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LITERATURE REVIEW ON HOSPITAL COSTS FOR PATIENTS UNDERGOING HYSTERECTOMY

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Background

- Abdominal (open) hysterectomy is a surgical procedure that removes the uterus through an incision in the abdomen.
- Laparoscopic hysterectomy is intended to replace abdominal hysterectomy. It offers the surgeon superior visibility inside the pelvic cavity during abdominal surgery. This is in part because of the possibility to magnify the image on the screen and because the lighting is much better during laparoscopy. Such approach is supposed to offer the prospect of improved outcomes and gains in cost effectiveness.
- The number of laparotomic hysterectomies performed in the United States has declined substantially over the past decade. Abdominal hysterectomy declined from 65% of procedures in 1998 to 54% by 2010. Laparoscopic hysterectomy declined to 9% of procedures in 2010.
- Most published studies comparing the costs of abdominal (open) vs laparoscopic procedures were conducted only within respective countries.

Objective

- This study aims to identify the range of direct hospital costs associated with a minimally invasive or abdominal hysterectomy procedure across different countries.

Methods

- A PubMed search was performed using the keywords: (Hysterectomy[MeSH]) AND (cost OR economics) AND (laparoscopic AND open) NOT (robot) with results limited to publications of human subject studies in English.
- Publication dates: January 1, 2006 to November 30, 2015.
- Studies comparing minimally invasive surgical techniques (laparoscopic or laparoscopically-assisted) to open surgical techniques were selected and studies of comparisons other than minimally invasive versus open procedures (e.g. robotic or vaginal) were excluded.
- All abstracts were filtered, including meta-analysis, RCTs and observational studies excluding case studies.
- Key data abstracted: Country, year, setting, type of study, cost calculation method, approach, OR cost per minute and total direct cost reported.
- Operating room (OR) cost include OR time and equipment cost. Some studies may also include anesthesia cost and do not have the granularity to be teased out.
- We derived the unit cost for OR by dividing the OR cost over the mean OR time (minutes) and the unit total cost by dividing the total cost reported over the mean length of stay (days) reported in each study.
- All cost values were adjusted for inflation and reported as 2016 U.S. dollars.

Table 1. Selected Study Characteristics, Design, Cost and Cost Analysis Methodologies

<table>
<thead>
<tr>
<th>Citation/Year</th>
<th>Country/Setting</th>
<th>Type of Study</th>
<th>Cost Calculation Methodology</th>
<th>Approach</th>
<th>OR Cost (per minute)</th>
<th>Total Direct Cost Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnett et al, 2010</td>
<td>US Single Center</td>
<td>Decision modeling</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>N/A</td>
</tr>
<tr>
<td>Wright et al, 2012</td>
<td>National Database</td>
<td>Observational</td>
<td>Top-down (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>N/A</td>
</tr>
<tr>
<td>Bell et al, 2008</td>
<td>Single Center</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>$7.3</td>
</tr>
<tr>
<td>Lundeen et al, 2011</td>
<td>Single Center</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>$9.2</td>
</tr>
<tr>
<td>Wright et al, 2012</td>
<td>Single Center</td>
<td>Observational</td>
<td>Bottom-up (Charge)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>$18.7</td>
</tr>
<tr>
<td>Yu et al, 2013</td>
<td>Multi-Center</td>
<td>Observational</td>
<td>Bottom-up (Charge)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>$20.3</td>
</tr>
<tr>
<td>Jonasson et al, 2011</td>
<td>Single Center</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>N/A</td>
</tr>
<tr>
<td>Venkat et al, 2012</td>
<td>Single Center</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>$25.4</td>
</tr>
<tr>
<td>Abdolhannem et al, 2006</td>
<td>US Single Center</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>N/A</td>
</tr>
<tr>
<td>Reinson et al, 2013</td>
<td>Sweden</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>$28.7</td>
</tr>
<tr>
<td>Baffert et al, 2015</td>
<td>France Multi-Center</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>$25.1</td>
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<tr>
<td>Coronado et al, 2012</td>
<td>Spain</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>$15.9</td>
</tr>
<tr>
<td>Delli-Gis guidi et al, 2013</td>
<td>France</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic (endometrial cancer)</td>
<td>Open</td>
<td>$16.6</td>
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<tr>
<td>Lu et al, 2012</td>
<td>China</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic (cervical cancer)</td>
<td>Open</td>
<td>$16.3</td>
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<tr>
<td>Lee et al, 2011</td>
<td>Korea</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>$10.2</td>
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<tr>
<td>Tapper et al, 2014</td>
<td>Finland</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
<td>$12.8</td>
</tr>
<tr>
<td>Bijen et al, 2016</td>
<td>Single Center</td>
<td>Observational</td>
<td>Bottom-up (Cost)</td>
<td>Laparoscopic</td>
<td>Open</td>
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</tr>
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<td>Bijen et al, 2009</td>
<td>Netherland Systematic review</td>
<td>Top-down (Cost)</td>
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</tbody>
</table>

Results

- Twenty of 89 articles were included in the analysis. Eleven (55%) studies were conducted in North America with the remaining based in European and Asia-Pacific countries.
- For laparoscopic hysterectomy, two recent meta-analyses reported longer operating time (22-53 mins) and 2-3 shorter hospital stays (3 days) and less blood loss (183-267 ml).
- A systematic review reported higher total costs for laparoscopic ($4,467) versus abdominal approach ($3,809).
- Direct hospital costs varied dramatically across countries. In North America, the cost of operating rooms (minute) ranged from $9-53 for open procedures and $7-54 for laparoscopies. The anesthesia cost (minute) ranged from $6-112 and the hospital cost (day) ranged from $1,489-$4,884 and $2,434-$13,665 for abdominal and laparoscopic hysterectomy, respectively.
- In European countries, the cost of operating rooms (minute) ranged from $8-526 for open procedures and $14-526 for laparoscopy. The hospital cost (day) ranged from $374-$2,537.
- In Asia, the cost of operating rooms (minute) ranged from $6-13 for open procedures and $9-23 for laparoscopies. The hospital cost (day) ranged from $182-$1,797.

Conclusion

Laparoscopic procedures appear to result in higher hospital costs across studies conducted in several regions, which is consistent with the findings from a recent systematic review. US has reported the highest hospital costs and has the additional to perioperative outcomes regarding direct hospital costs in Asia-Pacific countries is relatively limited. Comparison of direct hospital costs is challenging due to different costing structures and variations in reimbursement and clinical practices across countries. A standardized costing methodology guideline is warranted and may shed light on the future considerations of reimbursement strategy.

References