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EXPANDING THE WHIPPLE ACCELERATED RECOVERY PATHWAY (WARP) TO ALL PATIENTS UNDERGOING PANCREATICODUODENECTOMY (PD)

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Enhanced recovery after surgery refers to an optimization of preoperative, intraoperative, and postoperative care via a multidisciplinary team and multi-modal approach

– E.g. Earlier removal of NG tube, reduced length of stay (LOS)

A reduced LOS reduces time to adjuvant therapy (TTAT), which has been shown to improve patient outcomes and cost savings per patient ($3010 for colorectal and $7020 for pancreas surgery)

However, readmission rate (RR) were found to be higher, particularly in patients with renal insufficiency, sepsis, pancreatic fistula, and delayed gastric emptying (DGE)

Whipple Accelerated Recovery Pathway (WARP) trial at Jefferson aimed to reduce LOS to 5 days (traditional = 7 days) without increasing rate of post-operative complications (POC)

– RESULT: Reduced TTAT and hospital costs
• Although WARP patient outcomes are promising, the program is limited to a highly selective group of patients.

• From 2017, Jefferson began implementing the WARP pathway to all patients (previously categorized into WARP-ineligible and WARP-eligible), hoping to improve outcomes for a larger patient population.

• This study aimed to determine if WARP could be expanded to all patients undergoing PD by retrospectively comparing outcomes among previously WARP-eligible and WARP-ineligible patients.
Objectives & Hypothesis

• Research Question
  – **Purpose:** To determine if WARP can be expanded to all risk-level patients
  – **Variables/outcome measures:** POC (DGE and post-operative fistula [POP]), TTAT, patients initiating adjuvant therapy (PIAT), 30-day and 90-day mortality
  – **Population:** WARP-eligible vs. WARP-ineligible

• Hypothesis
  – The WARP pathway can be expanded to all risk-level patients undergoing PD
Approach & Results

- **Study design & Population**
  - A single-institution retrospective review of 281 patients with benign (18.1%) and malignant (81.9%) disease who underwent PD between 2017-2020
  - Patients were categorized into WARP-eligible and WARP-ineligible groups based on the WARP inclusion criteria
    - High-risk patients were excluded → CHF, end-stage renal disease, O2-dependent COPD, hepatic cirrhosis, soft pancreatic gland texture

- **Intervention**
  - Applying WARP to WARP-ineligible patients (162 patients, 57.7%)

- **Comparison group**
  - Applying WARP to WARP-eligible patients (119 patients, 42.3%)
  - Also compared to WARP patients from original WARP trial (results not included in this presentation)

- **Outcome**
  - LOS, TTAT, RR, POC (including delayed gastric emptying [DGE] and pancreatic fistula [POP], 30-day and 90-day mortality (and many, many more)

- **Data source, collection, and analysis**
  - Data source: EPIC, google drive (excel)
  - Analysis: Univariate/multivariate logical regression analysis

- **Rationale for Approach**
  - EPIC contains all information pertaining to the outcome measures
  - Univariate/multivariate analysis approach to compare ≥ 1 variables
### Approach & Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>WARP-eligible (n = 119)</th>
<th>WARP-ineligible (n = 162)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS</td>
<td>5</td>
<td>6</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>POC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DGE (all grades)</td>
<td>23.5%</td>
<td>45.1%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>POP (all grades)</td>
<td>5.1%</td>
<td>21.0%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>RR</td>
<td>12.6%</td>
<td>23.5%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Median TTAT</td>
<td>55 days</td>
<td>63 days</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Patients initiating adjuvant therapy (PIAT)</td>
<td>74.0%</td>
<td>68.5%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>30-day mortality</td>
<td>2.5%</td>
<td>0.0%</td>
<td>0.04</td>
</tr>
<tr>
<td>90-day mortality</td>
<td>3.4%</td>
<td>1.2%</td>
<td>0.22</td>
</tr>
</tbody>
</table>
• **Patient parameters**
  – E.g. Sex, Age, BMI

• **Presurgical parameters**
  – E.g. Resectable vs. Borderline

• **Intraoperative parameters**
  – E.g. Operative time, Est. blood loss, classic Whipple vs. PPPD

• **Pathology parameters**
  – E.g. PDAC, duodenal carcinoma, cholangiocarcinoma
Conclusions

• Our results demonstrate lower LOS, median TTAT, PIAT, 30-day and 90-day mortality rates in both WARP-eligible and WARP-ineligible groups
  – Would have been helpful to include existing LOS, TTAT, PIAT for non-WARP patients for comparison

• However, there is still a significant difference in findings, especially for RR and POCs
  – Opens doors to future studies focusing on ways to reduce POC and RR while keeping LOS low

• Nevertheless, our findings are consistent with current literature that enhanced recovery after surgery, focusing on reducing LOS along with other post-operative measures, is a significant contributor to positive patient outcomes
Future Directions

• **Comprehensive database ➔ Several abstracts already submitted**
  
  – Patients with G12V/R variant of pancreatic adenocarcinoma have significant greater survival compared to patients with G12D – *Collaboration with pathology department*
  
  – Euglycemic diabetic ketoacidosis after PD may necessitate new or increased insulin at discharge and correlates with readmission due to postoperative pancreatic fistula.

• **Future projects**
  
  – DGE rates at Jefferson vs. other institutions
  
  – Significance of neoadjuvant therapy in patient outcomes and compliance/tolerability of adjuvant therapy
  
  – Use of perioperative beta-blockade to reduce cardiac complications
  
  – Opioid reduction during hospital stay

*All may contribute to explaining the discrepancies in RR and POCs in WARP-eligible and WARP-ineligible patients*
Acknowledgements

• Thank you to Dr. Krampitz, Dr. Bowne, and Shawnna for their support, encouragement, and commitment to this project and database
• Thank you to Cyrus and Hamza for being the architectures and backbone of this project
• Thank you to Taylor and Cliff for working through the learning curve, obstacles, and time-consuming nature of this long, ongoing yet also valuable database!