A Plan Do Study Act (PDSA) Framework for Reducing Colorectal Surgical Site Infections

Background
- Surgical site infections (SSIs) are associated with increased mortality, prolonged postoperative length of stay (LOS), and more frequent re-hospitalization.1-4
- Each patient with an SSI requires an estimated $20,000 increase in cost for care, resulting in a national excess of $2.6 billion annually.5-8
- Colorectal SSI incidence ranges from 10% to 30%, which is higher than most other procedures.4,9-12
- At UTSW, the Centers for Medicare and Medicaid Services (CMS) complex COLO 30-day SSI model indicated an increase in the risk-adjusted standardized infection ratio (SIR) from 0.74 in calendar year (CY) 2018 to 1.45 in CY 2019 to 3.08 in CY 2020 which put our program in the bottom quartile of the nation.

Aim Statement
Reduce the number of COLO CMS Complex SSIs (Surgical Site Infections) occurring during the two-year period from January 2021 to December 2022 by 50% (13.5 infections per year), compared to a baseline of 27.

Analysis
- Colorectal surgical site infections reached their peak in 2020 with 27 total cases, resulting in 628 hospital days (initial surgery days plus readmission days).
- An estimated $540,000 was saved in total costs to the hospital in 2021 and 2022, compared to 2020, due to a reduction in surgical site infections (based on the unit cost per day average).5
- Through the implementation of our SSI reduction project, the number of infections decreased by more than half to 13 cases in 2021. This led to a reduction in total hospital days of 578 in 2021 and 2022 combined.

Interventions and Methodology
- Our project team successfully implemented rapid cycle improvement and PDSA cycles to test, refine, and optimize the effectiveness of interventions aimed at reducing colorectal surgical site infections.
- We implemented SSI bundle items and introduced interventions to improve compliance, such as making Flagyl available in Pyxis machines, post-op patient checklists, and automated reminder systems, using this approach.
- The use of rapid cycle improvement and PDSA cycles allowed us to identify and address issues quickly, resulting in a noteworthy reduction in SSI rates.
- By using this approach, our project team was able to continuously learn and improve our approach, ensuring that we were implementing the most effective interventions for reducing SSI rates and optimizing antimicrobial stewardship practices.
- PDSA cycles were prioritized based on compliance, literature review, and correlation with SSI incidence at our institution.

Results
- Aim goal met: We reduced the count of complex SSIs from a baseline of 27 infections in 2020 to 13 infections in 2021 and 14 infections in 2022 (avg. 13.5 over 2021-22), resulting in a 50% reduction.
- The considerable reduction in SSI led to decreases in hospital bed days, which not only saved the hospital system and patients capital but freed up new beds for potential additional surgeries and profits for the UTSW system.
- The strategies we implemented in our PDSA cycles to reduce colorectal SSI rates could serve as a useful model for other academic medical centers seeking to improve their own outcomes.

Plan Do Study Act (PDSA) Schedule as of June 2022

<table>
<thead>
<tr>
<th>Calendar Year</th>
<th>Colorectal Case Total</th>
<th>Total readmission LOS due to SSI (days)</th>
<th>Total original LOS after primary surgery (days)</th>
<th>Total days original + readmission due to SSI (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>27</td>
<td>628</td>
<td>147</td>
<td>775</td>
</tr>
<tr>
<td>2021</td>
<td>13</td>
<td>294</td>
<td>79</td>
<td>373</td>
</tr>
<tr>
<td>2022</td>
<td>14</td>
<td>238</td>
<td>67</td>
<td>305</td>
</tr>
</tbody>
</table>

Cost per SSI
- SSI Total: 27
- SSI Total Cost: $540,000
- Savings: $280,000
- Hospital Cost Savings: Total of $540,000

Citations
A standardized PDSA Worksheet allowed our team to uniformly track progress and collect data for each intervention.