Clinical Safety & Effectiveness
Cohort # 24 Team #5

ERAS: Enhanced Recovery After Hepatopancreaticobiliary (HPB) Surgery
ERAS Team

CS&E Participants

- Danielle Fritze: Transplant/HPB Surgeon
- Sheila Canton: UHS Quality
- Richard DeVera: 9ICU PCC, House Supervisor
- Adriana Saad: Transplant/HPB Inpatient PA

Facilitator: Sherry Martin

Sponsor Department: Transplant
- Tricia Jones, UTC Administrative Director
- Glenn Halff MD, Transplant Center Director
- Francisco Cigarroa MD, Transplant Center Director

Acknowledgments:
- Wayne Fischer: Statistical support
- Jose Fernandez & Lynda Sturges: Financial Decision Support
- Kristi Hill-Herrera, Brian Lewis & Sean Weber: UHS Quality
- Michael Payne: 9 Skytower Nursing Director

Team Members

- Lori Saathoff: HPB RN, Outpt
- Claudia Grimmer: LD Liver RN, Outpt
- Barbara Swanson: Nutrition, outpatient
- Tarwyn Smith: Pre-op Clinic
- Polly Smith: PACU Director
- Samir Gandhi: Anesthesia
- Mike Little: Anesthesia
- Erica Zuniga: Transplant/HPB OR
- Shane Beasley: Transplant Inpatient Mgr
- Alan Gonzales: 9ICU Nursing Educator
- Randee Blakemore: 9ACU Nursing Educator
- Arlienita Bereya: Center for Learning Excellence
- Liz Cepeda: Social Work
- Kasey Orian: Nutrition, inpatient
- Patrick Moreno: PT
- Ernesto Gutierrez: PT
- Reed Hall: Transplant Pharmacist
- Meenakshi Rani: Transplant Research
- ERAS Champions
Background

UH: ~100 pancreas, liver, and biliary ORs annually

Medically complex patients
  + highly technical operations
  = long hospitalizations & frequent readmissions

https://www.bcm.edu/healthcare/care-centers/pancreas-center/procedures/whipple-procedure
Background

2018 Outcomes

Median Length of Stay: 8 days  (UHS Quality Data)
30d Readmission Rate: 19%    (HPB Clinic Database)
AIM

To decrease median post-operative length of stay for hepato-pancreato-biliary surgery patients from 8 to 5 days

_without increasing 30 day readmission rate_

By July 1, 2019
PROCESS ANALYSIS
Flowchart: Post-op Process

1. Transfer patient from OR to ICU
2. Operating Resident Places Known Post-Op Order Set
3. Floor Resident Check On Patient
4. Clear on Mgmt?
5. YES Monitor Patient & Vitals → DISCHARGE
6. NO
7. Check with Transplant Midlevel/Chief Resident
8. Clear on Mgmt?
9. YES
10. NO
11. Check with Attending?
12. YES
13. NO
14. On Call Surgeon Available?
15. NO
16. YES
17. NO
18. Back Up Transplant Surgeon Available?
19. NO
20. Any Transplant Surgeon Available?
21. YES
22. NO
Barriers to Timely Discharge

THEMES

Medical Issues
• Ileus
• Infection
• Debility
• Pain

Variability
• Delayed decisions
• Slow progress

### THEMES

**Medical Issues**
- Ileus
- Infection
- Debility
- Pain

**Variability**
- Delayed decisions
- Slow progress
INTERVENTION
<table>
<thead>
<tr>
<th>GOAL</th>
<th>PRIMARY DRIVERS</th>
<th>INTERVENTIONS</th>
<th>MEASURE</th>
<th>RESPONSIBLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECREASE LOS FROM 8 to 5 days</td>
<td>Reduce variability amongst surgeons &amp; decisions</td>
<td>Staff Education (Residents/Nursing)</td>
<td>% Compliance</td>
<td>Dr. Fritze, Adriana, Richard De Vera, Randee</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Create Protocols</td>
<td>% Compliance</td>
<td>Dr. Fritze &amp; Surgeons</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Distribute Protocols</td>
<td>% Compliance</td>
<td>Adriana Saad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Create Order Set to reflect Protocols</td>
<td>% Compliance</td>
<td>Adriana Saad &amp; Dr. Fritze &amp; Transplant IT</td>
</tr>
<tr>
<td></td>
<td>Educate patients on expectations &amp; responsibilities</td>
<td>Anesthesia Clinic Appt</td>
<td>% Compliance</td>
<td>Tarwyn</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Train HPB Clinic Nurses</td>
<td>% Compliance</td>
<td>Dr. Fritze, Tarwyn</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ensure caregiver plan/disposition/transport</td>
<td>% Compliance</td>
<td>Social Work HPB Staff</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education material for patients (pre &amp; post)</td>
<td>% Compliance</td>
<td>Tarwyn, HPB Nurses, Randee, Richard</td>
</tr>
<tr>
<td></td>
<td>Optimize functional &amp; nutritional status</td>
<td>Pre-op Nutrition/PT post-op</td>
<td>Prealbumin/Grasp Strength</td>
<td>UHS Dietary Group</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre-op Carb loading</td>
<td>Yes or No</td>
<td>UHS PT</td>
</tr>
<tr>
<td></td>
<td>Ensure Proper Antibiotics Perioperative</td>
<td>Develop Afx Choice Guideline</td>
<td>% Compliance</td>
<td>Anesthesia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Update 92 form to include abx</td>
<td>% Compliance</td>
<td>HPB Nurses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Update order sets</td>
<td>% Compliance</td>
<td>Adriana, Transplant IT</td>
</tr>
<tr>
<td></td>
<td>Diminish need for opioids/Decrease post op pain</td>
<td>Update order sets</td>
<td>% Compliance</td>
<td>Adriana, Transplant IT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Multimodal Pain Control</td>
<td>% Compliance</td>
<td>Anesthesia, Dr. Fritze, Adriana</td>
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<tr>
<td></td>
<td>Prevent ileus</td>
<td>Intra-op goal directed fluids</td>
<td>% Compliance</td>
<td>Anesthesia</td>
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<tr>
<td></td>
<td></td>
<td>Post-op fluid management guidelines</td>
<td>% Compliance</td>
<td>Dr. Fritze, Adriana</td>
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<tr>
<td></td>
<td></td>
<td>Early diet</td>
<td>% Compliance</td>
<td>Dr. Fritze, Adriana</td>
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<tr>
<td></td>
<td>Apply MIS Technique</td>
<td>Consideration of all tumor board patients for MIS</td>
<td>% Compliance</td>
<td>Surgeons/Dr. Fritze</td>
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<tr>
<td></td>
<td>Avoid/Minimize use of drains</td>
<td>Protocols</td>
<td>% Compliance</td>
<td>Dr. Fritze</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consideration intra-op/assessment of need</td>
<td>% Compliance</td>
<td>Dr. Fritze</td>
</tr>
<tr>
<td></td>
<td>Further Educate Nursing Staff</td>
<td>Bedside Teaching</td>
<td>YES or NO</td>
<td>Adriana Saad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9th Floor Nursing Email</td>
<td>YES or NO</td>
<td>Adriana Saad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Identify ERAS Nursing Champions</td>
<td>YES or NO</td>
<td>Adriana Saad, Dr. Fritze, Randee, Blakemore</td>
</tr>
<tr>
<td></td>
<td>Pre-Operative Patient Education</td>
<td>Nursing/Patient Coordinator Teaching</td>
<td>% Compliance</td>
<td>Dr. Fritze, Adriana Saad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ERAS Anesthesia Pre-Op Appt</td>
<td>% Compliance</td>
<td>Dr. Fritze</td>
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<tr>
<td></td>
<td>Intraoperative Measures</td>
<td>Anesthesia Protocols</td>
<td>% Compliance</td>
<td>Anesthesia Department, Dr. Fritze</td>
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</tbody>
</table>
Enhanced Recovery After Surgery (ERAS) Protocol Development

Driver Diagram

ERAS Literature

Local Experts
Enhanced Recovery After Surgery

**Preparation Phase**
- Education
- Expectation Mgmt
- Nutrition & Carb Loading
- Medical Optimization
- Targeted Activity Plan

**Operative Phase**
- Short NPO Pre-op Drink
- Multi-modal Pain Management
- Epidural or Exparel
- Nausea/Vomiting Prophylaxis
- Target Fluid Management
- Normothermia, Normoglycemia
- Minimally Invasive

**Recovery Phase**
- Standardized Pathways with Discharge Targets
- Multi-Modal Opioid Sparing Pain Mgmt
- Early nutrition with supplementation
- Early activity
- Early removal of drains, tubes
- Avoidance of Volume Overload
- Appropriate VTE, Ulcer, Infectious Prophylaxis
<table>
<thead>
<tr>
<th>Fluids</th>
<th>POD 0</th>
<th>POD 1</th>
<th>POD 2</th>
<th>POD 3</th>
<th>POD 4</th>
<th>Rescue</th>
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<tbody>
<tr>
<td></td>
<td>NS @ 75cc/hr</td>
<td>D5 1/2 NS @ 50cc/hr</td>
<td>Saline lock</td>
<td>Saline lock</td>
<td>Saline lock</td>
<td>Hypotension/oliguria: 1. 5% albumin 250cc 2. 5% albumin 250cc 3. IVF 50cc/hr, check hct, hold epidural</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Pain</td>
<td>Epidural vs Exparel in OR</td>
<td>Epidural</td>
<td>Pregabalin 75mg po HS</td>
<td>Toradol* 30mg iv q6h</td>
<td>Ofirmev 1000mg iv q6h</td>
<td>Epidural</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowels</td>
<td>Scopolamine patch Zofran 4mg iv q6h PRN</td>
<td>Scopolamine patch Zofran 4mg iv q6h PRN</td>
<td>Scopolamine patch Zofran 4mg iv q6h PRN</td>
<td>Scopolamine patch Zofran 4mg iv q6h PRN</td>
<td>Scopolamine patch PRN Zofran 4mg iv q6h PRN</td>
<td>If no BM on POD… 2: MOM 30ml po bid 3: Dulcolax pr x1 4: Enema 5: KUB, consider CT</td>
</tr>
<tr>
<td></td>
<td>Colace 100mg po BID</td>
<td>Colace 100mg po BID</td>
<td>Colace 100mg po BID</td>
<td>Colace 100mg po BID</td>
<td>Colace 100mg po BID</td>
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</tr>
<tr>
<td>Activity</td>
<td>OOB to chair Ambulate</td>
<td>OOB to chair Ambulate TID</td>
<td>OOB to chair Ambulate TID</td>
<td>OOB to chair Ambulate TID</td>
<td>OOB to chair Ambulate TID</td>
<td>IMMUNIZATIONS BEFORE DISCHARGE</td>
</tr>
<tr>
<td>Tubes</td>
<td>Foley to gravity NG to suction</td>
<td>D/c Foley D/c NGT</td>
<td>D/c CVL Drain: if output &gt;10cc/d, send for amylase after regular meal.</td>
<td>Remove drains if amylase wnl, &lt;3x serum</td>
<td>If drain amylase elevated, recheck the following day. Anticipate discharge with drain in place.</td>
<td></td>
</tr>
<tr>
<td>Prophy</td>
<td>Cefazolin 1g iv q8h For allergies: Levaquin</td>
<td>Lovenox 40mg sq QHS Protonix 40mg po daily Melatonin 5mg PRN</td>
<td>Lovenox 40mg sq QHS Protonix 40mg po daily Melatonin 5mg PRN</td>
<td>Lovenox 40mg sq QHS Protonix 40mg po daily Melatonin 5mg PRN</td>
<td>Lovenox 40mg sq QHS Protonix 40mg po daily Melatonin 5mg PRN</td>
<td>If concern for bleeding: 1. Hold levofox if renal insufficiency: 1. Renal dose antibiotics 2. SQH 5000u sq TID</td>
</tr>
</tbody>
</table>
DATA COLLECTION
AIM

To decrease median post-operative length of stay for hepato-pancreato-biliary surgery patients from 8 to 5 days

*without increasing 30 day readmission rate*

By July 1, 2019

Process goal:

*To achieve a median 80% of Recovery Phase ERAS measures in the first month of implementation.*
# Data Collection Plan

<table>
<thead>
<tr>
<th>Type of Measure</th>
<th>Measure</th>
<th>Data Elements</th>
<th>Data Category New/Existing</th>
<th>Data Category Manual/Automated</th>
<th>Data Source</th>
<th>Data Frequency</th>
<th>Data Steward</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome</td>
<td>Length of Stay</td>
<td>= Discharge date – OR date</td>
<td>Existing</td>
<td>Automated</td>
<td>UHS Quality</td>
<td>Monthly</td>
<td>UHS Quality Sheila</td>
</tr>
<tr>
<td>Balance</td>
<td>30 day Readmission</td>
<td>= Readmit date – Discharge date</td>
<td>Existing</td>
<td>Automated</td>
<td>HPB Database</td>
<td>Monthly</td>
<td>HPB Clinic Valerie</td>
</tr>
<tr>
<td>Process</td>
<td>% Recovery Targets Met</td>
<td>= Targets achieved Targets possible</td>
<td>New</td>
<td>Manual</td>
<td>HPB ERAS Tracker &amp; Database</td>
<td>Date of pt discharge, Bi-Monthly</td>
<td>Unit Clerk Adriana Fritze</td>
</tr>
</tbody>
</table>

## ERAS Tracker

<table>
<thead>
<tr>
<th>ERAS Data Collection Patient</th>
<th>Surgeons: OR, TK</th>
<th>Case Living Donor Hepatocystomy Admit On Cell, TK</th>
<th>OR Date: 3/26/19 Discharge: DF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-op Day</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Open Hepatobiliary</td>
<td>X Stop IV</td>
<td>X Reg diet</td>
<td>X Regional Pain</td>
</tr>
<tr>
<td>Liver Resection</td>
<td>X Stop OR</td>
<td>X Reg diet</td>
<td>X Regional Pain</td>
</tr>
<tr>
<td>Living Donor Hepatocystomy</td>
<td>X Stop OR</td>
<td>X Reg diet</td>
<td>X Regional Pain</td>
</tr>
<tr>
<td>Biliary Reconstruction</td>
<td>X Stop OR</td>
<td>X Reg diet</td>
<td>X Regional Pain</td>
</tr>
<tr>
<td>Open Chole</td>
<td>X Stop OR</td>
<td>X Reg diet</td>
<td>X Regional Pain</td>
</tr>
<tr>
<td>Notes/Barriers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Inadequate pain control, provided PCA per protocol:**
- **Target met but not charted:**

Discharge date: 3/31/19
Processes: 12/14 860
IMPLEMENTATION
Implementation

• Recovery Phase: April 1, 2019
  – Education
    • 8 Stakeholder Meetings
  – Earlier soft roll-out to troubleshoot
  – Official start:
    • Revised recovery pathways
    • Pre-op ERAS education
  – Direct observation
  – Data review with each discharge
  – Tracker and in-person feedback
• Preparation Phase: May 20, 2019
• Operative Phase: July 1, 2019
Interim Analysis

**Outcome**  Median LOS: 5 days ✓

**Balance**  Readmit: 0% ✓

**Process**  Median Targets: 80% ✓

**Drains out**
**Issues:** Surgeons: POD 2 too early
**Change:** Target POD 3

**Activity**
**Issues:** Documentation Education

**Changes:** Nurse Champions
Bedside & Email Education
Revised Tracker Process
Change order format

**Diet delay**
**Issues:** Nausea Orders
**Change:** Revised nausea meds
Order sets pending
RESULTS
Process: ERAS Targets Met

SPC p-Chart: Percent Process Targets Met

- UCL = 1.000
- Avg = 0.802
- LCL

Case Date:
- 03/20/2019
- 03/26/2019
- 04/02/2019
- 04/05/2019
- 04/18/2019
- 04/23/2019
- 04/24/2019
- 05/01/2019
- 05/06/2019
- 05/07/2019
- 05/08/2019
- 05/14/2019
- 05/15/2019
- 05/17/2019

% Targets Met
Outcome: Length of Stay

SPC Individuals Chart: ALOS Hepatobiliary Patients

Baseline

ERAS

Goal 5d
## ERAS Results

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Length of Stay</th>
<th>Balance</th>
<th>Process % Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>8 days</td>
<td>19%</td>
<td>✓</td>
</tr>
<tr>
<td>ERAS</td>
<td>5 days</td>
<td>7%</td>
<td>82%</td>
</tr>
</tbody>
</table>

- Decrease Median LOS from 8→5 day ✓
- Without increasing readmissions ✓
- Meet >80% ERAS Targets ✓
Return on Investment

Primary cost savings estimate: decreased LOS

– Average cost/day for HPB surgery patients
  • ICU day: $4043
  • ACU day: $1410

– Cost savings/patient: $6,863
  • AIM decreased LOS from 8 to 5 days
  • Anticipate LOS decreased 1 ICU day + 2 ACU days
  • Cost savings per patient: 1x $4043 + 2x $1410

– Annual cost savings: $686,300
  • $6863 x 100 HBP pts/year
Total Cost by Month for Hepatobiliary Patients

Total Cost

ERAS
**Additional ROI**

- Additional open beds → opportunity to ↑ revenue
  - 3 days/patient x 100 patients/yr = 300 bed-days/year

- **Patients**
  - Better prepared for recovery
  - Improved Pain Control
  - Less Opioid Use
    - In-patient
    - After discharge
  - Improved functionality

- **Providers**
  - Less redundant communication
  - Fewer delays in care
  - Clarity of expected pt course
  - Standardized baseline for future interventions
MOVING FORWARD
NEXT STEPS

• Ongoing refinement of Recovery Phase
  – Further financial evaluation
  – Order sets

• Initial evaluation of Preparation & Operative Phases

• Develop formal evaluation method:
  – Patient satisfaction
  – Provider satisfaction
  – Opioid Use

• Expand to liver and kidney transplant recipients
LESSONS LEARNED

- Clarity and alignment of expectations for patients and providers is necessary for significant change.
- Streamlining patient care benefits patients & providers.
- People are eager to participate in anything that makes sense and helps patients.
Thank you!