (IR) drainage and/or surgery, whereas smaller abscesses (≤ 3.3cm) were treated with only antibiotics ($p = 0.0021$). Treatment failure occurred more often in outpatients than inpatients (60% vs. 35%, $p=0.0064$). Overall, 29 patients (47%) underwent same-admission emergent surgery, including 15 ileocecal resections (ICR), 10 ICR+ileostomy, 2 ileostomies, 1 subtotal colectomy+ileostomy, and 1 laparoscopic abscess drainage. Median time to emergent surgery was 11 days. Compared to elective surgeries (n=23, 37%), emergent surgeries had higher rates of laparotomy (33% vs. 13%, $p< 0.0001$), stoma (50% vs. 22%, $p< 0.0001$), and longer postoperative length of stay (15.5 vs. 5.5 days, $p=0.001$), but time to biologic initiation did not differ ($p=0.83$). Among patients initially treated with IV antibiotics alone, 35% required emergent surgery (median 11 days) and 44% underwent elective surgery (median 63 days). All 6 patients who initially received antibiotics with IR drainage eventually required surgery.
Conclusion:
This represents the largest pediatric cohort of patients with IAA and CD. Most children with CD and IAA ultimately required surgery (84%). Larger abscesses were more likely to need invasive management. While nearly half of patients required emergent surgery, one-third underwent elective surgery. Elective operations were associated with significantly lower rates of stoma, laparotomy, and shorter postoperative length of stay. Prospective multi-institutional studies are required to assess best practice for this complicated patient population.

Abbreviations: IAA: intra-abdominal abscess
CD: Crohn's disease
IR: interventional radiology

Table 1. Outcomes by treatment group.

Outcomes	Outpatient (n=5)	IV antibiotics (n=43)	IR drain (n=6)	Surgery (n=6)	IR drain + surgery (n=2)	*p-value*
Failure initial management, n (%)	3 (60%)	17 (39.5%)	2 (33.3%)	1 (16.7%)	0 (0%)	0.0064
Emergency surgery, n (%)	2 (40%)	16 (37.2%)	4 (66.7%)	6 (100%)	2 (100%)	0.0001
Antibiotics duration (days)	47.5 (22.5-97.3)	28 (17-69)	36.5 (22-50.5)	26.5 (19.5-52)	16.5 (4-29)	0.58
LOS (days)	0 (0-0)	6.5 (4-17.8)	13 (3-22)	16 (8.5-21)	11.5 (7-16)	0.53
Interval before biologics (days)	20 (7-129)	66 (42-96.5)	67 (49.3-439.5)	33 (22.3-127)	48 (33-63)	0.13
Readmission at 60 days, n (%)	0 (0%)	9 (21.4%)	1 (16.7%)	2 (33.3%)	0 (0%)	0.023
Recurrence at 60 days, n (%)	0 (0%)	8 (18.6%)	1 (16.7%)	1 (16.7%)	0 (0%)	0.05

Data are median (IQR) or n(%). Kruskal-Wallis test used for continuous variables; Fisher's exact test for categorical variables.

S133

PILONIDAL CYST LASER EXTIRPATION (PCLE) IN ADOLESCENTS AND YOUNG ADULTS: A RETROSPECTIVE REVIEW OF A NOVEL, MINIMALLY INVASIVE TECHNIQUE FOR EFFECTIVE OUTPATIENT MANAGEMENT

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Abstract: Purpose:
Pilonidal cyst disease primarily affects adolescents and young adults, with over half of cases occurring in patients 25 years or younger. Traditional operations, from incision and drainage to wide excision with flap reconstruction, are associated with prolonged healing, technical difficulty, morbidity, recurrence, and increased healthcare utilization. These factors make the disease particularly disruptive in this active population. PCLE is a minimally invasive outpatient procedure designed to reduce these burdens. This study evaluates outcomes and predictors of recurrence following PCLE in a single-surgeon cohort.

Methods:
A retrospective review of 91 consecutive patients treated with PCLE between 2017 and 2025 was performed. The primary outcome was overall success, defined as eradication of disease without recurrence, including those healed after a repeat procedure. Secondary outcomes included first-pass success, recurrence by prior surgical history, and predictors of recurrence using multivariate logistic regression. Variables analyzed included cyst length, number of pits, skin punch size (2 mm vs 5 mm), and perioperative use of betadine, phenol, or topical antibiotics. Demographics, follow-up duration, and treatment setting (office versus ambulatory surgery center) were also recorded.

Results:
The mean age was 20.5 ± 3.7 years (range 14–25). Median follow-up was 427 days (IQR 230.5–682.5; range 40–3068). The overall success rate was 98.9% (90 of 91), with first-pass success in 89.0% (81 of 91). Patients with prior surgery (n=8) had a 25% recurrence rate (2 of 8) versus 9.6% (8 of 83) in surgery-naive patients; this difference was not significant (OR 2.09, 95% CI 0.30–14.37, p=0.45). Cyst length showed a nonsignificant trend (p=0.065), while the number of pits, punch size, and adjunctive perioperative use of betadine, phenol, or topical antibiotics were not associated with recurrence. Most cases (87.5%) were completed in the office, with 12.5% in an ambulatory center.

Conclusions:
PCLE achieved nearly 99% success, with most patients cured after a single treatment. Although recurrence was more frequent in those with prior surgery, no factor independently predicted recurrence. Its high efficacy, low morbidity, and feasibility in the office setting support PCLE as an effective first-line therapy for pilonidal disease in young adults.

Abbreviations: PCLE = Pilonidal Cyst Laser Extirpation

Table. Key Outcomes of Pilonidal Cyst Laser Extirpation (PCLE) in Adolescents and Young Adults

Category	Variable	n (%) or Median (IQR)	Multivariate OR (95% CI)	p-value
Demographics	Age (years)	20.0 (18.0–23.5)	0.96 (0.79–1.17)	0.70
	Male / Female	67 (73.6) / 24 (26.4)	1.41 (0.26–7.52)	0.69
Clinical Characteristics	Prior pilonidal surgery	8 (8.8)	1.97 (0.29–13.26)	0.49
	Cyst length (cm)	7.0 (5.0–8.0)	1.32 (0.95–1.85)	0.10
	Number of pits	4.0 (3.0–5.0)	0.92 (0.61–1.38)	0.68
Treatment Setting	Office based	77 (87.5)	-	-
	Ambulatory surgical center	11 (12.5)	-	-
Outcomes	Overall success	90 (98.9)	-	-
	First pass success	81 (89.0)	-	-
	Recurrence	10 (11.0)	-	-

S134

COMPARISON OF NISSEN FUNDOPLICATION AND GASTROJEJUNOSTOMY TUBE PLACEMENT: A COST AND OUTCOMES ANALYSIS USING A MULTI-INSTITUTIONAL DATABASE

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Abstract: Background: Gastroesophageal reflux disease (GERD) in medically complex children often requires surgical management when refractory to medical therapy. Nissen fundoplication (NF) and laparoscopic jejunostomy (J-tube) placement are two primary approaches, yet comparative data remains limited. This study aims to evaluate clinical outcomes and resource utilization associated with NF versus J-tube placement among pediatric patients ≤5 years old.
Methods: A retrospective cohort study was conducted using the Pediatric Health Information System (PHIS) database from 2016-2024. Children ≤5 years undergoing either NF or J-tube placement for severe GERD were included. Patients with concurrent procedures, incomplete data, or both procedures during the same admission were excluded. Illness severity and mortality risk were derived from the All Patient Refined Diagnosis Related Group (APR-DRG) system within PHIS. Bivariate analyses were performed to compare demographics, hospitalization characteristics, and 30-day outcomes.
Results: A total of 4,581 patients were identified (J-tube = 3,509; NF = 1,072). Median age was lower in the J-tube group (11 months, IQR 4–25) than NF (15 months, IQR 5–34; $p < 0.0001$). NF patients had shorter median LOS (5 vs. 20 days, $p < 0.0001$) and lower adjusted hospitalization charges ($82.9k vs. $245.5k, $p < 0.0001$). High illness severity and mortality risk were more prevalent among J-tube patients (89.1% vs 53.0% and 53.7% vs 28.3%, respectively; $p < 0.0001$). Thirty-day ED revisits were more common after J-tube placement (16.5% vs 12.1%, $p = 0.0005$), as were readmissions (27.2% vs 15.4%), and returns to the OR (13.0% vs 6.2%, $p < 0.0001$). Acute kidney injury and urinary tract infection were more common following J-tube placement (AKI 2.1% vs 0.8%, $p = 0.0043$; UTI 1.3% vs 0.4%, $p = 0.0083$).
Conclusion: NF was associated with lower severity of illness, shorter LOS, and lower adjusted surgical costs compared to GJ tube placement but was performed in less medically complex children. These findings highlight the need for individualized decision-making based on patient complexity and long-term healthcare resource utilization. Future studies should evaluate longitudinal outcomes and cost-effectiveness to better guide surgical management of pediatric GERD.

Abbreviations: Pediatric Health Information System (PHIS)
Gastroesophageal reflux disease (GERD)
Nissen fundoplication (NF)

Table 1. Summary of Key Perioperative and 30-Day Outcomes for Nissen Fundoplication vs. Jejunostomy Tube Placement (PHIS 2016–2024).

Characteristic	J-tube (n = 3,509)	Nissen (n = 1,072)	*p*-value
Age at Surgery (months, md, IQR)	11 (4–25)	15 (5–34)	<0.0001
LOS (days, md, IQR)	20 (8–62)	5 (2–13)	<0.0001
Adjusted Total Charges ($1,000, md, IQR)	245.5 (72.5–887.5)	82.9 (50.1–281.3)	<0.0001
High Illness Severity Level	3127 (89.11%)	568 (52.99%)	<0.0001
High Mortality Risk	1885 (53.72%)	303 (28.26%)	<0.0001
30-day ED Revisit	580 (16.53%)	130 (12.13%)	0.0005
30-day Readmission	953 (27.16%)	165 (15.39%)	<0.0001
30-day Return to OR	455 (12.97%)	66 (6.16%)	<0.0001
Acute Kidney Injury	72 (2.05%)	8 (0.75%)	0.004
Urinary Tract Infection	47 (1.34%)	4 (0.37%)	0.008

Continuous variables reported as median (IQR). p values from Wilcoxon rank-sum or chi-square tests as appropriate.

S135

CULTURED THYMUS TISSUE IMPLANTATION FOR CONGENITAL ATHYMIA: SURGICAL OUTCOMES AND DOSE-EFFECT ANALYSIS.

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Abstract: Purpose: Cultured thymus tissue implantation (CTTI) is the only treatment for congenital athymia, a rare immune deficiency associated with DiGeorge syndrome, 22q11.2 deletion syndrome, CHARGE syndrome and FOXN1 deficiency. It results in early mortality due to overwhelming infections and immune dysregulation. Our aims were to report surgical outcomes of the implantation procedure and evaluate the dose-effect relationship.

Methods: We analyzed patients in prospective, single-arm open-label studies (IRB Pro00104164), who underwent allogenic CTTI in the quadriceps muscle, between 1993 and 2021. We reviewed reported adverse events, CTT doses (and naïve T-cell reconstitution 12 months after transplantation. Linear regression analysis was performed to evaluate dose-effect relationship.

Results: A total of 107 children underwent CTTI. Nine (8.4%) surgery-related adverse effects (Clavien-Dindo grade I or II) were observed: 5 cases of wound dehiscence (3 requiring antibiotic therapy), 2 stitch abscesses treated with antibiotics, 1 surgical site bleed and 1 surgical site edema managed with compression. Of the 107 children, 97 had treatment-naïve congenital athymia. Among these, 64 had both a dose reported, and T-cell flow cytometry performed 12 months post-implantation. The median delivered dose was 13.263 mm2/m2 (range 4.901-21.734 mm2/m2). Naïve CD4 T-cell reconstitution (naïve CD4>100 cells/mm3) was observed in 66.7% (38/57) 12 months after implantation, however, the number of T-cells (CD3, CD4, CD8 and naïve CD4) did not significantly correlate with the administered dose (CD3: r=0.0472, p=0.7112, CD4: r=0.2149, p=0.0882, CD8: r=-0.048, p=0.7111, naïve CD4: r=0.0847, p=0.5504, Figure).

Conclusion: Allogenic CTTI is a safe procedure that is well-tolerated by an immunocompromised population with only mild surgical wound complications. Whereas naïve CD4 T-cell are observed 12 months post-implantation, the dose of CTT does not correlate with the magnitude of the T-cell reconstitution.

Abbreviations: CTTI = Cultured thymus tissue implantation

S136

NATIONAL TRENDS IN AGE AT KASAI FOR INFANTS WITH BILIARY ATRESIA, 2005-2025

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Abstract: Purpose: For infants diagnosed with biliary atresia (BA), age at Kasai hepatoportoenterostomy (Kasai) is a critical determinant of long-term outcomes. Prior research has suggested that even a one-day delay in date of surgery decreases transplant-free survival. We evaluated contemporary trends in age at Kasai in the United States, both across and within demographic sub-groups.

Methods: We retrospectively analyzed all infants with BA who underwent Kasai between 1/1/2005-7/31/2025 using the Pediatric Health Information System, a national administrative database. We categorized infants into five time periods (2005-2009; 2010-2014; 2015-2019; 2020-2022; 2023-2025). Quantile regression models ($\tau = 0.5$) assessed for unadjusted and adjusted associations between age at Kasai and time period. The adjusted model controlled for race/ethnicity, insurance status, and the presence of BA-associated comorbidities. To account for clustering within hospitals (intra-class correlation = 0.031), a bootstrap method was used to calculate cluster-robust 95% confidence intervals and P-values.

Results: 2,449 infants with BA underwent Kasai across 49 children's hospitals from 2005-2025. 55% were non-White (Black: 16%, Hispanic: 18%, other race/ethnicity: 21%) and 42% did not have commercial insurance. Median age at Kasai was 58 days (IQR 41-73). Time to Kasai improved significantly across study time periods in both the unadjusted and adjusted models, with the lowest median age seen during the COVID-19 period. In the adjusted model, median age at Kasai decreased by 7 days between 2005-2009 and 2023-2025 (95% CI -12 to -3, $P< 0.05$). Infants who were Black, Hispanic, and other race/ethnicity underwent Kasai approximately 5 days later than infants who were White (all $P< 0.05$). Insurance status was not associated with median age at Kasai ($P=0.254$). Infants with comorbidities underwent Kasai 7 days earlier compared to those without (95% CI -9.5 to -4, $P< 0.05$) (Table 1).

Conclusions: Median age at Kasai hepatoportoenterostomy has significantly improved since 2005, which illustrates meaningful nationwide progress. However, non-White infants have consistently undergone Kasai at later ages. Future hospital-based interventions to streamline timely access to subspecialty care for infants with biliary atresia must target minority populations. Additionally, the national implementation of policies such as universal screening may help to accelerate biliary atresia diagnoses across all infant demographics.

Abbreviations: BA = biliary atresia
Kasai = Kasai hepatoportoenterostomy

S137

LONG-TERM OUTCOMES FOLLOWING MESO-REX BYPASS WITH DIFFERENT INITIAL CONDUITS: A 25-YEAR INSTITUTIONAL EXPERIENCE OF 200 PATIENTS

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Abstract: Introduction
The treatment of extra-hepatic portal vein obstruction (EHPVO) with a Meso-Rex Bypass (MRB) is well described. However, long term outcomes and comparison patency rates of various mesenteric bypass conduits is lacking. The purpose of this investigation is to determine patency rates under various bypass conditions, including re-do bypass options following an initial EHPVO surgery.

Methods
A prospectively collected database of all pediatric patients that underwent a surgical procedure for EHPVO at a quaternary stand-alone children's hospital from 1997 to 2025 were reviewed. Patients identified as having a meso-rex bypass were selected. Patients with major abdominal, specifically major hepatic surgery including liver transplantation were excluded. Patient's demographics, pre-operative clinical characteristics and operative details were reviewed. Comparison of MRB patency rates (includes need for interventional radiology procedures) were revied by initial conduit type including internal jugular vein (IJV), inferior mesenteric vein (IMV), Gortex Graft (GG) or autologous vein (AV) as well as secondary EHPVO operation at an outside facility.

Results
A total of 230 underwent a MSB over the study period, 179 met study criteria. The mean age at time of surgery was 5.4 years old and 51% were female. The major presenting symptom of EHPVO was GI bleeding in 54% of patients and hypersplenism in 35% of patients. 16.5% of patients had a hypercoagulable state and 14.7% had a history of an umbilical catheter. A total of 125 patients underwent a primary MRB with a IJV with a patency rate of 95.2%. 27 patients underwent an IMV conduit with a patency rate of 91.6% and 8 patients had either a Gortex Graft or Coronary or Splenic vein conduit with a patency rate of 87.5%. 19 patients had a prior EHPVO procedure at an outside facility, prior to MRB at our institution with an overall patency rate of 84.2%. Median follow-up of patients was 4.3 years.

Conclusion
Long term patency rates for a MRB is best achieved with a primary IJV conduit, though IMV conduits offer excellent outcomes. Though patency rates drop for secondary MRB following a previously attempted EHPVO surgery, long term patency rates remain acceptable at 85%.

Abbreviations: extra-hepatic portal vein obstruction (EHPVO); Meso-Rex Bypass (MRB); internal jugular vein (IJV), inferior mesenteric vein (IMV), Gortex Graft (GG) or autologous vein (AV)

S138

SURGICAL MANAGEMENT OF HEPATOBLASTOMA WITH MAJOR VASCULAR INVOLVEMENT: A CASE SERIES OF EXTENDED HEPATECTOMIES WITH VASCULAR RECONSTRUCTION OR REPAIR

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Abstract: Introduction:
Previous investigations have demonstrated excellent survival for children with POST-TEXT III and IV hepatoblastoma lesions treated with non-transplant resections. The current investigation reviewed the efficacy of non-transplant resections for hepatoblastoma lesions with major vascular involvement.

Methods:
All pediatric patients undergoing a hepatic resection for hepatoblastoma at our institution from 2000- 2023 were identified. Individual operative reports were reviewed for patients who underwent an extended hepatectomy with vascular reconstruction or repair secondary to tumor involvement.
Results:
Over the study period, 120 patients underwent a hepatectomy for hepatoblastoma, 12 of which underwent an extended hepatectomy with vascular reconstruction or repair for tumor involvement. Preoperative grouping after neoadjuvant chemotherapy was POST-TEXT II in 1 patient, POST-TEXT III in 5 patients and POST-TEXT IV in 6 patients. All vascular reconstructions for hepatoblastoma involved outflow vessels- either the hepatic veins or the IVC. 8 patients had skeletonization of the hepatic veins with primary repairs of vessels, while 4 patients underwent major vascular reconstruction. For the vascular reconstructions- two patients had both the IVC and the right atrium reconstructed with pericardial patch. The additional two patients had reconstruction of the hepatic veins and IVC with Gortex interposition graft. 5-year overall survival for this cohort was 83.3%.

Conclusion:
Non-transplant extended hepatic resection for pediatric primary hepatic tumors, even in the setting of vascular involvement, may provide outcomes comparable to transplantation when performed at high-volume centers with expertise in pediatric hepatobiliary surgery.

Abbreviations: None

Scientific Session 15: Education and Innovation

1:30 PM – 3:00 PM

S139

FROM ASPIRATION TO ATTRITION: A QUALITATIVE STUDY OF GENERAL SURGERY RESIDENTS' CAREER DECISIONS AWAY FROM PEDIATRIC SURGERY

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Abstract: Purpose: Pediatric surgery (PS) has a long-standing reputation as a highly desirable specialty with a competitive fellowship match process. However, recent years have demonstrated a decline in the number of fellowship applicants, raising concerns about trainee interest in the specialty. We sought to understand why general surgery residents who once expressed a strong interest in PS but ultimately did not pursue it came to that decision.

Methods: General surgery (GS) residents and recent GS graduates from across the United States who at one point in their training aspired to be a PS but ultimately did not do so were recruited via purposive and snowball sampling to participate in semi-structured qualitative interviews conducted from June-September 2025. Open-ended questions were designed to explore trainees' initial interest in PS, reasons for not pursuing the specialty, and suggestions for how to improve the pathway for future trainees. Interview transcripts were inductively coded by two members of the research team, which were then thematically analyzed.

Results: Twelve participants were interviewed including 9 current GS residents (postgraduate year 4-7) and 3 recent residency graduates (class of 2022-2025) from nine institutions across the country. Reasons for their initial interest in PS included their personal experience as a patient, a desire to work with children, positive clinical experiences, early exposure as a student, and interest in PS pathophysiology. Residents' decisions to change their minds encompassed five themes (Table 1). Interviewees provided a variety of suggestions for how PS can attract and retain interested residents, including (1) re-evaluation of fellowship research requirements, (2) consideration of new training pathways to increase opportunities for PS care delivery, (3) interventions to improve the fellowship experience, (4) opportunities faculty to foster an inclusive environment for junior trainees, and (5) transparency about the job market for PS faculty positions.

Conclusion: GS residents who had a genuine interest in pediatric surgery expressed a variety of reasons for deciding to pursue a different career pathway. These included personal, interpersonal, and specialty specific factors. While some of these factors are intrinsic to the field, there are opportunities for interventions to promote and sustain future trainee interest.

Abbreviations: Pediatric Surgery (PS)
General Surgery (GS)

Table 1: Key themes influencing general surgery trainees' decisions against pursuing pediatric surgery

Major Theme	Subtheme(s) Representative quotes	
(1) Recognition that the specialty was not a good fit	a) *Emotional toll of working with sick or injured children* "Taking care of sick patients, taking care of very sick children, was actually, uh, much harder to do, particularly once I had children myself." (I8) "I realized that while I love kids, I could not handle bad outcomes. And to this day, I still am not great at handling and letting go of bad outcomes, and it is completely amplified with children." (I10)	b) *Types of cases and pathologies did not fit trainee's personal interests* "It just wasn't a feeling of good fit. I thought it would be well aligned with what I wanted, and then when I was sort of experiencing it on a day-to-day basis, it didn't feel like it fit me as well as some of the things that I had been doing before." (I9) "As the month progressed, seeing the breadth of everything they did. I just felt like there was so much to learn, and so much to know. And so, it was just so much... All of it was so much. Over time, I was just kind of like, I don't know that I want to do this much with my career." (I5)
(2) Competitiveness of the fellowship match process	a) *No guarantees for match success* "[Pediatric surgeon mentor] had in his head, 'Here's the formula for how to match. Interestingly, that formula doesn't always work. So [resident A] didn't really follow that and they matched. [resident B], followed it to a T, and they're still applying, now their third time" (I12) "The mold to become a pediatric surgeon in the United States is that you have to go to a wildly competitive residency program. You have to do some mind-boggling research and publish in Nature and Cell and all of these places. You have to have the biggest people [...] write you a letter of recommendation. [...] The opportunity cost is too high, because I can go into something else, I would have a job, I don't risk a 50% match rate" (I3)	b) *Emphasis on research is not a realistic metric* "I don't know, like... It becomes kind of like a pageantry show in terms of how many publications you have and all that stuff, so... but that's not gonna change, right? Because there's only a certain number of cases, there's only a certain number of people they can let in every year." (I3) "Honestly, I think it's unfortunate that there's so much emphasis on research to get into a pediatric surgery fellowship, because – at least from what I've seen, if you're not at a big academic medical center, there's not a ton of opportunities for research once you actually get out into practice, and so it's kind of interesting that that is the bar that's used to measure" (I4)
(3) Rigor of fellowship training	"I watched the fellows, and I said, I don't want that life." (I5) "It's not just one year. I feel like a lot of things you can do for a year, right? It's 12 months, you can, like, barrel through. But that second year where you're tired, now you're the senior fellow, you're supposed to be taking the junior fellow through cases, you're supposed to be a leader, you're supposed to be organizing all the conferences and organizing all the residents. That is grueling. Yes, yes. Oh, and possibly at home with kids, or thinking about starting a family, or freezing your eggs, like, right?" (I6)	
(4) Ineffective mentorship	"It felt like the field... is developed in a way that is... we're peds surgeons, you have to earn your place here, and you have to show us that you earn it. Which is valid, but it just feels like there's, like, a cement wall that you have to pound through to get to that point. So that would be one, to work as a community to be more open and accepting." (I10) "The faculty are focused on the fellows, I would say. And, I didn't feel unsupported by the faculty, in the sense, like, I never felt like they would have abandoned us, or that I didn't have anybody I could ask questions to, or scared to talk to them. But I didn't feel like any of them were making a significant effort to pull me in to be interested." (I5)	
(5) Limited future career opportunities	"And after the fellowship and finding a job and not knowing where you're gonna live. You have no control over that, really, because it's just such a small community and so competitive. And so, unless you know someone that knows someone, and things are guaranteed, that's... too much stress for a lot of people." (I6) "As much as I absolutely love pediatric surgery, both the fellowship process and also the job process, you don't have a lot of say in where you end up. It just became very apparent to me that for my family what was going to be needed was being able to end up back home. It was really important" (I4)	

S140

PREFERENCING SIGNALING FOR PEDIATRIC SURGERY FELLOWSHIP: PERSPECTIVES OF PROGRAM DIRECTORS AND APPLICANTS

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Abstract: Purpose:
"Preference signaling" is a new feature within ERAS allowing applicants to indicate special interest in a limited number of programs at the time of application. Preference signals are used in general surgery, and pediatric surgery is considering adoption. This study aims to understand program directors' (PDs) and applicants' perceptions of the current application process and impact of preference signaling to inform future pediatric surgery fellowship selection practices.

Methods:
PDs/Associate PDs (APDs) and applicants from the 2024-2025 cycle were invited to participate in virtual interviews regarding current challenges in the application process and anticipated implications of preference signaling. Purposive and snowball sampling were employed to recruit interviewees representing different regions/program sizes for PDs and differing interview opportunities, experiences, and associations to pediatric surgery fellowship programs for applicants. De-identified transcripts underwent qualitative analysis using open, inductive coding, followed by thematic analysis.

Results:
Thirteen PDs/APDs alongside eleven applicants participated. Prevailing PD/APD themes (Table 1) included: PDs/APDs had mixed opinions regarding signaling: (1) PDs/APDs noted signals may provide additional information to guide interview selection, however, (2) the absence of a signal may disadvantage applicants, despite many being genuinely interested in matching at most programs. (3) Signals risk being misleading, as applicants often lack sufficient program information before interviews to make informed signaling decisions. Applicant themes (Table 1) included: (1) signaling can provide some empowerment to certain applicants with specific interests. However, applicants are concerned about signal misallocation due to (2) limited knowledge regarding programs when signals must be assigned and (3) changing perspectives about programs post-interview (e.g. low rank programs pre-interview becomes a top rank programs post-interview). Both cohorts acknowledged the interpretation of signals depend on the number allotted, with disagreement about the optimal number.

Conclusion:
Program Directors expressed ambivalence and applicants were cautious regarding preference signaling in pediatric surgery. While some recognized potential benefits in improving equity and refining interview selection, others worried signals could disadvantage applicants and mislead programs as signals are assigned pre-interview when applicants have limited knowledge regarding most programs. If implemented, a cautious pilot accompanied by rigorous evaluation is warranted to determine effectiveness and guide future policy.

Table 1: Themes and Representative Quotes Related to Preference Signaling from Program Director Interviews

Theme	Representative Quote
(1) Pediatric surgery differs substantially from general surgery with reduced need to filter applications due to smaller applicant pool	"I wonder can it be taken from what's a very sort of large a pool of programs [general surgery] with, you know, proportionally large applicant pool. And is it as effective when you adapt that? Or what kind of modifications would you need to make when you adapt that to our situation…I had a different mindset in going into fellowship, and part of that is because of the limited amount of programs there are, and the competitive nature of it. Where you just wanted to cast as wide a net as possible and match at a program period" (P1)
(2) PRO: PDs/APDs noted signals may provide additional information to guide interview selection	"Within the middle tier and lower tier applicants. If you get a signal from one of them that you otherwise would have screened out during that 1st phase, you might look at them again a little closer" (P13)
(3) PRO: Signaling could promote applicant equity by formalizing a process that currently occurs unofficially through well-connected mentors	"Just getting in the door. You're almost on equal footing once you're in the door…If you signal me, you're gonna get in. And if you, even if you're like, you know, position 15. You didn't signal me. I'd rather interview someone that has a higher likelihood of like wanting to come here" (P7)
(4) CON: The absence of a signal may disadvantage applicants, despite many being genuinely interested in matching at most programs	"But if a signal existed and someone didn't send us a signal. Would that subconsciously affect the way we think about them? Like, maybe right? Like, I think that's a risk the applicant is taking and in some ways that might create a disadvantage" (P3)
(5) CON: Signals risk being misleading, as applicants often lack sufficient program information before interviews to make informed decisions on where to signal	"And maybe the whole idea of signaling before you've even interviewed at the place is also a little premature right? I just think the interview is very important. Part of the selection process from both ends like from the applicant side and from the program side" (P4)
(6) Interpretation and value of signals depend on the number allotted, with disagreement about the optimal number	"If I knew individuals could signal 15 programs… it could be that people are just signaling any place along the east coast because they want to be there, but they could very well change their minds later. That's why I think more selective signaling is probably better" (P2)

S141

ADDRESSING PEDIATRIC SURGERY TRAINEE AUTONOMY: EXPERIENCES FROM A LIVE, PIG-BASED MINIMALLY INVASIVE SIMULATION WORKSHOP

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Abstract: Purpose: Unique challenges of pediatric surgical training derive from high-complexity index operations. Educators must safely balance allowing graduated operative autonomy for trainees; however, evidence supporting simulation-based interventions for trainees is limited. This study aimed to evaluate a novel minimally invasive, live pig-based simulation workshop to improve trainee operating confidence, entrustment, and competency.

Methods: A regional, multi-institutional one-day simulation workshop was designed for pediatric surgery trainees. Live, anesthetized 1-month old, 18-kg pigs were used, real surgical instruments were provided, and trainees were tasked with performing laparoscopic Nissen fundoplication, laparoscopic duodenal atresia repair, and thoracoscopic lobectomy under the guidance of moderators. Trainees completed surveys before and after the workshop assessing operative confidence, entrustment, and teaching level.

Results: Six trainees participated from four NY institutions, including two senior and two junior fellows, one general surgery resident, and one research fellow. The trainees' median age was 34.5 years, 83% of the cohort were female, 67% were White and 33% were Asian. No trainee had previously participated in a live animal pediatric surgery simulation. Confidence scores for all operations significantly improved following the simulation (Figure 1). The median pre- to post-simulation operating confidence scores significantly improved for Nissen fundoplication, from "(2) Direct Supervision" to "(3) Indirect Supervision" (p=0.046), and were similar pre- to post-simulation for duodenal atresia repair and lobectomy. The median pre- to post-simulation teaching confidence scores significantly improved for Nissen fundoplication (p=0.046) and duodenal atresia repair (p=0.034), with trainees achieving the level of "(3) Some Help" post-simulation. Teaching confidence scores were similar pre- to post-simulation for lobectomy. All trainees agreed the workshop enhanced their operative understanding, identified knowledge gaps, replicated real surgical environments, improved intraoperative decision-making, bridged the gap between theory and practice, and supported autonomy. Trainees noted simulation workshops should be regularly instituted within pediatric surgery training curricula.

Conclusion: Animal model–based simulation workshops provide an effective means for safely expediting autonomy and learning in pediatric surgery trainees performing index operations. Leveraging resources and incorporating trainees from various regional programs may help overcome barriers associated with providing an immersive simulation model to a small number of trainees within a highly specialized field.

Abbreviations:

S142

COACHING IN SURGICAL TRAINING: A FIVE-YEAR STUDY OF WELLNESS, RESILIENCE, AND BURNOUT IN PEDIATRIC SURGERY

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Abstract: Purpose:
Burnout, disengagement, and challenges to well-being remain prevalent among surgical trainees and contribute to attrition, decreased professional fulfillment, and negative impacts on patient care. Coaching has emerged as a tool that may enhance resilience, self-reflection, and overall wellness. While coaching has been explored in other fields, data on its role in surgical training remain limited. This study aimed to evaluate the impact of a five-year, multi-cohort coaching program on validated measures of well-being, resilience and burnout among pediatric surgery trainees.
Methods:
From 2020-2025, 144 pediatric surgery fellows participated in a one-year structured coaching program with pediatric surgeon coaches trained in positive psychology coaching. A well-being survey was administered at the beginning of the year and again at the end of the year. Survey incorporated validated measures, including PERMA profiler (evaluating well-being), professional fulfillment index including burnout measures, self-valuation scale evaluating self-care, dispositional resilience scale measuring hardiness, measure of current status assessing ability for stress management, sense of gratitude, and intolerance of uncertainty scale measuring perception of uncertainty as stress. Baseline demographics were recorded. Statistical analyses included descriptive analyses, as well as paired t-tests and two sample t-tests for comparison. This study was IRB approved.
Results:
Sixty-one (42.4%) of coached fellows completed both the pre- and post-program surveys. This group served as the population for analysis. Sixty-four percent were female, 61% were junior fellows, 61% were age 30-35, 74% were white, and 15% Latinx. Coaching was associated with improvement in scores across several domains: well-being (PERMA), burnout, self-valuation, hardiness or resilience, and measurement of ability to handle stress. (Table 1) Both junior and senior fellows showed improvement in scores. Gratitude was high amongst this population with a mean score above 12 out of a maximum of 14 points. Professional fulfillment and intolerance of uncertainty scores did not show significant change.
Conclusions:
Implementation of a structured coaching program for pediatric surgery trainees was associated with improvements in well-being, resilience, self-valuation, and coping skills, with a reduction in burnout scores. Coaching may represent a valuable resource to promote wellness and professional growth during surgical training.

Abbreviations:

Table 1. Comparison of Pre- and Post-Coaching Survey Scores

Measure	Pre-Mean (SD)	Post-Mean (SD)	Mean Diff	p-value
PERMA (Well-being)	59.23 (6.33)	60.84 (7.15)	+1.61	**0.04**
Professional fulfillment	2.69 (0.73)	2.68 (0.97)	-0.01	0.94
Burnout	1.35 (0.76)	1.17 (0.72)	-0.18	**<0.001**
Self-valuation	6.05 (2.72)	7.77 (3.46)	+1.72	**<0.001**
Dispositional Resilience Scale	29.54 (5.61)	30.64 (4.70)	+1.10	**0.02**
Measurement of Current Status	7.72 (2.04)	8.33 (2.10)	+0.61	**0.01**
Gratitude	12.38 (1.46)	12.21 (2.30)	-0.17	0.60
Intolerance of Uncertainty Scale	33.74 (5.36)	33.48 (6.03)	-0.26	0.70

S143

THE COACH PERSPECTIVE: UNDERSTANDING THE IMPACT OF POSITIVE PSYCHOLOGY ON PEDIATRIC SURGEON COACHES

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Abstract: Purpose:
Professional development coaching is an evidence-based technique shown to result in improved physician well-being and decreased burnout. A coaching program, pairing pediatric surgeons with pediatric surgical trainees, was initiated in 2020 to improve well-being and professional development in trainees. While the trainees were the main focus of the project, this study analyzed the experience of the coaches to determine if the role of coach improves well-being, professional fulfillment, and resilience.

Methods:
From 2020-2025, pediatric surgeons were invited to participate in the APSA (American Pediatric Surgical Association) coaching program. Coaches underwent mandatory training focusing on positive psychology, reflection, and strength-building. Coaches were paired with 1-2 trainees and were encouraged to meet for at least 3 coaching sessions during the academic year. Coaches completed a pre- and post-program survey containing demographics and validated well-being measures. Statistical analyses were conducted using paired t-tests. This study was IRB approved.

Results:
Eighty-two pediatric surgeon coaches participated in the program and completed both pre- and post-program surveys. Of these, 49 (60%) had been in surgical practice for fewer than 15 years, while 32 (40%) had been in practice for more than 15 years. Mean professional fulfillment score improved from pre-coaching (mean=2.67, sd=0.82) to post-coaching (mean=2.87, sd=0.77), p=0.009. A dose effect was noted in burnout scores, with coaches who had >3 coaching sessions scoring lower on burnout (mean=0.75, sd=0.60) than those with < 2 sessions (mean=1.13, sd=0.53), p=0.011. In subgroup analysis on the post-coaching survey, surgeons in practice >15 years had higher professional fulfillment, well-being, resilience, and coping scores and lower burnout scores than coaches in practice < 15 years.

Conclusions:
Implementation of a structured coaching program is beneficial for pediatric surgeon coaches, with overall improvement in professional fulfillment and a dose-related decrease in burnout with more coaching sessions. Coaches with more years in practice who chose to coach demonstrated higher scores across multiple well-being domains. The exercise of coaching likely provides benefit to coaches. Future coach recruiting efforts can highlight the well-being benefits among coaches.

Abbreviations:

S144

IMPACT OF IMPLEMENTATION OF AN E-HEALTH PLATFORM OF PERIOPERATIVE EDUCATION FOR FAMILIES OF CHILDREN UNDERGOING GASTROSTOMY TUBE PLACEMENT ON PATIENT OUTCOMES

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Abstract: Background: We previously created an e-health platform of perioperative education for families of children undergoing gastrostomy (GT) placement. We aimed to assess the impact of implementation of the e-health platform on family reported and clinical outcomes.

Methods: Families of patients who underwent GT placement at a single center from 1/25-7/25 were eligible. Families were invited to create an e-health account and access the education. Two surveys assessing family readiness were administered to e-health users (before discharge and before first GT exchange). Patient outcomes were assessed via retrospective chart review. Comparisons were made between an historic cohort of GT patients (9/22-5/23) and those who underwent GT placement during the study (1/25-7/25) via Wilcoxon Rank Sum or Fisher's exact test.

Results: During the study, 188 patients underwent GT placement; 69 families created e-health accounts: 52 families completed Survey 1 and 14 completed Survey 2. 100% of respondents understood why their child needs a GT, where the GT is placed, possible complications, and reported their questions and concerns had been sufficiently addressed. One family (4%) needed more information about surgery; two families (8%) reported they did not know what to expect after surgery; four families (17%) reported they needed more information about caring for the GT. Fourteen (100%) reported watching the GT videos was helpful, they felt comfortable exchanging the GT with supervision, and they know where to go to find information about GT exchange. Thirteen (93%) reported they felt comfortable exchanging their child's GT on their own. Most families reported using the website was useful for their child's health, it improved access to healthcare services, helped them care for the GT, and they would recommend it to a friend. When comparing clinical outcomes between cohorts, groups did not differ regarding age, sex, race, or ethnicity. The study cohort had a significantly lower number of phone calls to the clinic nurses, readmissions, and tube dislodgements. (Table 1).

Conclusions: Implementation of an e-health platform of perioperative education is associated with adequate preparation for surgery by the families as well as decreased utilization of hospital resources including clinic phone calls, ED visits, and readmissions.

Abbreviations: Gastrostomy tube - GT
Emergency department - ED

Table 1. Characteristics of patients undergoing gastrostomy tube placement before and after implementation of an e-health platform for perioperative education			
	Historic cohort (N=329)	Study cohort (N=188*)	P value
Age in years, median (IQR)	0.33 (0.14, 1.83)	0.75 (0.08, 3.25)	0.14
Government Insurance	216 (65.7)	103 (54.8)	0.02
English as preferred language	298 (90.6)	163 (86.7)	0.19
RN calls (8 weeks)	59 (17.9)	21 (11.2)	0.04
ED visit (30 days)	60 (18.2)	22 (11.7)	0.06
Reoperation (30 days)	8 (2.4)	3 (1.6)	0.75
Readmission (30 days)	31 (9.4)	5 (2.7)	<0.01
Granulation tissue (8 weeks)	151 (45.9)	78 (41.5)	0.36
Tube dislodgement (8 weeks)	33 (10)	9 (4.8)	0.05
Cellulitis (8 weeks)	20 (6.1)	15 (8)	0.47

*69 of 188 families used the e-health platform

S145

HOLOUS: AN AUGMENTED REALITY TOOL FOR VASCULAR ACCESS DURING CENTRAL LINE INSERTION

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Abstract: Purpose: Ultrasound-guided vascular access is the preferred technique for central line placement in the pediatric population. A limitation of ultrasound-guided vascular access, especially for trainees, is having to look between the needle entry point and the ultrasound screen during the procedure, which can lead to challenges with precise needle guidance and increased procedural difficulty. Therefore, we developed a novel augmented reality ultrasound application, HoloUS, which uses the Microsoft HoloLens 2 to project real-time ultrasound images directly into the user's field of view. In this work, we assessed the feasibility of using HoloUS for vascular access during central line placement.
Methods: HoloUS employs a custom tablet-based module that captures live ultrasound images, compresses them, and transfers them via hotspot to the Microsoft HoloLens 2, an augmented reality headset. On the HoloLens 2, an application was developed to receive, decompress, and display the live ultrasound image. Voice command and hand gesture features were implemented to reposition, resize, and change the gain of the live ultrasound image. After IRB approval we enrolled pediatric patients between 3/2025 and 9/2025 who were undergoing peripherally inserted central catheter (PICC) placement or tunneled central line placement via internal jugular access. After informed consent participants were randomized to either undergo the procedure with standard ultrasound guidance (control) or with the HoloUS (intervention). All procedures were performed by two experienced interventional radiology physicians. Time to vascular access and number of skin punctures were recorded.
Results: Thirty patients were enrolled. Ten underwent PICC placement (5 control, 5 HoloUS) and 20 underwent tunneled central line placement (10 control, 10 HoloUS). All cases were successful and there were no procedural complications (Figure 1). There was similar time to vascular access between groups for PICC (25 seconds control, 27 seconds HoloUS) and central line placements (13 seconds control, 13 seconds HoloUS). One case in each group required a repeat skin puncture.
Conclusion: HoloUS is a feasible and safe tool for vascular access during central line placement in pediatric patients. Further studies are needed to assess the potential benefit of HoloUS for other ultrasound-guided procedures and its role as teaching tool.

Abbreviations: Peripherally Inserted Central Catheter (PICC)

S146

THE VALIDATION OF A NON-INVASIVE PREMATURE INFANT MONITORING PROBE (PREMO) FOR BLOOD PRESSURE ASSESSMENT IN A FETAL LAMB MODEL

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Abstract: Purpose
Continuous and reliable blood pressure monitoring in premature infants remains a major challenge. Current non-invasive modalities rely on peripheral perfusion which is not always indicative of core blood pressure. Furthermore, these modalities fail in extremis when accuracy is essential. Invasive monitoring devices can be impractical to place in critically ill premature infants. To address this gap, we developed a non-invasive multiparameter premature infant monitoring probe (PreMo) that measures core tissue perfusion via placement in the rectum or esophagus and is capable of estimating core blood pressure using photoplethysmography (PPG) waveform feature and pulse arrival time (PAT) delay. We compared these surrogates to gold-standard invasive blood pressure monitoring.
Methods
We used an ex-utero intrapartum (EXIT) fetal lamb model at 125 days' gestation (Figure 1A). After hysterotomy, an endotracheal tube was placed and esophageal and rectal probes inserted. An umbilical artery catheter (UAC) was used as the gold standard for mean arterial pressure (MAP) monitoring. The fetus was then separated from the placenta and hypoxia was induced via breath holding in order to precipitate hypotension. Duplex rectal and esophageal probe monitoring was compared to UAC MAP readings using linear regression. IACUC approval was obtained for this study.
Results
There were three fetal lambs that underwent an EXIT procedure for MAP validation. Rectal PPG amplitude correlated with MAP (R2=0.46, p-value=0.01; Figure 1B) while esophageal amplitude showed a stronger association (R2=0.56, p-value < 0.01; Figure 1C). Furthermore, measurements of PAT between the esophageal and rectal probes demonstrated the strongest correlation with MAP (R2=0.70, p-value < 0.01) (Figure 1D).
Conclusions
We conclude that PreMo provides an estimate of MAP using either PPG amplitude (single probe) or PAT delay (dual probes). However, PAT appears to be a more accurate surrogate marker of core blood pressure. These findings support further study of PreMo in clinically relevant models of premature infant hypotension resulting from sepsis, hypovolemia, and other relevant physiologic derangements. Ultimately, the addition of blood pressure monitoring to heart rate, temperature and oxygen saturation highlights the potential for the PreMo probe to provide multiparameter vital sign monitoring of the premature infant throughout a broad range of physiologic change.

Abbreviations: PreMo = Premature monitoring probe
PPG = Photoplethysmography
PAT = Pulse arrival time
EXIT = Ex utero intrapartum
MAP = Mean arterial pressure

UAC = umbilical artery catheter
IACUC = Institutional Animal Care and Use Committee

S147

MERMAID MAGIC: USE OF ACELLULAR FISH SKIN SUBSTITUTE IN PEDIATRIC BURN MANAGEMENT

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Abstract: Purpose The limited availability of donor skin for pediatric autografts suggests a role for skin substitutes to promote a healthy wound bed and improve autograft outcomes. Acellular Fish Skin Substitute (AFSS) acts as a dermal matrix skin substitute to foster dermal cell and capillary adhesion. We sought to review the use of AFSS as a bridge to autograft in pediatric full thickness burns.

Methods This single institution case series reviewed all patients under 18 years of age who received AFSS as part of their burn management by pediatric general and plastic surgeons from Jan 1, 2024 to Mar 5, 2025 (n=15). Patient and burn wound demographics, burn wound management, and burn related procedures were recorded. Study outcomes included date of complete re-epithelization, need for autograft, hypertrophic scar formation, and complications. Outcomes were analyzed using unpaired student T or Fisher exact test, where $p< 0.05$ was significant.

Results Patients who met criteria had mean age 5.6 years (1–16 years) and mean burn total body surface area of 6.2% (TBSA 0.5–16%). Most burns were scald (73%, n=11) and classified as completely or mixed full thickness (87%, n=13). After burn excision with AFSS application, nearly all patients required additional sedation or general anesthetic procedures (2.7±SD 2.1, n=14). Only 6 patients required burn related procedures beyond dressing changes: 3 autografts, 2 scar reconstruction, and 1 change of skin substitute technique. No wound infections or mortality occurred. Complete re-epithelization took an average 51±SD 28 days. Comparing patients who achieved re-epithelization ≤45 days (n=8) to >45 days (n=7), there were significantly fewer post-AFSS procedures (1.6 vs. 3.9, p=0.03) and less hypertrophic scar formation (0 vs. 5 patients, p=0.007), but no difference in full thickness TBSA (2.5% vs. 3.4%, p=0.6), date of AFSS placement (4.5 vs. 5 days, p = 0.7), or autografting (0 vs. 3, p=0.08).

Conclusion This is the largest case series of AFSS application in pediatric burn wound management to date which demonstrates very favorable cosmetic results and a surprising 77% of full thickness burn patients avoiding autograft entirely. Future studies will seek to standardize management and compare AFSS to other skin substitute techniques.

Abbreviations: AFSS- Acellular Fish Skin Substitute

S148

A LOW-COST BIOABSORBABLE BOWEL STAPLER PROTOTYPE FOR NEONATAL INTESTINAL SURGERY: DEVELOPMENT AND PILOT TESTING IN IRAQ

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Abstract: Background:
Commercial bioabsorbable stapling devices are unaffordable in many low- and middle-income settings. Locally fabricated alternatives might expand surgical capacity in neonates with intestinal disorders. The aim is to design, fabricate, and pilot test a low-cost, bioabsorbable bowel stapler prototype for neonatal use, assessing feasibility, biocompatibility, and early in vivo performance in an Iraqi animal model.

Methods:
We engineered a disposable bioabsorbable stapler using polylactic-co-glycolic acid (PLGA) staples and a 3D-printed polymer housing. In benchtop testing, staple compression strength, retention force, and burst pressure were measured and compared to standard sutured anastomosis. Next, in a pilot rat model (weanling rats, n = 12), small-bowel anastomoses were performed using our prototype vs standard hand-sewn technique. Animals were observed for 14 days, with endpoints of leakage, stricture, inflammatory response (histology), and anastomotic strength (burst pressure).

Results:
• Benchtop: the prototype achieved a mean burst pressure of 220 mmHg (vs 230 mmHg for hand-sewn, p = 0.45).
• In vivo: 1/6 animals with stapler had minor leak (not clinically fatal) vs 0/6 in hand-sewn. No significant adhesion or inflammation difference on histology. Anastomotic burst strength at day 14: 200 mmHg (stapler) vs 210 mmHg (hand-sewn), p = 0.55.
• Costs: our prototype materials cost ~USD 12 per device (vs commercial staple kits > USD 200 in our context).

Conclusion:
We demonstrate the feasibility of a low-cost bioabsorbable stapler prototype for neonatal bowel surgery with comparable early anastomotic integrity to hand-sewn technique. With further optimization and scale-up, this innovation could transform neonatal surgery access in low-resource settings.

Abbreviations:

Scientific Session 16: Basic Science

1:30 PM – 3:00 PM

S149

RESISTANCE-BASED PHENOTYPING OF MICROBIOTA IDENTIFIES A HARD-TO-TREAT CLUSTER ASSOCIATED WITH POOR OUTCOMES IN PERFORATED APPENDICITIS

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Abstract: Purpose:
The microbiology of perforated appendicitis is complex and variable, and the clinical relevance of specific pathogens remains uncertain. Standard species-level reporting often fails to capture the broader resistance context of polymicrobial infections. We sought to identify clinically meaningful patterns in bacterial resistance profiles that could inform risk stratification and treatment decisions. We hypothesized that resistance-weighted clustering of bacterial species cultured from patients with perforated appendicitis would reveal phenotypic groupings associated with postoperative outcomes.

Methods:
This retrospective cohort study included children (age < 18y) who underwent appendectomy for perforated appendicitis at a tertiary children's hospital (2019–2024). Operative culture and antibiotic susceptibility data were collected at index operation. For each pathogen-antibiotic pair, a weighted resistance score was assigned (1=complete resistance, 0.5=intermediate, 0=complete susceptibility), and organisms were grouped by similarity in resistance phenotype using hierarchical clustering. Length of stay, organ space infection (OSI), and 30-day readmission were clinical outcomes compared across clusters using chi-square and univariate logistic regression (significance $p < 0.05$).

Results:
Among 194 patients, 176 (90.7%) had available culture data, yielding 631 isolates representing 25 bacterial species. Three phenotypic clusters emerged: (1) Enterobacteriaceae Group (dominated by Escherichia coli); (2) Low-Resistance Gram-Positive Cocci (GPC) Cluster (including Staphylococcus aureus); and (3) Hard-to-Treat Cluster (including Streptococcus anginosus, Enterococcus faecium, Aeromonas species, and Pseudomonas aeruginosa; Figure). The Enterobacteriaceae Group was associated with OSI (Odds Ratio [OR] 4.60, 95% Confidence Interval (CI) 1.11-20.43; p=0.015) and prolonged length of stay (median (interquartile range [IQR]), 5.0 (4.0-7.0) vs. 4.0 (3.0-6.0) days, p=0.004). The Hard-to-Treat Cluster was also associated with prolonged length of stay (5.0 (4.0-7.0) vs. 4.0 (3.0-6.0) days, p=0.009) and higher 30-day readmission (5.6% vs. 1.5%, p=0.040). The Low Resistance GPC Cluster was not associated with outcomes.

Conclusions:
Grouping bacteria by shared resistance behavior revealed clinically important clusters that were not evident from species identity alone. The Enterobacteriaceae and Hard-to-Treat clusters

were associated with adverse outcomes, suggesting that culture data can yield actionable prognostic information. This resistance-based approach offers a novel framework for microbiological phenotyping, which may improve early recognition of higher-risk infections, inform antimicrobial therapy, and advance precision surgical care in pediatric patients with complicated appendicitis.

Abbreviations: GPC (Gram-Positive Cocci)
OSI (organ space infections)
CI (confidence interval)
OR (odds ratio)
IQR (interquartile range)

S150

THE INTESTINAL MICROBIOTA OF MECONIUM IN NEONATES WITH CONGENITAL MALFORMATIONS: CHARACTERISTICS ASSOCIATED WITH GASTROINTESTINAL ATRESIA

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Abstract: Purpose
The microbial composition of neonatal meconium, despite its low biomass, is important for the acquisition of gut immunity and the pathogenesis of various diseases. However, the characteristics of the meconium microbiota in neonates with congenital anomalies have not been reported. We hypothesized that the presence of gastrointestinal atresia, which possibly alters the intrauterine intestinal environment, would influence the meconium microbiota. This study aimed to characterize the first-pass meconium microbiota in neonates with congenital anomalies, focusing specifically on those with gastrointestinal atresia.
Methods
This study was approved by Institutional Review Board (E22-0263). Meconium samples were collected from full-term healthy neonates (Control) and neonates with congenital malformations (Malformation) other than gastrointestinal atresia and congenital gastrointestinal atresia (Atresia) admitted to the growth care unit or obstetrics ward. Microbiota analysis was performed using 16S rRNA gene sequencing with bioinformatics processing conducted in QIIME2. Alpha-diversity was assessed using Shannon index and operational taxonomic unit counts, and beta-diversity was analyzed using Principal Coordinate Analysis. Microbial composition at phylum and genus levels was examined, and analyses were stratified by mode of delivery, maternal antibiotic exposure, and neonatal sex.
Results
The study included 20 Control neonates, 41 with Malformation such as urinal tract malformation and abdominal wall defect, and 11 with Atresia (6 esophageal, 2 duodenal, 2 small bowel, and 1 colonic obstruction). No statistical differences were observed in sex and maternal antibiotic use but mode of delivery ($p < 0.001$). Alpha-diversity did not differ significantly across the three groups, yet cesarean delivery and maternal antibiotic exposure were associated with reduced diversity, particularly in Atresia ($p < 0.05$) (Figure A). Beta-diversity revealed greater inter-individual variation and a broader distribution in Atresia compared to Control and Malformation (Figure B). Taxonomic analysis indicated a largely different microbial composition in Atresia, characterized by a significant reduction in Firmicutes and an increase in Actinobacteria at the phylum level ($p < 0.05$; Figure C), as well as lower abundances of Staphylococcus and Escherichia but higher abundances of Pseudomonas and Bacillus at the genus level ($p < 0.01$; Figure D) compared to Control and Malformation.

Conclusions
Gastrointestinal atresia specifically alters meconium microbiota, distinct from both healthy neonates and other congenital malformations.

Abbreviations: full-term healthy neonates; Control, neonates with congenital malformations other than gastrointestinal atresia; Malformation, congenital gastrointestinal atresia; Atresia. C-sec; cesarean section.

S151

RESTORING GUT SEROTONIN SIGNALING ATTENUATES SYSTEMIC AND NEUROLOGICAL INFLAMMATION IN A MURINE TRAUMATIC BRAIN INJURY MODEL

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Abstract: Purpose: Traumatic brain injury (TBI) is a leading cause of disability and causes significant gastrointestinal dysfunction, where gut-derived inflammation can exacerbate neurological injury via the gut-brain axis. We have previously shown that TBI induces gut inflammation and ileal dysmotility and is associated with decreased gut-derived serotonin (5HT), a key regulator of intestinal homeostasis and systemic inflammation. We hypothesize that targeting the gut-brain axis by restoring intestinal 5HT signaling would mitigate both the systemic and neuroinflammatory response following TBI.
Methods: A murine-controlled cortical impact model was utilized in adult mice, and results were analyzed on post-injury day (PID) 3. We used four groups: Sham C57Bl/6 wild type (WT) (n=6), WT TBI (n=10), TBI orally treated with prucalopride (a gut-selective serotonin agonist) (n=7), and TBI with genetic overexpression of intestinal enteroendocrine cells (EEC) (n=4). Mice were sacrificed at PID 3, with serum and brain collected for analysis. Systemic and neuroinflammatory markers were compared using ELISA and real-time PCR (qRT-PCR). The Institutional Animal Care and Use Committee approved all animal protocols. Student's t-test and one-way ANOVA were used for statistical analysis, with significance at $p< 0.05$. AI-assisted technology was utilized for proof-reading.
Results: On PID3, TBI induced a significant systemic inflammatory response, increasing pro-inflammatory cytokines like IL-15 ($p < 0.001$), which was met with a non-significant rise in anti-inflammatory IL-10. Genetic restoration of gut serotonin via EEC overexpression reversed this systemic cascade, attenuating TBI-induced IL-15 ($p < 0.05$) and reducing the neutrophil chemoattractant KC ($p < 0.05$). Consequently, IL-10 levels were significantly lower in the EEC-overexpressor TBI group compared to WT TBI mice. In parallel, TBI induced significant neuroinflammation, evidenced by increased cortical gene expression of IL-1β ($p < 0.01$) and Tnf ($p < 0.05$). Pharmacologic stimulation of gut serotonergic receptors with prucalopride attenuated the expression of IL-1β ($p < 0.001$) and showed a trend of attenuation with Tnf.
Conclusion: We conclude that targeting gut 5HT signaling is a promising therapeutic strategy to mitigate the debilitating consequences of TBI. Restoring intestinal 5HT, through either genetic or pharmacologic means, effectively reduces both systemic and central nervous system inflammation in a clinically relevant model of TBI.

Abbreviations: TBI: Traumatic Brain Injury; 5HT: Serotonin; WT: wild type; EEC: enteroendocrine cells; PID: post-injury day.

S152

PP2A ACTIVATION ENHANCES DOXORUBICIN EFFICACY IN NEUROBLASTOMA THROUGH MODULATION OF DRUG EFFLUX TRANSPORTERS

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Abstract: Purpose
Neuroblastoma (NB) is the most common pediatric extracranial solid tumor and children with recurrent and metastatic disease have survival rates below 20% despite multimodal therapies. Anthracyclines, such as doxorubicin, are a cornerstone of treatment, but resistance limits its efficacy. ABCB1 and MRP1 are members of the ATP-binding cassette (ABC) membrane-bound transporter family of proteins and contribute to NB therapeutic resistance by pumping drugs out of the cell. Protein phosphatase 2A (PP2A) is a tumor suppressor downregulated in NB. We have shown that reactivation of PP2A decreases NB cell viability in vitro and tumor growth in vivo. Further, our previous work demonstrated that PP2A activation increases intracellular doxorubicin accumulation, potentiating its antitumor activity in NB (Fig. 1A, 1B). Because phosphorylation regulates the expression of ABC transporters, and PP2A is known to dephosphorylate these proteins, we hypothesized that the doxorubicin accumulation seen with PP2A activation is secondary to its modulation of these drug efflux pumps.

Methods
SK-N-AS and SK-N-BE(2) human NB cells were treated with doxorubicin in combination with a novel PP2A activating compound, ATUX-1215, supplied by our collaborator. Flow cytometry assessed cell surface expression of ABC transporters, ABCB1 and MRP1, following treatment. To further ascribe PP2A as a regulator of doxorubicin, cells were treated with okadaic acid, a PP2A inhibitor, and intracellular doxorubicin accumulation was quantified by flow cytometry. All experiments were performed in triplicate, and results reported as mean fold change (FC) +/- standard deviation relative to controls.

Results
Combination treatment with ATUX-1215 and doxorubicin significantly decreased cell surface expression of ABCB1 and MRP1 in SK-N-AS (FC 0.71 +/- 0.10; FC 0.76 +/- 0.02, Fig. 1C, 1D) and SK-N-BE(2) cells (FC 0.53 +/- 0.21; FC 0.77 +/- 0.08, Fig 1E, 1F). PP2A inhibition with okadaic acid significantly decreased intracellular doxorubicin accumulation compared to doxorubicin alone in both cell lines (Fig. 1G, 1H).

Conclusion
PP2A activation in NB cells decreases cell surface expression of drug efflux transporters. Inhibition of PP2A decreases intracellular doxorubicin concentration, corroborating the role of PP2A activation in drug accumulation. These findings support PP2A activation as a promising therapeutic adjunct to overcome drug resistance in NB.

Abbreviations: NB = neuroblastoma
ABC = ATP-binding cassette
PP2A = protein phosphatase 2A

FC = fold change
Fig. = Figure

S153

ACETAMINOPHEN EXPOSURE DRIVES SENESCENT PATHWAY ACTIVATION IN PULMONARY EPITHELIAL CELL LINE

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Abstract: Purpose
Acetaminophen (APAP) is widely used to manage post-operative pain in neonates. APAP provides analgesia without the side effects of opioids, including hypotension and respiratory depression. While the use of APAP over opioids has become favorable, emerging literature has shown that APAP adversely affects the developing lung. One possible mechanism by which this damage occurs is via senescent pathway activation, inducing proliferative arrest and an inflammatory response through the senescence associated secretory phenotype (SASP). This study aims to look at if APAP activates senescence in pulmonary epithelial cells.

Methods
MLE12 cells were exposed to APAP [1/5mM, 5/24 hrs (n= 3-4)]. Cellular proliferation was evaluated by counting cells. Senescent cells were detected utilizing a β-Galactosidase staining assay and through nuclear exclusion of LaminB by western blot. Known regulators of senescence, phosphorylated p53 and its target gene p21, were evaluated by western blot. Expression of cell cycle regulators Cdkn1a, Ccnd1 and SASP components Il1a, Mmp9, Cxcl1, Cxcl2 were measured by qPCR. Statistical analyses were done with GraphPad Prism.

Results
MLE-12 cells exposed to APAP demonstrated decreased cell proliferation in a dose dependent manner ($p < 0.05$) and this was associated with an increased number of cells staining positive for β-Galactosidase. Consistent with induction of senescence, nuclear LaminB significantly decreases with APAP exposure across both timepoints and doses ($p < 0.05$). Nuclear phosphorylated p53 significantly increases with APAP exposure across both timepoints and doses ($p < 0.05$). Both Cdkn1a (p21) mRNA and protein significantly increase at 24hrs in a dose dependent manner ($p < 0.05$), while Ccnd1 (a driver of cell cycle progression) significantly decreases after APAP exposure ($p < 0.05$). SASP components Il1a, Mmp9, Cxcl1, Cxcl2 significantly increase in a dose dependent manner ($p < 0.05$).

Conclusions
We conclude that there is evidence of senescence activation in response to APAP in pulmonary epithelial cells. Activation of these pathways could have detrimental effects on the developing lung. This mechanism needs to be further investigated to assess the safety of using APAP in pain management of post-op neonates.

Abbreviations: Acetaminophen - APAP
senescence associated secretory phenotype - SASP

S154

STROMAL CELL SUBTYPES CONTRIBUTE TO ABERRANT EXTRACELLULAR MATRIX IN HIRSCHSPRUNG DISEASE

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Abstract: Purpose:
Hirschsprung disease (HSCR) is a congenital disorder of the intestine caused by defective migration of enteric neural crest cells, resulting in distal bowel aganglionosis. Recent evidence implicates extracellular matrix (ECM) dysregulation as a barrier to enteric cell colonization, with alterations in laminin, collagen, and fibronectin. However, the cell-type–specific drivers of ECM remodeling remain poorly defined. This study aimed to characterize the transcriptomic landscape of ECM components in HSCR and identify stromal subtypes responsible for aberrant ECM regulation.
Methods:
We reanalyzed published single-cell RNA sequencing (scRNA-seq) data from full-thickness colonic tissues of five HSCR patients and two non-HSCR controls. ECM-associated gene expression was assessed across major intestinal cell types. Stromal cells were subjected to unsupervised clustering to identify distinct subtypes, followed by differential expression analysis of ECM components across these populations.
Results:
Neuronal populations in HSCR aganglionic rectum exhibited significant upregulation of LAMB1, COL3A1, COL4A1, and COL4A2 compared with controls (Figure A). In mesenchymal and stromal compartments, COL1A1, COL1A2, COL3A1, and TNC were increased, while FN1 expression was decreased (Figure A). Clustering revealed nine transcriptionally distinct stromal subtypes (Figure B, C). Notably, RSPO3+ and KCNN3+ stromal cells were detected exclusively in the aganglionic colon of HSCR patients, where they were enriched relative to controls (Figure C, D). Functional annotation linked RSPO3+ stromal cells to glial migration and KCNN3+ stromal cells to collagen organization. ECM gene analysis confirmed subtype-specific contributions: RSPO3+ stromal cells showed increased COL1A1 and COL3A1 expression, while KCNN3+ stromal cells upregulated COL4A1 and COL6A1 (Figure E).
Conclusion:
This study provides a cell-type–resolved map of ECM remodeling in HSCR and identifies stromal subtype, specific contributions to the pathological microenvironment. The exclusive presence of RSPO3+ and KCNN3+ stromal populations in the aganglionic colon highlights their potential role in generating an ECM niche that impairs enteric neural crest migration. By linking neuronal and stromal ECM dysregulation to disease-specific stromal subtypes, these findings offer new mechanistic insight into HSCR pathogenesis and suggest stromal-ECM interactions as potential therapeutic targets.

Abbreviations: Hirschsprung disease (HSCR), extracellular matrix (ECM), single-cell RNA sequencing (scRNA-seq)

S155

CRYPT EXPANSION IN DISTANT BOWEL INDUCED BY DISTRACTION ENTEROGENESIS

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Abstract: Purpose:
Distraction enterogenesis uses mechanical force to stimulate intestinal growth and lengthening. Prior studies have revealed that this force results in intestinal hormonal increases. Based on this observation, we aimed to determine whether the small intestine outside of the segment where the expanding spring is placed may be affected.

Methods:
Yucatan minipigs underwent insertion of a compressed nitinol spring in a segment of jejunum. The length of the distracted segment was measured 7 days later. The crypt width, depth, and density in segments of jejunum away from the segment containing the nitinol spring were measured in three minipigs. Four minipigs that underwent surgery without distraction enterogenesis were used for comparison. Student's t test was used to determine significance.

Results:
Minipigs underwent distraction enterogenesis and the segment of jejunum containing the nitinol spring increased in length by 224 to 250%. In a segment of jejunum that did not contain the expanding spring, the jejunum had an average crypt width of 42.8±8.6 μm, crypt depth of 109.9±30.5 μm, and crypt density of 0.02±0.003 crypts/μm. A segment of jejunum from minipigs that did not undergo distraction enterogenesis had an average crypt width of 35.4±6.5 μm, crypt depth of 72.9±32.7 μm, and crypt density of 0.02±0.004 crypts/μm. The crypt width and depth in minipigs that underwent distraction enterogenesis were increased when compared with those in minipigs that did not undergo intestinal lengthening ($p < 0.001$). That said, the crypt density was not found to be significantly different between these two groups of minipigs ($p=0.08$).

Conclusion:
Distraction enterogenesis results in more than intestinal lengthening of the segment containing the spring. There appears to be systemic impacts including increased crypt width and depth in segments of bowel outside of where the nitinol spring is placed. Our results indicate that lengthening of one segment of intestine with a spring results in quantifiable changes in the intestine outside of the spring segment. This, along with prior findings of hormonal changes with spring placement suggest that distraction enterogenesis may result in endocrine effects that augment intestinal function beyond effects seen in the lengthened bowel segment.

Abbreviations: μm = micrometer

S156

MECHANICAL FORCE DRIVES INTESTINAL EPITHELIAL GROWTH THROUGH A DISTINCT PROGENITOR-INDUCING MECHANOSENSITIVE PROGRAM

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Abstract: Introduction:
The intestinal epithelium renews continuously through intestinal stem cell (ISC) proliferation and differentiation. While biochemical pathways such as Wnt, Notch, and BMP are well defined, the role of mechanical forces in epithelial growth is less understood. In short bowel syndrome, limited mucosal surface restricts nutrient absorption, and mechanically driven epithelial expansion offers a potential therapy. Building on our work in Distraction Enterogenesis, we used a partial obstruction model in the present study to identify mechanosensitive programs driving epithelial growth and regeneration.
Method:
Partial obstruction was induced by placement of 5 mm rubber bands around the terminal ileum of 16–18 week C57BL/6 mice to generate sustained intraluminal pressure (Fig. A). Dilated segments proximal to the obstruction were harvested at serial time points. Histologic analysis and Ki-67 immunofluorescence identified the peak proliferative phase. Using the Young's modulus parameters of the mouse small intestine, we constructed a biomechanical model to estimate wall stress and applied force. Bulk and single-nucleus RNA sequencing were then performed on tissue from the proliferative (obstructed) and sham segments to define mechanosensitive transcriptional programs driving epithelial growth.
Results:
The maximal reduction in muscle thickness and crypt density occurred on postoperative day (POD) 3, coinciding with the peak ratio of circumferential stress to luminal pressure, indicating maximal mechanosensation (Fig. B). By POD 5, crypt bifurcation and Ki-67 expression significantly increased, marking peak epithelial proliferation (Fig. C). These findings suggest that epithelial growth follows the initial mechanosensory response to sustained luminal pressure. Pseudotime analysis of single-nuclei RNA-seq at this proliferative peak identified two epithelial trajectories (L1–L2) originating from $Lgr5^{+}$ intestinal stem cells and progressing toward differentiated lineages In obstructed samples, pseudotime alignment showed a leftward shift, reflecting enrichment of cells at earlier developmental states, consistent with a mechanically induced regenerative or progenitor-like epithelial phenotype (Fig D-F).
Conclusion:
Mechanical stimulation from partial obstruction activates a proliferative epithelial response characterized by expansion of $Lgr5^{+}$ stem and mechanosensitive progenitor populations. These cells exhibit early pseudotime states and upregulation of developmental and repair-associated genes, suggesting that mechanical force reprograms epithelial fate toward growth and regeneration, highlighting a potential therapeutic avenue for short bowel syndrome.

Abbreviations:

S157

DEFINING THE FORCE-INJURY PROFILE FOR RETRIEVAL OF ESOPHAGEAL BUTTON BATTERIES: AN EX VIVO PORCINE MODEL

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Abstract: INTRODUCTION: Treatment of button battery ingestion requires rapid removal to limit injury. While some preliminary data demonstrate the rapidity with which injury occurs, there are little data to define the magnitude with which this injury reduces the integrity of the esophagus. We developed a button battery extraction model in cadaveric porcine esophagus to measure the force-injury relationship.

METHODS: Our model was developed to address 3 questions: 1) following button battery ingestion, what is the time to injury? 2) what force is needed for esophageal injury? 3) in a severely injured esophagus, what force is needed to remove a button battery? Descriptive statistics were tabulated, and continuous variables were compared with independent samples t-tests.

RESULTS: Mucosal injury began after 21 minutes of button battery exposure. In an in vitro stricture model, after button battery exposure, injury occurred with 8.99 ± 3.30 lbs at 30 minutes, 4.99 ± 0.53 lbs of force at 60 minutes and 1.18 ± 0.51 lbs at 120 minutes, which was less than the 11.68 ± 1.48 lbs of force required to injure native esophagus ($p < .001$). Using injured esophagus at matching time points, it took between 0.14 to 0.18 lbs of force to extract a button battery in the absence of a stricture.

CONCLUSIONS: Using an in vitro button battery extraction model, we define the force-injury profile after esophageal button battery exposure. Notably, the force required to injure an esophagus after 1 hour of button battery exposure is less than half (43%) that required in native esophagus, but still 30 times more than the maximal force needed to extract a button battery. This difference suggests a reasonable factor of safety present when removing esophageal foreign bodies to avoid iatrogenic injury.

Abbreviations: pounds (lbs)