Minimally Invasive Robotic Colon Surgery

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Kettering Physician Network  
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Learning Objectives

Discuss local and national trends and experience with robot-assisted colon surgery.

Understand the benefits of robot-assisted colon surgery.

Determine which patients are good candidates for referral for robot-assisted colon surgery.
Origins of Minimally Invasive Surgery

- Endoscopic instruments described as early as 2640 BC
  - Egypt
  - China
  - India
- Hippocrates describes anoscopy with cautery of hemorrhoids 400 BC
- Surgical instruments resembling laparoscopic trocars recovered from Roman ruins
Origins of Minimally Invasive Surgery

- Aulus Cornelius Celsus
- 25 BC to 50 AD
- Roman medical scholar and writer, ?? doctor
- De medicina octo libri
- Described placing a lead or copper cannula into the peritoneal cavity to drain bad humors
- Cauterize wound to close
Origins of Minimally Invasive Surgery

- Albukasim, Arabian physician 936–1013 AD
  - Speculum using reflected light from flame
  - “Exploring needle with groove” mounted on handle allowed access to the peritoneal cavity
- Dimitri Ott, German gyn 1901
  - “Ventroscopy”
  - Introduced speculum through a posterior vaginal incision to view the pelvis
- George Kelling, German surgeon 1901
  - “Celioscopy”
  - Used a cystoscope inserted into an insufflated abdomen in an animal model
Origins of Minimally Invasive Surgery

- Jacobeus, Swedish surgeon 1910
  - First human celioscopy
  - To evaluate patients with ascites
- Bertram M Bernheim, United States 1911
  - Published his series of laparoscopic experience
  - “Organoscopy”, *Annals of Surgery*
- George Kelling reported his 22 years of experience to German Surgical Society in 1923
- World War I and II
Origins of Minimally Invasive Surgery

- 1938, Veress designs the needle entry/insufflation technique
- 1952, quartz rod used to transmit high intensity light to end of scope
- 1959, television image, monitor
- 1970’s, laparoscopy widely used by gyn
- 1982, laparoscopic liver biopsy
- 1987, first lap chole done in France
- 1989, first lap colon resection
Acceptance of MIS

- Obstacles to adoption of laparoscopy:
  - It costs too much!
  - It takes too long!
  - Lap surgery cannot be as good as open!
    - Concerns about cancer surgery.
      - Adequate margins.
      - Adequate lymph node harvest.
      - Adequate exploration of peritoneal cavity.

- Thousands of studies now comparing outcomes.
- Laparoscopic surgery has proven to be superior to open for most indications.
Benefits of MIS

- Laparoscopic surgery has been shown to:
  - Shorten hospital stays
  - Decrease pain
  - Provide patients with a more rapid recovery
  - Decrease complication rate
  - Decrease re admission rate
  - Have equivalent oncologic outcomes
    - with exception of rectal cancer

- Numerous studies show decreased overall cost
MIS as New Standard of Care

- Cholecystectomy
- Appendectomy
- Bariatric surgery
- Hysterectomy
- Oophorectomy
- Endometriosis
- Adrenal surgery
- Splenectomy
- Nissen wrap
- Heller myotomy
- Right colectomy
- Left colectomy
- Low anterior resection
- Liver resections and ablations
- Nephrectomy
- Pancreaticoduodenectomy
Shortcomings of Laparoscopic Surgery

- Operate in 3D space with a 2D view – unstable visualization
- Reduced dexterity – lack of precision
- Limitations of surgeon flexibility and reach – awkward posturing
- Long and unstable instruments magnify natural tremors
Laparoscopic Instruments
Technologic Advances

- Need for better technology to allow more complex cases to be done minimally invasively.
- Lap prostatectomy never was widely adopted.
  - Limitations of working in narrow male pelvis
  - Poor visualization
  - Instrumentation
- Robot-assisted laparoscopic surgery.
  - FDA approved 2000
  - Moved prostatectomy to an MIS procedure
  - Now robot-lap is standard for prostatectomy
What is Robotic Surgery?

- Laparoscopic minimally invasive surgery.
- Robot is a laparoscopic tool.
- Surgeon introduces ports and docks robot to ports, allowing instrument placement.
- Surgeon controls all aspects of instrument movement.
- Carries all the risks of any laparoscopic procedure.
- Increasing the complexity of cases that can be done minimally invasively.
Surgery: *da Vinci*® Surgery
Robotic Instruments
Room set up for Robotic Surgery
**da Vinci® Surgery**

- Surgeon is immersed in a 3D-HD surgical field with up to 10x magnification.
- Surgeon directs every move of the tiny instruments using console controls.
- Robotic system scales and replicates surgeon’s hand movements while minimizing hand tremors.
- Allows surgeon to operate with increased dexterity & precision.
Acceptance of Robotic Assisted MIS

- Obstacles to adoption of robotic surgery:
  - It costs too much!
  - It takes too long!
  - Robotic surgery cannot be as good as lap!
    - Concerns about cancer surgery.
      - Adequate margins.
      - Adequate lymph node harvest.
      - Adequate exploration of peritoneal cavity.
- Studies now comparing outcomes.
- Robot-assisted surgery is proving to be equal or superior to lap for many indications.
Lap rectal resection has not been consistently shown to be equal to open – TME quality
Can we do a better TME robotically?
Robot assisted-lap surgery allows surgeon to do an intact TME

<table>
<thead>
<tr>
<th></th>
<th>Laparoscopic</th>
<th>Robotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 year DFS</td>
<td>76.0%</td>
<td>76.8%</td>
</tr>
<tr>
<td>Local recurrence</td>
<td>6.3%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Systemic recurrence</td>
<td>18.9%</td>
<td>15.6%</td>
</tr>
</tbody>
</table>

Robotic MIS – Rectal Cancer

- Meta analysis of robotic versus laparoscopic
  - 854 patients
  - Robotic surgery had lower rate of:
    - Conversion to open
    - Complications
    - Length of stay

- Difficult patient – rectal resection in obese
  - 82 patients
  - More pronounced benefit to robotic surgery
  - Complication 9.4 % compared to 23.9% in lap
  - Decreased blood loss and length of stay

Open TME vs Robotic TME for rectal cancer
5 year follow up data

Equivalent outcomes for:
- Disease free survival
- Overall survival

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Open</th>
<th>Robotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of LN’s</td>
<td>14.1</td>
<td>20.1</td>
</tr>
<tr>
<td>Est blood loss</td>
<td>150 mls</td>
<td>Less than 10 mls</td>
</tr>
<tr>
<td>OR time</td>
<td>207.5 min</td>
<td>299.0 min</td>
</tr>
<tr>
<td>Length of stay</td>
<td>9 days</td>
<td>6 days</td>
</tr>
<tr>
<td>Local recurrence</td>
<td>16.1%</td>
<td>3.4%</td>
</tr>
</tbody>
</table>
## Conversion to Open Rectal Resection Has Significant Implications for Patient Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Conventional Lap</th>
<th>Conventional Lap Converted to Open</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfusion Rate(^1) (n=300)</td>
<td>2%</td>
<td>12%</td>
<td>0.001</td>
</tr>
<tr>
<td>Wound Infection Rate(^1) (n=300)</td>
<td>12%</td>
<td>23%</td>
<td>0.01</td>
</tr>
<tr>
<td>Complication Rate(^2) (n=1,073)</td>
<td>21%</td>
<td>44%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Length of Stay Increase(^2) (n=1,073)</td>
<td>Base</td>
<td>+ 6 days</td>
<td>0.01</td>
</tr>
<tr>
<td>5-yr Disease-Free Survival Rate(^3) (n=450)</td>
<td>70%</td>
<td>40%</td>
<td>0.011</td>
</tr>
</tbody>
</table>

**Study limitations:** multiple studies, none are randomized trials; outcomes may vary subject to the surgeon’s prior laparoscopic experience and training

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## Initial Clinical Data for dV in Rectal Cancer is Promising

<table>
<thead>
<tr>
<th>Study</th>
<th>Patient Population</th>
<th>Positive CRM, %</th>
<th>Conversion Rate, %</th>
<th>LOS days</th>
<th>Complication Rate, %</th>
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</thead>
<tbody>
<tr>
<td>Pigazzi (2006)</td>
<td>6</td>
<td>NR</td>
<td>0.0</td>
<td>4.5</td>
<td>1</td>
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<tr>
<td>Hellan (2007)</td>
<td>39</td>
<td>0.0</td>
<td>1.0</td>
<td>4.0</td>
<td>5</td>
</tr>
<tr>
<td>Baik (2008)</td>
<td>18</td>
<td>NR</td>
<td>0.0</td>
<td>7.0</td>
<td>4</td>
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<tr>
<td>Patrioti (2009)</td>
<td>29</td>
<td>0.0</td>
<td>0.0</td>
<td>11.9</td>
<td>7</td>
</tr>
<tr>
<td>Baik (2009)</td>
<td>56</td>
<td>7.1</td>
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<td>5.0</td>
<td>3</td>
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<tr>
<td>Park (2010)</td>
<td>41</td>
<td>1.9</td>
<td>0.0</td>
<td>9.9</td>
<td>12</td>
</tr>
<tr>
<td>Pigazzi (2010)</td>
<td>143</td>
<td>0.7</td>
<td>7.0</td>
<td>9.3</td>
<td>59</td>
</tr>
<tr>
<td>Bianchi (2010)</td>
<td>25</td>
<td>0.0</td>
<td>0.0</td>
<td>6.5</td>
<td>4</td>
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<tr>
<td>Baek (2010)</td>
<td>64</td>
<td>0.0</td>
<td>6.0</td>
<td>5.0</td>
<td>23</td>
</tr>
<tr>
<td>Baek (2011)</td>
<td>41</td>
<td>2.4</td>
<td>3.0</td>
<td>6.5</td>
<td>9</td>
</tr>
<tr>
<td>Kwak (2011)</td>
<td>59</td>
<td>1.7</td>
<td>0.0</td>
<td>NR</td>
<td>19</td>
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<tr>
<td>Park (2011)</td>
<td>52</td>
<td>2.4</td>
<td>0.0</td>
<td>10.0</td>
<td>10</td>
</tr>
<tr>
<td>Kang (2013)</td>
<td>165</td>
<td>4.2</td>
<td>0.6</td>
<td>10.8</td>
<td>21</td>
</tr>
<tr>
<td>D’Annibale (2013)</td>
<td>50</td>
<td>0.0</td>
<td>0.0</td>
<td>8.0</td>
<td>10</td>
</tr>
<tr>
<td><strong>da Vinci</strong></td>
<td>788</td>
<td>2.1%</td>
<td>2.1%</td>
<td>8.2</td>
<td>22%</td>
</tr>
<tr>
<td>MRC Classic</td>
<td>242</td>
<td>16.0</td>
<td>34.0</td>
<td>10.0</td>
<td>32</td>
</tr>
<tr>
<td>COLOR II</td>
<td>739</td>
<td>10.0</td>
<td>17.0</td>
<td>8.0</td>
<td>49</td>
</tr>
<tr>
<td><strong>Lap</strong></td>
<td>981</td>
<td>11.0%</td>
<td>21.0%</td>
<td>8.5</td>
<td>38%</td>
</tr>
<tr>
<td>MRC Classic</td>
<td>132</td>
<td>14</td>
<td>N/A</td>
<td>13.0</td>
<td>37</td>
</tr>
<tr>
<td>COLOR II</td>
<td>364</td>
<td>10</td>
<td>N/A</td>
<td>9.0</td>
<td>37</td>
</tr>
<tr>
<td><strong>Open</strong></td>
<td>496</td>
<td>11.0%</td>
<td>N/A</td>
<td>10.1</td>
<td>37%</td>
</tr>
</tbody>
</table>

*Studies selected based on highest quality of available literature; no statistical analysis has been performed; analysis may confirm that numerical differences are not statistically significant.*
Initial Clinical Data for dV in Colon Surgery is Promising

<table>
<thead>
<tr>
<th>Study</th>
<th>Patient Population</th>
<th>EBL, mL</th>
<th>Conversion Rate, %</th>
<th>Complication Rate, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weber (2002)</td>
<td>2</td>
<td>NR</td>
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<td>0.0</td>
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<tr>
<td>Delaney (2003)</td>
<td>5</td>
<td>140</td>
<td>9.6</td>
<td>20.0</td>
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<tr>
<td>de Noto (2006)</td>
<td>11</td>
<td>NR</td>
<td>9.1</td>
<td>NR</td>
</tr>
<tr>
<td>Rawlings (2007)</td>
<td>30</td>
<td>62</td>
<td>6.7</td>
<td>15.7</td>
</tr>
<tr>
<td>Spinoglio (2008)</td>
<td>50</td>
<td>NR</td>
<td>4.0</td>
<td>14.0</td>
</tr>
<tr>
<td>de Souza (2010)</td>
<td>40</td>
<td>50</td>
<td>2.5</td>
<td>20.0</td>
</tr>
<tr>
<td>Park (2012)</td>
<td>35</td>
<td>36</td>
<td>0.0</td>
<td>17.1</td>
</tr>
<tr>
<td>da Vinci®</td>
<td>226</td>
<td>42</td>
<td>5.1%</td>
<td>14.3%</td>
</tr>
<tr>
<td>COLOR Trial</td>
<td>534</td>
<td>100</td>
<td>17.0</td>
<td>21.0</td>
</tr>
<tr>
<td>COST Trial</td>
<td>435</td>
<td>N/A</td>
<td>21.0</td>
<td>21.0</td>
</tr>
<tr>
<td>MRC CLASSIC</td>
<td>185</td>
<td>N/A</td>
<td>25.0</td>
<td>26.0</td>
</tr>
<tr>
<td>Laparoscopy</td>
<td>1154</td>
<td>100</td>
<td>19.8%</td>
<td>21.8%</td>
</tr>
</tbody>
</table>

Studies selected based on highest quality of available literature; no statistical analysis has been performed; analysis may confirm that numerical differences are not statistically significant.
American College of Surgeons NSQIP
387 pts per group – open, robot, lap
Operative time longer in robotic cases
Lower in robotic:
- Length of stay
- Overall morbidity
- Superficial SSI
- Blood loss/transfusion
- Ventilator dependence post op
- Ileus

Firefly™ Shows Trend Toward Reduction in Leak Rate

The use of indocyanine green fluorescence to assess anastomotic perfusion during robotic assisted laparoscopic rectal surgery*

Mehraneh D. Jafari · Kang Hong Lee · Wissam J. Halabi · Steven D. Mills · Joseph C. Carmichael · Michael J. Stamos · Alessio Pigazzi

<table>
<thead>
<tr>
<th></th>
<th>Firefly Group (n=16)</th>
<th>Non-Firefly Control Group (n=22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revision of Transection Point</td>
<td>19%</td>
<td>5%</td>
</tr>
<tr>
<td>Anastomotic leak rate</td>
<td>6%</td>
<td>18%</td>
</tr>
<tr>
<td>Diversion (Temporary Stoma)</td>
<td>75%</td>
<td>77%</td>
</tr>
<tr>
<td>Median level of anastomosis</td>
<td>3.5 cm</td>
<td>5.5 cm</td>
</tr>
</tbody>
</table>

Example of revised transection point

Study limitations: retrospective non-randomized study design may result in sampling bias; no statistical analysis was performed

Ongoing Level I Randomized Clinical Trial

- Grant from Efficacy and Mechanism Evaluation Programme from the Medical Research Council, part of the UK’s National Institute for Health Research

- Randomized multi-center, international trial for robotic vs laparoscopic surgery

- Enrolling a total of 400 patients

- **Primary endpoints:**
  - Conversion
  - Cancer outcomes

- **Secondary endpoints:**
  - Safety, Functional, Oncological, Quality of life, Health Economics, GOALS Score

- Expecting completion of enrollment by Sept 2014

For more information, visit [www.clinicaltrials.gov](http://www.clinicaltrials.gov).
Next Generation
National Trends in Colorectal Surgery

- National Inpatient Sample database
- 2009 – 2012
- 509,029 patients undergoing colectomy
  - 52.3% open
  - 46.2 % laparoscopic
  - 1.5% robotic
- Trend toward higher volume centers doing higher percentage of MIS
- Robotic cases quadrupled from 2009 to 2012

Adoption of MIS is Limited, Even Among Fellowship Trained Surgeons & Regardless of Procedure Type

The impact of practice environment on laparoscopic colectomy utilization following colorectal residency: a survey of the ASCRS Young Surgeons

Scott R. Steele*, Sharon L. Stein†, Liliana G. Bordeianou‡, Eric Johnson§, Dan O. Herzig¶ and Bradley J. Champagne† on behalf of the American Society of Colon and Rectal Surgeons' Young Surgeons Committee

Reasons Provided:
1) Inappropriate Patients
2) Lack of Qualified Bedside Assist
3) Personal Comfort / Experience

Study limitation: Survey study design has inherent sampling biases.

Few Surgeons Offer Advanced MIS Surgery

- **Colon**
  - Open: 75%
  - Hand-Assist: 15%
  - Lap: 7%
  - da Vinci: 3%

- **Rectal**
  - Open: 53%
  - Hand-Assist: 30%
  - Lap: 15%
  - da Vinci: 2%

- Since 1990
- Since 1996
- Since 2008
Financial Incentive to Surgeon?

- No separate billing codes for robotic surgery.
- Procedures generally take longer.
- Financial disincentive to robotic surgery

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Open (RVU’s)</th>
<th>Lap (RVU’s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Anterior Resection</td>
<td>28.58</td>
<td>31.92</td>
</tr>
<tr>
<td>Partial Colectomy</td>
<td>22.59</td>
<td>26.42</td>
</tr>
<tr>
<td>Right Colectomy</td>
<td>20.89</td>
<td>22.95</td>
</tr>
<tr>
<td>Mobilize Splenic Flex</td>
<td>2.23</td>
<td>3.50</td>
</tr>
</tbody>
</table>
Overall Cost

- Cost analysis review of 227 patients
  - Robotic – 96
  - Laparoscopic – 131
- Pathology, complications, readmission, 30 day mortality similar in this study

<table>
<thead>
<tr>
<th></th>
<th>Laparoscopic</th>
<th>Robotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR time</td>
<td>113 min</td>
<td>109 min</td>
</tr>
<tr>
<td>Length of stay</td>
<td>6.6 days</td>
<td>5.7 days</td>
</tr>
<tr>
<td>Conversion</td>
<td>6%</td>
<td>13%</td>
</tr>
<tr>
<td>Cost</td>
<td>114,853.00</td>
<td>107,220.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Procedure</th>
<th>#</th>
<th>Time (min)</th>
<th>LOS (days)</th>
<th>Avg Direct Supply Cost</th>
<th>Avg. Net Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diverticulitis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robotic</td>
<td>19</td>
<td>131</td>
<td>4.2</td>
<td>$3,863</td>
<td>$12,960</td>
</tr>
<tr>
<td>Lap.</td>
<td>70</td>
<td>122</td>
<td>5.3</td>
<td>$1,809</td>
<td>$11,541</td>
</tr>
<tr>
<td>Open</td>
<td>7</td>
<td>157</td>
<td>12.7</td>
<td>$1,336</td>
<td>$5,297</td>
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<tr>
<td>Rectal Cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robotic</td>
<td>13</td>
<td>145</td>
<td>4.2</td>
<td>$3,863</td>
<td>$10,994</td>
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<tr>
<td>Lap.</td>
<td>5</td>
<td>154</td>
<td>7.2</td>
<td>$2,987</td>
<td>$3,877</td>
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<tr>
<td>Open</td>
<td>1</td>
<td>157</td>
<td>12.7</td>
<td>$1,463</td>
<td>$547</td>
</tr>
</tbody>
</table>

Data should be considered preliminary until published in a peer-reviewed journal; no statistical analysis has been performed.

Provided courtesy of Jorge Lagares-Garcia, MD and Roper Hospital (Charleston, SC)
Cost Implications of MIS

- Projected cost analysis
- If all hospitals increased MIS to the level of the top 1/3 of hospitals
- 7 most common complications

<table>
<thead>
<tr>
<th></th>
<th>Colectomy</th>
<th>Appendectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of stay, days</td>
<td>-3.0</td>
<td>-1.4</td>
</tr>
<tr>
<td>Savings per case, $</td>
<td>7507.00</td>
<td>1528.00</td>
</tr>
<tr>
<td>Complications avoided</td>
<td>2289</td>
<td>1257</td>
</tr>
<tr>
<td>Hospital days avoided</td>
<td>91,257</td>
<td>60,478</td>
</tr>
<tr>
<td>COST SAVINGS, $</td>
<td>227,875,653.00</td>
<td>54,834,092.00</td>
</tr>
</tbody>
</table>
Long Term Costs

- **Small Bowel Obstruction**
  - Lap – 2.4%
  - Open 7.3%

- **Early (within 30 days)**
  - Lap 5%
  - Open 8%

- **Late**
  - Lap 2%
  - Open 4.5%

- **Incisional Hernia**
  - 10–25% rate currently
  - Lap – 10.1 %
  - Open – 16.7 %

- **CLASICC Trial**
  - Decreased incis hernia rate with MIS.

- **COLOR Trial**
  - Decreased rate of incis hernia with lap surgery

KHN Data

Enable Minimally Invasive Surgery²
Service Lines with Emerging Clinical Interest

Colorectal
2013: 53%
2013: 42%
2013: 5%
d a Vinci YoY Growth²⁷
~50%

Ventral Hernia Repair
2013: 74%
2013: 25%
2013: 1%
d a Vinci YoY Growth²⁷
>200%

Lobectomy
2013: 53%
2013: 33%
2013: 13%
d a Vinci YoY Growth²⁷
~15%

Based on 2013 Premier database.
KHN Robotics Program
KHN Data

Potential Cost Offset
Reduce Length of Stay (Days)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Potential Savings vs Open</th>
<th>Potential Savings vs Lap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobectomy²</td>
<td>$6,267</td>
<td>$3,261</td>
</tr>
<tr>
<td>Prostatectomy¹⁰</td>
<td>$2,640</td>
<td>$1,087</td>
</tr>
<tr>
<td>Hyst-Malignant¹¹</td>
<td>$2,951</td>
<td>$1,087</td>
</tr>
<tr>
<td>Hyst-Benign¹²</td>
<td>$2,174</td>
<td>$777</td>
</tr>
<tr>
<td>Colon Resection²</td>
<td>$7,144</td>
<td>$1,864</td>
</tr>
</tbody>
</table>

Hospital Day (General Ward) = $1,553⁴
KHN Data

Potential Cost Offset
Reduce MIS Conversion to Open Surgery

Conversion (Low Complexity) = $3,162\textsuperscript{2}
Conversion (High Complexity) = $7,812\textsuperscript{3}

* The LAR data in this publication may represent an outlier comparing da Vinci surgery and laparoscopy.
* Not statistically significant.
Who is Appropriate for referral for MIS Robotic Colon Surgery?

- Everyone!!
  - Goal to achieve MIS for as many patients as possible
  - Robotic surgery may allow more patients to benefit
- Recurrent diverticulitis
  - Stricture
  - Chronic LLQ pain, difficulty passing stool
  - Colovesicular/colovaginal/coloenteric fistula
- Polyps not amenable to endoscopic removal
- Need for diverting colostomy
- Crohn’s disease, Ulcerative Colitis
- Colon Cancer, Rectal Cancer
Who may not be a good candidate?

- Anything that precludes laparoscopy
  - Known extensive adhesions
  - Inability to tolerate pneumoperitoneum
  - Large bulky tumor or need for en bloc resection with adjacent organs

- ?Emergent Cases
  - GI bleed with hemodynamic instability
  - Perforated colon with peritonitis
  - Ischemic colon
  - Limited by robot/staff availability
  - Limited by patient instability, need for quickest intervention
Minimally Invasive Robotic Colon Surgery

- Achieve oncologic outcomes equal to or better than lap or open
- Decreased complications
- Improved patient satisfaction
  - Reduced pain
  - Reduced length of stay
  - Quicker return to work/activity
- Quicker learning curve for surgeon
- Able to do more complex cases
- Proving to be financially beneficial to Healthcare System
QUESTIONS ???