Pediatric Surgery Quality Collaborative

September 8, 2022
PSQC Brief Update

Kevin Lally, MD, MS, FACS
PSQC Executive Director
Surgeon-in-Chief, Children’s Memorial
Hermann Hospital
Houston, TX
Agenda

- State of the Collaborative
- Current status with the ACS
- Project Reviews
  - Project 2 – Derek Wakeman/Tamar Levene
  - Project 3 – Shawn Rangel
  - Projects 4 –
    - Antibiotics and Complex Appendicitis – Eric Grethel/Monica Lopez
    - Opioid Stewardship – Steve Shew
    - Colorectal SSI – Justin Lee
PSQC Overview

- 85 Members with signed DUA
- Majority of the CSV Level 1 hospitals
- National in scope by design
- Likely to add 10-15
Agenda

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  - Project 3 – Shawn Rangel
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    - Colorectal SSI – Justin Lee
The Triad of Surgical Quality Improvement

CSV

NSQIP-P

PSQC

Improving Surgical Care for Children
Project Development and Implementation Committee (PDIC)
Agenda

- State of the Collaborative
- Current status with the ACS
- Project Reviews
  - Project 2 – Derek Wakeman/Tamar Levene
  - Project 3 – Shawn Rangel
  - Projects 4 –
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    - Opioid Stewardship – Steve Shew
    - Colorectal SSI – Justin Lee
Reducing postoperative CT imaging utilization in pediatric complicated appendicitis

Tamar Levene, MD MS
Derek Wakeman, MD
September 8, 2022
# Workgroup Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Position and Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary Bolhuis, RN</td>
<td>SCR, Children’s Wisconsin</td>
</tr>
<tr>
<td>John Chandler, MD</td>
<td>Surgeon, PrismaHealth</td>
</tr>
<tr>
<td>Cathy Ehster, RN</td>
<td>SCR, Children’s Wisconsin</td>
</tr>
<tr>
<td>Cindy Gingalewski, MD</td>
<td>Surgeon, Randall Children’s</td>
</tr>
<tr>
<td>Fabienne Gray, MD</td>
<td>Surgeon, New Orleans Children’s</td>
</tr>
<tr>
<td>Peter Juviler, MD</td>
<td>PGY3, Golisano Children’s</td>
</tr>
<tr>
<td>Tamar Levene, MD MS</td>
<td>Co-Lead, Surgeon, Joe DiMaggio Children’s</td>
</tr>
<tr>
<td>Derek Wakeman, MD</td>
<td>Co-Lead, Surgeon, Golisano Children’s</td>
</tr>
</tbody>
</table>
Rationale

- Appendicitis is a common surgical emergency
- Significant practice variability
- Computed tomography imaging frequently used
- Increased risk of radiation-associated malignancies
  - Hematologic malignancy risk highest in 0-15 yo

NEJM 2007;357(22):2277--8
Lancet 2012;380(9840):499--505
JAMA Surgery 2021;156(4):343--51
Reduction of CT utilization for Pre-op Imaging of Pediatric Appendicitis

Implementation Guide

Aim Statement

By June 30, 2022, the aggregate CT utilization rate for the Collaborative will be reduced from 24.5% to 15%.

Balancing Measure

The negative appendectomy rate for the Collaborative will remain at or below 1.75%.
Variation in CT Utilization

Complicated Appendicitis
Postoperative Imaging Utilization

- Clinical Pathways
- Infection Rates
- Institutional US availability/quality
- Institutional MRI availability/quality
- Postop imaging selection criteria
OS/SSI Rate vs. Postop CT Rate

Comp Appy OS/SSI Rate

PSQC Aggregate Post-Op CT Rate (14.11%)

PSQC Aggregate OS/SSI (7.85%)
Project 2 Methodology

- Qualitative methods
  - Semi-structured interviews
  - Low and high outlier performance vs. all centers
  - Shared learning
    - Best practices, culture change, sustainability of implementation strategies
- Postop imaging utilization scorecards
- Implementation of specific QI initiatives
### Project Timeline

#### Timeline for 2nd PSQC Project Targeted Appy Post-Op CT Utilization

<table>
<thead>
<tr>
<th>Task</th>
<th>CY2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft Interview Guide</td>
<td>15-Jun</td>
</tr>
<tr>
<td>Review interview guide/finalize</td>
<td>30-Jun</td>
</tr>
<tr>
<td>Request permission to unmask sites for interviews</td>
<td>15-Jul</td>
</tr>
<tr>
<td>Identify interviewees at each site</td>
<td>30-Jul</td>
</tr>
<tr>
<td>Set-up interviews</td>
<td>15-Aug</td>
</tr>
<tr>
<td>Conduct interviews</td>
<td>30-Aug</td>
</tr>
<tr>
<td>Analyze transcripts</td>
<td>15-Sep</td>
</tr>
<tr>
<td>PSQC SAR released</td>
<td>30-Sep</td>
</tr>
<tr>
<td>Identify best practices</td>
<td>15-Oct</td>
</tr>
<tr>
<td></td>
<td>30-Oct</td>
</tr>
<tr>
<td></td>
<td>15-Nov</td>
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<tr>
<td></td>
<td>30-Nov</td>
</tr>
<tr>
<td></td>
<td>15-Dec</td>
</tr>
<tr>
<td></td>
<td>30-Dec</td>
</tr>
</tbody>
</table>
## Project Timeline-2023

<table>
<thead>
<tr>
<th>Task</th>
<th>CY2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSQC SAR released</td>
<td>15-Jan</td>
</tr>
<tr>
<td>Develop implementation bundle</td>
<td>30-Jan</td>
</tr>
<tr>
<td>Train all sites on implementation bundle</td>
<td>15-Feb</td>
</tr>
<tr>
<td>Meet with sites, review progress</td>
<td>28-Feb</td>
</tr>
<tr>
<td>PDSA Cycles</td>
<td>15-Mar</td>
</tr>
<tr>
<td>Develop interim report on process findings</td>
<td>30-Mar</td>
</tr>
<tr>
<td>Present prelim at APSA</td>
<td>15-Apr</td>
</tr>
<tr>
<td>Webinar for members on process experiences</td>
<td>30-Apr</td>
</tr>
<tr>
<td>Continue meeting with sites, receiving feedback</td>
<td>15-May</td>
</tr>
<tr>
<td>Present prelim at ACS Q&amp;S</td>
<td>30-May</td>
</tr>
<tr>
<td>PSQC SAR released</td>
<td>15-Jun</td>
</tr>
<tr>
<td>Webinar for members on SAR measures</td>
<td>30-Jun</td>
</tr>
<tr>
<td>Develop report on outcomes</td>
<td>15-Jul</td>
</tr>
<tr>
<td></td>
<td>30-Jul</td>
</tr>
<tr>
<td></td>
<td>15-Aug</td>
</tr>
<tr>
<td></td>
<td>30-Aug</td>
</tr>
</tbody>
</table>
Next Steps

- Conduct interviews
- Qualitative analysis
- Identify best practices
- Develop implementation guide
- Share with collaborative
ACS-NSQIP PSQC Project #3:
Reducing Unnecessary Postoperative Antimicrobial Prophylaxis in Children Undergoing Elective GI Surgery

Shawn J. Rangel, MD, MSCE
Senior Surgical Advisor for Quality & Safety | Boston Children’s Hospital
Director & Principal Investigator | NSQIP-Pediatric Antimicrobial Stewardship Pilot Project
shawn.rangel@childrens.harvard.edu
@ShawnRangelMD
ACS-NSQIP PSQC Project #3: Reducing Unnecessary Postoperative Antimicrobial Prophylaxis in Children Undergoing Elective GI Surgery

Overview:

- Background & Justification – *Why antibiotic stewardship?*
- NSQIP-P SAP Pilot Data – *Where should we focus our efforts?*
- PSQC Collaborative Structure – *How will we get better together?*
- Timeline and next steps – *When does this all get underway?*
The American College of Surgeons (ACS) Children’s Surgery Verification Program

- Procedure-targeted outcomes and resource utilization measures (2016)
- Time-to-OR process measures for emergent surgical conditions (2018)
- Compliance measures for appropriate use of antimicrobial prophylaxis (2021)
Estimated minimum number of illnesses and deaths caused annually by antibiotic resistance*:

At least 2,049,444,442 illnesses, 23,000 deaths
Goals & Vision of the NSQIP-Pediatric Surgical Antimicrobial Prophylaxis Pilot Project
(Conceptualized March, 2018....)

- Provide hospitals with benchmarking data to prioritize efforts around stewardship and infection prevention
- Establish a prioritization framework for procedures where evidence-based guidelines are needed most
- Develop guidelines for SAP utilization based on the best available evidence in children
- Provide a platform for the sharing of ideas and successful projects to facilitate and promote antimicrobial stewardship
Prioritization Framework: (Mis)utilization drivers of antimicrobial resistance

What areas of prophylaxis misutilization are considered the major drivers of antimicrobial resistance and adverse events?

#1: Prolonged duration (postop utilization)

#2: Use of overly broad-spectrum agents

#3: Use of unindicated prophylaxis (single dose)
NSQIP-P SAP Pilot Data Overview

Prophylaxis utilization data collected at 92 hospitals by from 6/2018-6/2020 using standardized chart review process

- **Inclusion criteria:** 417 non-emergent procedures representing all 6 NSQIP-P surgical specialties (83,234 patients)

- **Exclusion criteria:** pre-existing infection, preoperative antibiotic treatment, impaired immune function, allergies to antibiotics

- **Data collected:** number and type of prophylactic agents, timing relative to incision, prophylaxis duration

- **Prophylaxis misutilization rates:** calculated for appropriate indication, spectrum, timing & duration based on contemporary consensus guidelines and adjusted for case-mix
Variation in Postop Prophylaxis Utilization

Any postop prophylaxis
- Overall rate: 41.1%
- Hospital range: 0-71.2%
- 30-fold variation in aOR’s
- Statistical outliers: 57.6%
  (53/92)

Postop prophylaxis >24 hrs
- Overall rate: 9.2%
- Hospital range: 0-35.1%
- 96-fold variation in aOR’s
- Statistical outliers: 47.8%
  (44/92)

He et al., JAMA Surg, In press
Correlation between Postoperative Prophylaxis Utilization and SSI Rates

He et al., JAMA Surg, In press
Hospital-level Correlation between Postoperative Prophylaxis Utilization and SSI Rates

ORL

$r = -0.13; p = 0.25$

General Surgery

$r = 0.02; p = 0.83$

$r = 0.02; p = 0.85$

Orthopedic Surgery

$r = 0.05; p = 0.61$

Plastic Surgery

$r = 0.11; p = 0.35$

Neurosurgery

Urology

$r = 0.05; p = 0.64$
## Postoperative Prophylaxis Utilization Associated with GI Procedures in General Surgery

<table>
<thead>
<tr>
<th>Procedure Description</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal procedures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>COLORECTAL-PULLTHROUGH (HIRSCHSPRUNGS DISEASE)</strong></td>
<td>448</td>
<td>69.64</td>
<td>312</td>
<td>33.04</td>
<td>148</td>
</tr>
<tr>
<td><strong>COLORECTAL-ANORECTAL MALFORMATION</strong></td>
<td>808</td>
<td>64.48</td>
<td>521</td>
<td>36.26</td>
<td>293</td>
</tr>
<tr>
<td><strong>COLORECTAL-PULLTHROUGH WITH POUCH</strong></td>
<td>304</td>
<td>61.84</td>
<td>188</td>
<td>26.64</td>
<td>81</td>
</tr>
<tr>
<td><strong>ESOPHAGUS NON-REFLUX</strong></td>
<td>387</td>
<td>39.02</td>
<td>151</td>
<td>13.95</td>
<td>54</td>
</tr>
<tr>
<td><strong>SMALL BOWEL</strong></td>
<td>1318</td>
<td>36.80</td>
<td>485</td>
<td>15.71</td>
<td>207</td>
</tr>
<tr>
<td><strong>COLORECTAL-COLOSTOMY</strong></td>
<td>913</td>
<td>36.69</td>
<td>335</td>
<td>12.27</td>
<td>112</td>
</tr>
<tr>
<td><strong>COLORECTAL-OTHER</strong></td>
<td>1121</td>
<td>31.85</td>
<td>357</td>
<td>11.69</td>
<td>131</td>
</tr>
<tr>
<td><strong>GASTRIC-OTHER</strong></td>
<td>276</td>
<td>24.64</td>
<td>68</td>
<td>8.33</td>
<td>23</td>
</tr>
<tr>
<td><strong>GASTROESOPHAGEAL REFLUX</strong></td>
<td>1698</td>
<td>15.84</td>
<td>269</td>
<td>4.30</td>
<td>73</td>
</tr>
<tr>
<td><strong>GASTROSTOMY</strong></td>
<td>7679</td>
<td>9.87</td>
<td>758</td>
<td>0.25</td>
<td>19</td>
</tr>
<tr>
<td><strong>GASTROSTOMY CLOSURE</strong></td>
<td>2589</td>
<td>4.40</td>
<td>114</td>
<td>0.89</td>
<td>23</td>
</tr>
<tr>
<td><strong>CHolecystectomy</strong></td>
<td>4767</td>
<td>4.34</td>
<td>207</td>
<td>0.80</td>
<td>38</td>
</tr>
<tr>
<td><strong>PYloromyotomy</strong></td>
<td>5249</td>
<td>2.51</td>
<td>132</td>
<td>0.48</td>
<td>25</td>
</tr>
</tbody>
</table>
# Postoperative Prophylaxis Utilization Associated with GI Procedures in General Surgery

<table>
<thead>
<tr>
<th>Gastrointestinal procedures</th>
<th>Any postoperative use</th>
<th>Postoperative use &gt;24 hr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
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<td>448</td>
<td>69.64</td>
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<td>2589</td>
<td>4.40</td>
</tr>
<tr>
<td><strong>CHOLECYSTECTOMY</strong></td>
<td>4767</td>
<td>4.34</td>
</tr>
<tr>
<td><strong>PYLOROMYOTOMY</strong></td>
<td>5249</td>
<td>2.51</td>
</tr>
</tbody>
</table>
SSI Rates Associated with General Pediatric Surgical Procedures

He et al., Ann Surg, In press
SSI Rates Associated with General Pediatric Surgical Procedures

He et al., Ann Surg, In press
Association between Postoperative Prophylaxis Utilization and SSI Rates (Very preliminary analysis of pilot data)

<table>
<thead>
<tr>
<th>Procedure group / wound class</th>
<th>Postoperative Antibiotics (+)</th>
<th>Postoperative Antibiotics (-)</th>
<th>aOR*</th>
<th>95%CI LOW</th>
<th>95%CI HIGH</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean contaminated - GI foregut</td>
<td>SSI % (N SSI/Total)</td>
<td>SSI % (SSI N/Total)</td>
<td>4.50</td>
<td>84/1828</td>
<td>4.04</td>
<td>396/9806</td>
</tr>
<tr>
<td>Clean contaminated - GI colorectal</td>
<td><em>Adjustment made using covariates associated with SSI risk by NSQIP-P historical modeling data</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Why are us surgeons so poorly compliant?

• Believe their practice reflects the “norm” among peers
• Variable **knowledge** of existing/published guidelines
• Underestimation of potential harm; over-estimation of benefit
• Variable **confidence** in existing guidelines derived from adult data
PSQC SAP Collaborative Framework

• Establish SAP stewardship improvement teams
  - Include surgery, anesthesia, OR nursing, antimicrobial stewardship program, OR pharmacy

• Identify opportunities for improved stewardship from your site report
  - Which GI procedures (and attendings!) offer the lowest hanging fruit?

• Identification of high performers from PSQC collaborative report
  - Qualitative assessment – what makes them better and what can we learn from them?

• Development/sharing of strategies for culture & practice change
  - Dissemination of evidence-based guidelines for postoperative utilization
  - Development of practice change Toolkits (American Pediatric Surgical Association)
  - Leverage “lessons learned” from SHARPS/NSQIP-P postop SAP de-implementation trial (R01)
SAP Pilot Survey: “Which of the following stewardship principles for SAP are targeted by the efforts at your hospital?”

<table>
<thead>
<tr>
<th>Stewardship Principle</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving timely administration (e.g. within 1 hour of incision)</td>
<td>60.00%</td>
</tr>
<tr>
<td>Avoiding the use of unnecessarily broad spectrum agents</td>
<td>56.84%</td>
</tr>
<tr>
<td>Avoiding use in cases where it is not indicated</td>
<td>54.74%</td>
</tr>
<tr>
<td>Avoiding prolonged utilization following incision closure</td>
<td>48.42%</td>
</tr>
<tr>
<td>I am not sure.</td>
<td>25.26%</td>
</tr>
<tr>
<td>N/A, we have no current strategies.</td>
<td>4.21%</td>
</tr>
</tbody>
</table>
SAP Pilot Survey: “Are any of the following used at your hospital to monitor or promote stewardship around SAP?”

<table>
<thead>
<tr>
<th>Activity</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardized guidelines for SAP based on procedure.</td>
<td>53.76%</td>
</tr>
<tr>
<td>Standardized preoperative orders/ordersets for SAP.</td>
<td>49.46%</td>
</tr>
<tr>
<td>Standardized postoperative orders/ordersets for SAP.</td>
<td>43.01%</td>
</tr>
<tr>
<td>SAP discussion during perioperative surgical checklist/briefing</td>
<td>40.86%</td>
</tr>
<tr>
<td>SAP utilization audits fed back to surgeons/surgical departments.</td>
<td>33.33%</td>
</tr>
<tr>
<td>SAP guideline audits fed back to surgeons/surgical departments.</td>
<td>32.26%</td>
</tr>
<tr>
<td>SAP-focused newsletters, emails, or other information</td>
<td>25.81%</td>
</tr>
<tr>
<td>Targeted education (verbal or written) for rotating trainees</td>
<td>25.81%</td>
</tr>
</tbody>
</table>
Timeline and next steps (*very* tentative...)

- New NSQIP-P SAP site reports to be released this Fall
- NSQIP-Pediatric Webinar to review comparative data (Winter 2023)
- Publication of pilot data to support evidence-based guidelines (Spring)
- Launch of the PSQC SAP Project TBD (Summer 2023?)
  - First collaborative PSQC report release (Summer 2023?)
  - Qualitative interviews of high-performers (Summer-Fall 2023)
  - Development of implementation strategies & toolbox “kits” (Winter 2023)
  - Sharing of best practices through webinars (Winter 2023/Spring 2024)
Disclosures

• No financial disclosures
Disclosures

• *Significant contributor to opioid prescriptions in Calif since early 2000s*
Background

- Opioid Rx has been existing standard for postop analgesia
- American Pain Society 1996: “Pain as 5th Vital sign”
- Biased provider perceptions and variability in prescribing
- Poor provider to patient/parent opioid education
- Under-recognized misuse of opioid prescriptions
- Current opioid epidemic estimated costs by CDC:
  - >600,000 deaths
  - $92 billion dollars
Opioid Prescription Misuse

APS: “Pain 5th vital sign”

Fig. 1. Historical trends in lifetime prevalence (left scale) and incidence (right scale) of prescription opioid misuse among youth. 1965–2002.

Sung HE et al. J Adolesc Health 20
Opioid Prescription Misuse

from SAMHSU - Substance Abuse and Mental Health Services Admin, based on 2017 NSDUH survey
Opioid Prescription Misuse

Direct Patient Misuse
- Prescription from One Doctor (34.6%)
- Prescriptions from More Than One Doctor (1.5%)
- Stole from Doctor’s Office, Clinic, Hospital, or Pharmacy (0.5%)

Got through Prescription(s) or Stole from a Health Care Provider (36.6%)
- Some Other Way (4.6%)
- Bought from Drug Dealer or Other Stranger (5.7%)

From Friend or Relative for Free (38.5%)
- Bought from Friend or Relative (10.6%)
- Took from Friend or Relative without Asking (4.0%)

11.1 Million People Aged 12 or Older Who Misused Prescription Pain Relievers in the Past Year

SAMHSU - Substance Abuse and Mental Health Services Admin, based on 2017 NSDUH survey
Opioid Rx - Variation for Appy

Fig. 2. Proportion of patients receiving opioid prescriptions at discharge after appendectomy for simple appendicitis by surgeon.

Table 3
Postdischarge outcomes in simple appendicitis patients who did not receive opioids compared to those who did receive opioids. ED = emergency department.

<table>
<thead>
<tr>
<th></th>
<th>No Opioids Received</th>
<th>Received Opioids</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (%)</td>
<td>139 (37.5)</td>
<td>232 (62.5)</td>
<td></td>
</tr>
<tr>
<td>ED visit</td>
<td>6 (4.3)</td>
<td>31 (13.4)</td>
<td>0.005</td>
</tr>
<tr>
<td>ED chief complaint</td>
<td>3 (50)</td>
<td>22 (70.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>abdominal pain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Readmission</td>
<td>3 (2.2)</td>
<td>12 (52)</td>
<td>0.15</td>
</tr>
<tr>
<td>Constipation</td>
<td>0 (0)</td>
<td>9 (3.9)</td>
<td>0.02</td>
</tr>
<tr>
<td>Constipation requiring readmission</td>
<td>0 (0)</td>
<td>4 (2.1)</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Tsao et al. JPS 2018
Common Opioid Stewardship Goals

• Decrease or eliminate postop opioid prescriptions
  • Limit opioid prescription dose number and refill
  • Minimize prescription variation by use of guidelines
  • Avoid inappropriate prescribing (eg., codeine, Tramadol)

• Maximize local / regional anesthesia modalities
  • Pre-incision blockade

• Maximize appropriate NSAID use
  • Preemptive analgesia admin
  • Postop routine RTC NSAID use
  • Multi-modality non-opioid meds w- alternate dose timing
Opioid Rx QI - Ped Surgery

• Stanford Ped Surgery Opioid Prescription QI in 2018
  • Universal surgeon consensus in division (rare)
  • Inspired by principles from the ‘mother of opioid stewardship’
• Goal: Eliminate all opioid postop discharge prescription
  • Exceptions: Nuss procedure, Bariatric procedures, some trauma
    • Multi-modality meds and anesthesia
    • Limit dose prescriptions
• Maximize local / regional anesthesia modalities
• Standard alternating Tylenol / Ibuprofen
Multi-Institutional Quality Improvement Project to Minimize Opioid Prescribing in Children after Appendectomy Using NSQIP-Pediatric

Lorraine I Kelley-Quon, MD, MSHT, FACS, FAAP, Shadassa OursHalimian, MPH, Justin Lee, MD, FACS, Katie W Russell, MD, FACS, Karen Kling, MD, FACS, Stephen B Shew, MD, FACS, Claudia Mueller, PhD, MD, FACS, Aaron R Jensen, MD, MED, MS, FACS, Lan Vu, MD, FACS, Benjamin Padilla, MD, FACS, Daniel Oslie, MD, FACS, Caitlin Smith, MD, FACS, Thomas Inge, MD, FACS, Jonathan Roach, MD, FACS, Romeo Ignacio, MD, FACS, Katrine Losberg, MD, FACS, Stephanie Radu, MCR, Autumn Rohan, BS, Kasper S Wang, MD, FACS
The WPSRC is a multi-institutional surgical collaborative committed to advancing the care of infants and children through contemporary evidence-based research.
QI Goal:

Decrease opioid Rx at time of discharge for children undergoing laparoscopic appendectomy across WPSRC consortium sites
Baseline Opioid Stewardship - WPSRC sites

- 5 of 10 centers had existing protocols for eliminating opioid Rx after laparoscopic appendectomy
- Significant variation at remaining sites

- WPSRC member consensus:
  - pediatric surgeons *should* be eliminating opioid Rx after lap appy
  - multi-site buy-in would be attainable
Leveraging NSQIP-Peds for Multi-Institutional QI

- NSQIP platform customizable field inputs
- Opioid Rx variables at discharge (EMR) and SCR 30d follow-up
  - Opioid type, dose, alternative source opioid Rx, persistent use at 30d
  - ER visit, Readmission (all-cause and cause)
  - Likert 5-point satisfaction scale on 30d F-U (balancing measure)
- Strong SCR engagement, minimal work added
- Engagement elicited and project endorsed by parent representative
  - Uniform discharge instructions - alternating Tylenol & Ibuprofen
QI Implementation Plan

- Multi-site Buy In
- Instruct SCR Custom Fields Creation
- Discharge Instructions Standardized (Multi-lingual)
- SCR data collect & 30d F-U Data Extraction after 90d lockout
- Q3mo PDSA Cycles & Site feedback
# Demographics of NSQIP

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total, N = 1,524</th>
<th>Preintervention, n = 730</th>
<th>Postintervention, n = 794</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex, n (%)</td>
<td>891 (58.5)</td>
<td>435 (59.6)</td>
<td>456 (57.4)</td>
<td>0.393</td>
</tr>
<tr>
<td>Race, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.694</td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>16 (1.1)</td>
<td>9 (1.2)</td>
<td>7 (0.9)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>57 (3.7)</td>
<td>25 (3.4)</td>
<td>32 (4.0)</td>
<td></td>
</tr>
<tr>
<td>Black or African American</td>
<td>27 (1.8)</td>
<td>11 (1.5)</td>
<td>16 (2.0)</td>
<td></td>
</tr>
<tr>
<td>Multiracial</td>
<td>2 (0.1)</td>
<td>1 (0.1)</td>
<td>1 (0.1)</td>
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</tr>
<tr>
<td>Native Hawaiian or Pacific Islander</td>
<td>6 (0.4)</td>
<td>4 (0.6)</td>
<td>2 (0.3)</td>
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<tr>
<td>Unknown</td>
<td>439 (28.8)</td>
<td>219 (30.0)</td>
<td>220 (27.7)</td>
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</tr>
<tr>
<td>White</td>
<td>977 (64.1)</td>
<td>461 (63.2)</td>
<td>516 (65.0)</td>
<td></td>
</tr>
<tr>
<td>Hispanic ethnicity, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.113</td>
</tr>
<tr>
<td>Yes</td>
<td>670 (44.0)</td>
<td>340 (46.6)</td>
<td>330 (41.6)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>789 (51.8)</td>
<td>363 (49.7)</td>
<td>426 (53.7)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>65 (4.3)</td>
<td>27 (3.7)</td>
<td>38 (4.8)</td>
<td></td>
</tr>
<tr>
<td>Insurance, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>720 (47.2)</td>
<td>333 (45.6)</td>
<td>387 (48.7)</td>
<td>0.222</td>
</tr>
<tr>
<td>Public</td>
<td>764 (50.1)</td>
<td>366 (49.7)</td>
<td>398 (50.1)</td>
<td>0.997</td>
</tr>
<tr>
<td>Self-pay</td>
<td>14 (0.9)</td>
<td>8 (1.1)</td>
<td>6 (0.8)</td>
<td>0.487</td>
</tr>
<tr>
<td>Other</td>
<td>106 (7.0)</td>
<td>64 (8.8)</td>
<td>42 (5.3)</td>
<td>0.008</td>
</tr>
<tr>
<td>Complicated appendicitis, n (%)</td>
<td>463 (30.4)</td>
<td>230 (31.5)</td>
<td>233 (29.4)</td>
<td>0.359</td>
</tr>
<tr>
<td>Age at surgery, y, mean ± SD</td>
<td>10.6 (3.7)</td>
<td>10.4 (3.8)</td>
<td>10.7 (3.6)</td>
<td>0.044</td>
</tr>
</tbody>
</table>
Figure 2. Run chart: percent of children receiving opioids at discharge by hospital (A–J) before and after the quality improvement intervention. No-Protocol Hospitals are highlighted in red/orange/yellow, Protocol Hospitals are highlighted in blue/green.
Outcomes based on type of appendicitis

Table 2. Overall Rate of Opioid Prescribing at Discharge and Balancing Measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Complicated appendicitis</th>
<th>Overall</th>
<th>Uncomplicated appendicitis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preintervention, n = 230 (%)</td>
<td>Postintervention, n = 233 (%)</td>
<td>p Value</td>
</tr>
<tr>
<td>Discharged with opioid prescription, n (%)</td>
<td>19 (8.3)</td>
<td>5 (2.2)</td>
<td>0.003</td>
</tr>
<tr>
<td>30-day ER visit, n (%)</td>
<td>23 (10.1)</td>
<td>35 (15.8)</td>
<td>0.0694</td>
</tr>
<tr>
<td>Parent satisfaction score, mean ± SD</td>
<td>-</td>
<td>4.7±0.7</td>
<td>–</td>
</tr>
</tbody>
</table>

ER, emergency room.
Outcomes based on *pre-existing* hospital opioid-free Rx protocol.

### Table 3. Rate of Opioid Prescribing at Discharge and Balancing Measures for Complicated Appendicitis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Complicated appendicitis</th>
<th>No-protocol hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Protocol hospital</td>
<td></td>
</tr>
<tr>
<td>Discharged with opioid prescription, n (%)</td>
<td>Preintervention, n = 122</td>
<td>1 (0.8)</td>
</tr>
<tr>
<td></td>
<td>Postintervention, n = 145</td>
<td>1 (0.7)</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>1.000</td>
</tr>
<tr>
<td>30-day ER visit, n (%)</td>
<td>Preintervention, n = 108</td>
<td>18 (16.7)</td>
</tr>
<tr>
<td></td>
<td>Postintervention, n = 88</td>
<td>4 (4.6)</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>0.011</td>
</tr>
<tr>
<td>Parent satisfaction score, mean ± SD</td>
<td>Preintervention, n = 108</td>
<td>11 (10.4)</td>
</tr>
<tr>
<td></td>
<td>Postintervention, n = 88</td>
<td>9 (10.5)</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>0.984</td>
</tr>
<tr>
<td></td>
<td>Protocol hospital</td>
<td></td>
</tr>
<tr>
<td>Discharged with opioid prescription, n (%)</td>
<td>Preintervention, n = 122</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Postintervention, n = 145</td>
<td>4.8 ± 0.6</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>–</td>
</tr>
<tr>
<td>30-day ER visit, n (%)</td>
<td>Preintervention, n = 108</td>
<td>4.6 ± 0.9</td>
</tr>
<tr>
<td></td>
<td>Postintervention, n = 88</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>–</td>
</tr>
<tr>
<td>Parent satisfaction score, mean ± SD</td>
<td>Preintervention, n = 108</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Postintervention, n = 88</td>
<td>4.6 ± 0.9</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>–</td>
</tr>
</tbody>
</table>

ER, emergency room.

### Table 4. Rate of Opioid Prescribing at Discharge and Balancing Measures for Uncomplicated Appendicitis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Uncomplicated appendicitis</th>
<th>N = 1061 (69.6%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Protocol hospitals</td>
<td></td>
</tr>
<tr>
<td>Discharged with opioid prescription, n (%)</td>
<td>Preintervention, n = 286</td>
<td>10 (3.5)</td>
</tr>
<tr>
<td></td>
<td>Postintervention, n = 330</td>
<td>3 (0.9)</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>0.045</td>
</tr>
<tr>
<td>30-day ER visit, n (%)</td>
<td>Pre-intervention, n = 214</td>
<td>104 (48.6)</td>
</tr>
<tr>
<td></td>
<td>Post-intervention, n = 231</td>
<td>24 (10.4)</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mean parent satisfaction score, mean ± SD</td>
<td>Pre-intervention, n = 214</td>
<td>16 (7.8)</td>
</tr>
<tr>
<td></td>
<td>Post-intervention, n = 231</td>
<td>19 (8.3)</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>0.851</td>
</tr>
<tr>
<td></td>
<td>Protocol hospitals</td>
<td></td>
</tr>
<tr>
<td>Discharged with opioid prescription, n (%)</td>
<td>Preintervention, n = 286</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Postintervention, n = 330</td>
<td>4.8 ± 0.5</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>–</td>
</tr>
<tr>
<td>30-day ER visit, n (%)</td>
<td>Pre-intervention, n = 214</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Post-intervention, n = 231</td>
<td>4.7 ± 0.7</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>–</td>
</tr>
<tr>
<td>Parent satisfaction score, mean ± SD</td>
<td>Pre-intervention, n = 214</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Post-intervention, n = 231</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>p Value</td>
<td>–</td>
</tr>
</tbody>
</table>

ER, emergency room.
PSQC Opioid QI Proposal

Can we extrapolate opioid stewardship QI to PSQC sites ??
PSQC Opioid QI Proposal

QI Goals:

• Assess current variation in opioid Rx patterns across all NSQIP pts from PSQC sites and specialties
• Establish guidelines and resources for opioid stewardship to distribute to PSQC sites
• **Decrease opioid Rx by 50% of baseline across PSQC sites in 1yr**
• Eliminate inappropriate opioid type prescribing
• Maintain equivalent counter-balance measures
  • 30-d ER revisit, patient/parent satisfaction score
PSQC Opioid QI Proposal

Implementation Plan:

- Utilize NSQIP platform and SCR / Surg champion engagement
- New standard, required variables to be created in NSQIP platform:
  - Opioid prescription (Y/N) - [REQUIRED]
  - Opioid type (drop down selection) - [REQUIRED]
  - Doses prescribed - [OPTIONAL]
- NSQIP platform to assess PSQC site practice patterns in opioid Rx
- Custom variables to further characterize opioid Rx
- Quarterly to semi-annual reports of site comparison to PSQC
Implementation Goals:

- **Phase 1a** - Survey current basic opioid prescribing practices of different specialties from each site and establish regular self-reporting of sites to PSQC.
- **Phase 1b** - Implement a site-specific opioid prescribing quarterly report generated from the PSQC as blinded site comparison.
- **Phase 1c** - Offer basic educational tools, known opioid sparing guidelines and potential QI coaching from select low opioid prescribing sites of different surgical specialties.
- **Phase 2a** - Create a custom, multiple variable opioid dataset within NSQIP-pediatric to analyze across specific sites by procedure to generate risk adjusted effects toward highly effective opioid-sparing outcomes.
- **Phase 2b** - Determine factors associated with most successful opioid sparing efforts and establish most effective best practice opioid stewardship guidelines to be disseminated to PSQC sites.
- **Phase 2c** - Track improvement efforts across PSQC sites over time toward effective minimizing opioid prescribing nationally.
- **Phase 2d** - Facilitate creating standardized, site specific opioid stewardship SAR for to be incorporated into NSQIP-Pediatric SARs.
PSQC Opioid QI Proposal

Immediate Next Steps:

- Formation of PSQC Opioid Stewardship working group
- Selection of pertinent process and outcome variables and counter-balance measures
- Potential barriers to address / solve:
  - NSQIP creation of new standard variables → at least 18-24 months before in standard NSQIP SAR
  - Site engagement / bandwidth for custom variables and data management
  - DUAs
PSQC Opioid QI Proposal

Questions?
Interested in being involved ??!!

Stephen Shew
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Terry Fisher
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Antibiotic Duration in Complex Appendicitis

Erich Grethel, Monica Lopez
NSQIP-P cohort there is wide variability in antibiotic prescription practice

- Most recent NSQIP-P SAR reveals usage of oral antibiotics on discharge ranging from 0% to 100%, with a median of about 65%

Lack of universally accepted treatment with regard to antibiotic therapy after appendectomy for complex appendicitis in pediatric patients

Antibiotic stewardship protects patients from harms caused by unnecessary antibiotic use and combats antibiotic resistance
Discharge Oral Antibiotic Usage in Complicated Patients
• 518 Adult patients
• Set duration of 4+/−1 days of antibiotic administration after source control of intra-abdominal infections
• Similar outcomes to those treated with longer duration antibiotics (2 days after resolution of fever, leukocytosis, ileus/ max 10 days)
• Median duration of antibiotic therapy was 4.0 days in the experimental group, as compared with 8.0 days in the control group
Effectiveness of a clinical pathway for pediatric complex appendicitis based on antibiotic stewardship principles

Megan E. Cunningham a, Huirong Zhu a, Connor T. Hoch b, Annalyn S. DeMello a, Nakada D. Gusman a, Sara C. Fallon a, Monica E. Lopez a, b

a Texas Children’s Hospital, Division of Pediatric Surgery, 6791 Fannin Street, Houston, TX 77030, USA
b Baylor College of Medicine, 1 Baylor Plaza, Houston, TX 77030, USA

A complete course of intravenous antibiotics vs a combination of intravenous and oral antibiotics for perforated appendicitis in children: a prospective, randomized trial

Department of Surgery, The Children’s Mercy Hospital, Kansas City, MO 64106, USA

Colorectal
Prospective evaluation of a clinical response directed pathway for complicated appendicitis

Nick Lansdale a, Samantha Fryer b, Mairead Stockdale b, James Bancroft b, Jennifer Orr b, Harriet Corbett b, Simon Kenny b, c

a Department of Paediatric Surgery, Royal Manchester Children’s Hospital, UK
b Department of Paediatric Surgery, Alder Hey Children’s Hospital, Liverpool, UK
Aim of Project

- Evaluate the Collaborative cohort antibiotic usage (oral and IV) after appendectomy for complex appendicitis
- Baseline data
  - discharge antibiotic information plotted against length of stay in morbidity excluded patients (primary outcome)
  - discharge antibiotic information plotted against surgical site infections (secondary outcome)
  - discharge antibiotic information plotted against return to ED/re-hospitalization (alternative secondary outcome/balance metric).
- Understand outliers of centers that discharge these patients without antibiotics, have shorter hospital stay, and less postoperative occurrences
- Use qualitative methods to ascertain postop protocols from low and high outliers
Scatter Plot Example

*Report IDs have been removed and hospital-specific graphs will be issued.*
Aggregate Median Length of Stay (Days; Morbidity Excluded) = 3 Days (Q1 = 2 Days, Q3 = 5 Days)
Variables

- Evaluate in complex appendectomy patients as well as the morbidity excluded set
  - Length of stay
  - Antibiotics at discharge
  - Surgical site infections
  - Return to ED/OR
  - Readmission
  - Duration of postoperative antibiotics (days from source control)*
  - Method of antibiotics (IV vs oral - with time stamp for each)*
  - Type of oral antibiotic at discharge*

- Additional confounding factors include severity of complex appendicitis and method of source control

*additional data to be collected
Suppositions and Implications

● Hypothesis: no significant difference in postoperative occurrence rate in centers that discharge complex appendectomy patients with or without antibiotics

● Implication that antibiotic stewardship principles would dictate more judicious use of postoperative antibiotics after source control in this population
Project Design

- Phase 1: Assemble workgroup
- Phase 2: Design project parameters
- Phase 3: Collect data
  - NSQIP/PSQC reports
  - Survey/compile strategies of high/low outliers
  - Determine factors associated with appropriate antibiotic usage
- Phase 4: Assess and Dissemination
  - Basic educational tools
  - Algorithm/teaching from select low antibiotic usage sites
Colon Bundle Protocol for Pediatric Surgical Patients

Justin Lee, MD
Phoenix Children’s Hospital
Background

- Pediatric colorectal procedures: high rate of SSI
  - 7.2% all SSI burden: 2.5% NSQIP-P caseload
    - Partial colectomy (29%)
    - Total colectomy (11%)
    - Colostomy closure (11%)

- Standardized perioperative care in colorectal surgery
  - Reduction in SSI in adults
  - Increasing evidence in pediatric population
Background

- Single center experience
  - Retrospective study (n=145)
  - Superficial SSI (21% vs 8%)
  - Readmission (16% vs 4%)

Intraoperative

- Leak test (if arterial anastomosis performed)
- Dedicated closure tray
  - Minor instrument tray opened after fascial closure
- Placement of subcutaneous drain in grossly contaminated cases
  - Drains can be:
    - Vessel loop
    - Penrose
    - Umbilical tape
    - Other commonly seen object

Postoperative

- Occlusive dressing removed at 48h
  - (clean-contaminated cases)
- Maintenance of Euphemia
  - Perioperative antibiotics discontinued at 24h
Background

- Single center experience\(^7\)
  - Retrospective study (n=145)
  - Superficial SSI (21% vs 8%)
  - Readmission (16% vs 4%)

- Multicenter experience\(^{11}\)
  - Prospective study (n=336)
  - Superficial SSI (9.7% vs 4.0%)
Study Design

- Prospective study
- Working Group: pilot hospitals
Study Design

- Prospective study
- Working Group: pilot hospitals
- Colon Bundle Design

WPSRC Multicenter Prospective Study

**Colon Bundle Protocol Checklist**

**Procedures to Include:** All colorectal procedures WITH anastomosis and abdominal closure

**Preoperative**
- (Optional) Bowel preparation
- (Optional) Chlorhexidine (SAGE) bath/wipes
- Umbilical cleansing (alcohol cleaning of umbilicus prior to skin prep)
- Preoperative antibiotic given within 1 hour of incision
  - Includes gram negative and anaerobic coverage

**Intraoperative (Document in operative report)**
- Anastomotic leak test
- Dedicated closure tray (instrument change and new drapes prior to skin closure)
- Glove change prior to skin closure
- (Optional) Placement of subcutaneous drain in grossly contaminated cases
  - Drain can be: vessel loop, penrose, umbilical tape, or other wicking object
- Maintenance of normothermia (<36°C or >38°C for less than 30 minutes)

**Postoperative**
- Perioperative antibiotics discontinued at 24 hours
  - If present, occlusive dressing removed at 48 hours to examine wound
Study Design

- Prospective study
- Working Group: pilot hospitals
- Colon Bundle Design
- CPT procedure codes

Current procedure terminology (CPT) codes used to identify the study cohort on the basis of colorectal procedures and procedure groups.

<table>
<thead>
<tr>
<th>Procedures and procedure groups</th>
<th>Current procedure terminology codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colostomy</td>
<td>44188; 44320; 44322; 44605</td>
</tr>
<tr>
<td>Colostomy closure</td>
<td>44620; 44625; 44626; 44227</td>
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<tr>
<td>Colostomy revision</td>
<td>44340; 44345; 44346</td>
</tr>
<tr>
<td>Partial colectomy</td>
<td>44160; 44140; 44205; 44204; 44145; 44207; 44147; 44208; 45123</td>
</tr>
<tr>
<td>Partial colectomy + colostomy</td>
<td>44141; 44143; 44206; 44208; 45110</td>
</tr>
<tr>
<td>Partial colectomy + diverting ostomy</td>
<td>44144</td>
</tr>
<tr>
<td>Proctocolectomy +/- ostomy</td>
<td>45113; 45397; 45119; 45110; 45112; 45120</td>
</tr>
<tr>
<td>Pullthrough (PT) +/- ostomy</td>
<td>45120; 45121; 45397; 45112; 45119; 45117; 45123; 45395; 45111; 45113</td>
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<tr>
<td>Repair of high imperforate anus</td>
<td>46730; 46735; 46740; 46742</td>
</tr>
<tr>
<td>Repair of low imperforate anus</td>
<td>46716</td>
</tr>
<tr>
<td>Total abdominal colectomy (TAC) + PT</td>
<td>44211; 44158; 44157</td>
</tr>
<tr>
<td>TAC + PT + diverting ostomy</td>
<td>44211; 44158; 44211; 44212</td>
</tr>
<tr>
<td>TAC +/- ostomy</td>
<td>44120; 44150; 44151; 44155; 44156; 44210; 44212</td>
</tr>
</tbody>
</table>
Study Design

- Prospective study
- Working Group: pilot hospitals
- Colon Bundle Design
- CPT procedure codes
- NSQIP SCR: custom variables
Study Timeline

- Pretest Baseline Rates
- Outcome measures

Pretest
- 6/2022-12/2022

Post-test
- 1/2023-6/2023

Primary Outcome:
- Superficial SSI

Secondary Outcomes:
- Bundle compliance
- Length of stay
- Readmission
- Return to OR
Study Timeline

- Pretest Baseline Rates
- Outcome measures
- Site specific reports
- PDSA cycles
  - 2-mo intervals

Pretest
• 6/2022-12/2022

Post-test
• 1/2023-6/2023

Primary Outcome:
• Superficial SSI

Secondary Outcomes:
• Bundle compliance
• Length of stay
• Readmission
• Return to OR
Colon Bundle Pilot Study

- Feasibility
  - Doable: consensus bundle checklist
  - Compliance: education and awareness

- Infrastructure and support
  - NSQIP online portal customizable variables
  - SCR data collection: dot phrases

- Clinical effectiveness
  - Decrease SSIs
References

Thank you

Justin Lee
jlee8@phoenixchildrens.com
Elizabeth Fialkowski
fialkows@oahus.edu
Questions

Terry Cell: 832-441-6314
Thank you