Available online at www.sciencedirect.com
ScienceDirect
Gynecologic Oncology 111 (2008) 407–411
Gynecologic Oncology
www.elsevier.com/locate/ygyno

Comparison of outcomes and cost for endometrial cancer staging via traditional laparotomy, standard laparoscopy and robotic techniques

Maria C. Bell [a,*], Jenny Torgerson [a], Usha Seshadri-Kreaden [b], Allison Wierda Suttle [a], Sharon Hunt [a]

[a] *Sanford Women's Health, Sanford Clinic, Sioux Falls, SD, USA*
[b] *Intuitive Surgical, Sunnyvale, CA, USA*

Received 6 May 2008
Available online 1 October 2008

Abstract

Objectives. The study purpose was to compare hysterectomy and lymphadenectomy completed via robotic assistance, laparotomy, and laparoscopy for endometrial cancer staging with respect to operative and peri-operative outcomes, complications, adequacy of staging, and cost.

Methods. One hundred and ten patients underwent hysterectomy with bilateral salpingo-oophorectomy, pelvic and para-aortic lymphadenectomy for endometrial cancer staging. All cases were performed by a single surgeon, at a single institution (40 robotic, 40 laparotomy, and 30 laparoscopic) and were retrospectively reviewed to compare demographics and peri-operative variables including, operative time, estimated blood loss, lymph node count, hospital stay, complications, and return to normal activity. Additionally, a cost comparison between all three modalities was performed.

Results. Patients undergoing robotic assisted hysterectomy and staging experienced longer operative time than the laparotomy cohort with no difference in comparison to the laparoscopic cohort (184 min, 108.6 min, 171 min, $p<0.0001$, $p=0.14$). Estimated blood loss was significantly reduced for the robotic cohort in comparison to the laparotomy cohort and comparable to laparoscopic cohort (166 cc, 316 cc, 253 cc, $p=0.01$, $p=0.25$). The complication rate was lowest in the robotic cohort (7.5%) relative to the laparotomy (27.5%) and laparoscopic cohorts (20%) ($p=0.015$, $p=0.03$). Average return to normal activity for the robotic patients was significantly shorter than those undergoing laparotomy (24.1 days versus 52 days, $p<0.0001$) and those undergoing laparoscopy (31.6 days, $p=0.005$). Lymph node retrieval did not differ between the 3 groups (robotic 17 nodes, laparotomy 14 nodes, laparoscopic 17 nodes). The total average cost for hysterectomy with staging completed via laparotomy was $12,943.60, for standard laparoscopy $7569.80, and for robotic assistance $8212.00. The difference in cost between laparotomy and robotic cohorts was significant $p=0.0001$ while there was no statistically significant difference in cost between laparoscopy and robotic cohorts $p=0.06$.

Conclusions. Robotic hysterectomy provides comparable node retrieval to laparotomy and laparoscopic procedures in the case of the experienced laparoscopic surgeon. While robotic hysterectomy takes longer to perform than hysterectomy completed via laparotomy, it is equivalent to laparoscopic hysterectomy and provides the patient with a more expeditious return to normal activity with reduced post-operative morbidity. Additionally, the average cost for hysterectomy and staging was highest for laparotomy, followed by robotic, and least for standard laparoscopy.

Keywords: Hysterectomy; Endometrial staging; Cost; Laparoscopy; Robotics; Laparotomy

Introduction

Surgical staging for endometrial cancer is considered the standard of care. Surgical approach can vary from traditional laparotomy, standard laparoscopy, and the newest surgical approach — robotic total laparoscopic hysterectomy with staging. Robotic gynecologic surgery has been FDA approved since March 2005, and several investigators have switched to the robotic approach. The advantage of robotic surgery is that it restores the 3 dimensional approach to surgery that is lost with laparoscopy while maintaining the minimally invasive approach. Additionally, robotic instruments articulate with 6 degrees of freedom, thus allowing the surgeon to more readily suture and perform difficult dissections. Critics of robotic surgery are quick to discuss the time factor for learning and performing robotic surgery and the cost of robotic surgery. This retrospective review analyzes all endometrial cancer staging

* Corresponding author. Department of Obstetrics and Gynecology, Sanford School of Medicine at the University of South Dakota, 1500 West 22nd Street Suite 301, Sioux Falls, SD 57105, USA. Fax: +1 605 328 8801.
E-mail address: BELLM@sanfordhealth.org (M.C. Bell).

0090-8258/$ - see front matter
doi:10.1016/j.ygyno.2008.08.022

procedures performed by a single surgeon at a single institution via traditional laparotomy, standard laparoscopy, and robotic surgery.

Methods

A retrospective chart review was performed on all endometrial cancer staging procedures done by a single board certified gynecologic oncologist at a single institution. The practice of this surgeon is a private practice without ob/gyn residents. The dates of accrual for patients were from May 2000 to June 2007. During the study period, the surgeon started performing standard laparoscopic hysterectomies with nodes in 2003, and robotic hysterectomies with nodes in 2005. Once the surgeon started minimally invasive surgery, the only patients who underwent laparotomy were those who requested laparotomy, or patients with uterine size greater than 14 weeks. Once robotic surgery was available, the surgeon still performed standard laparoscopic hysterectomies with staging due to scheduling issues. One hundred ten cases of hysterectomy with staging were identified. Charts were reviewed for the following parameters: demographic data, operative time, peri-operative complications, adequacy of node sampling, and return to normal activity. Return to normal activity was determined by a follow-up examination by the surgeon and was defined by either the patient going back to work full time, or in the case of a patient who did not work, when she returned to her normal activity.

The hospital business office performed the financial analysis and abstracted direct and indirect costs associated with each of the three modalities. Direct costs were divided into the following categories: radiology, pharmacy, laboratory, central supplies (patient supplies outside of operating room), surgery procedure (time based), surgery supplies (chargeable supplies in operating room consisting of trocars and any resposables including robotic instruments), PACU (recovery time), anesthesia (not MD cost), and room and board. Indirect costs for each of the categories were captured separately. The direct and indirect costing is based upon American Hospital Association standards. Direct costs include labor, supplies, and depreciation for moveable equipment. Indirect costs include all other overhead costs allocated to each department including non-moveable depreciation costs, utilities, and non-direct staff costs like administration and maintenance. Societal/productive costs were based upon the Lewin Inc.'s group assignment of $1015/week for a woman age 40 [1].

Amortization of the daVinci Surgical System is included in the direct costs. Amortization cost was calculated based on 5 year straight-line depreciation. Service agreement costs (approximately 10% of the purchase price of the daVinci) were also included in the direct costs.

Statistical analysis was performed using SAS version 9.2 (SAS, Cary, NC). Data were tested for normality assumptions using a Kolmogorov–Smirnov test. Continuous variables are reported as mean and standard deviation, while discrete variables are reported as percentages of the total. All comparisons of continuous variables across cohorts were analyzed using a *t*-test and discrete variables were compared between cohorts using a chi-squared test with or without continuity correction. In the case of small cells, Fisher's exact test was used. In all instances a two-tailed *p*-value of <0.05 was considered statistically significant.

Table 1
Pre-operative characteristics

	Laparotomy ($n=40$)	Laparoscopy ($n=30$)	Robotic ($n=40$)
Age [a]			
Average	72.3	68.4	63.0
Std	±12.5	±11.9	±10.1
BMI [b]			
Average	31.8	31.9	33.0
Std	±7.7	±9.8	±8.5
Uterine weight (g) [c]			
Average	155.6	138.5	135.9
Std	±134.8	±75.5	±72.8

2 sampled *t*-test used for statistical comparisons.
[a] Age *p*-value for laparotomy vs. Robotic — $P=0.0005$ and laparoscopy vs. Robotic — $P=0.03$.
[b] Body mass index *p*-value for laparotomy vs. Robotic — $P=0.54$ and laparoscopy vs. Robotic — $P=0.59$.
[c] Uterine weight *p*-value for laparotomy vs. Robotic — $P=0.41$ and laparoscopy vs. Robotic — $P=0.87$.

Table 2
Intra-operative characteristics

	Laparotomy ($n=40$)	Laparoscopy ($n=30$)	Robotic ($n=40$)
Operative time (min) [a]			
Average	108.6	171.1	184.0
Std	±41.4	±36.2	±41.3
EBL (cc) [b]			
Average	316.8	253.0	166.0
Std	±282.1	±427.7	±225.9
Number of nodes [c]			
Average	14.9	17.1	17.0
Std	±4.8	±7.1	±7.8

2 sampled *t*-test used for all statistical comparisons.
[a] Operative time *p*-value for Laparotomy vs. Robotic — $P=0.0001$ and Laparoscopy vs. Robotic — $P=0.14$.
[b] Estimated blood loss *p*-value for Laparotomy vs. Robotic — $P=0.01$ and Laparoscopy vs. Robotic — $P=0.25$.
[c] Number of nodes *p*-value for Laparotomy vs. Robotic — $P=0.15$ and Laparoscopy vs. Robotic — $P=0.95$.

Results

The demographic data indicate that women who underwent laparotomy were oldest with a mean age of 72.3 years. This was significantly higher than the mean age of women who underwent standard laparoscopy (mean age 68.4 years), and women who underwent robotic staging (mean age of 63.0 years). The body mass index was highest for women who underwent robotic staging with a mean BMI of 33.0, but this was not statistically different from the laparoscopic group with an average BMI of 31.9, and the laparotomy cohort with an average BMI of 31.8. The average weight of the uterus was highest for the laparotomy cohort at 155.6 g, followed by standard laparoscopy at 138.5 g, and least for the robotic cohort at 135.9 g. The differences between the groups were not statistically significant (Table 1).

Patients undergoing robotic assisted hysterectomy experienced longer operative times than the laparotomy cohort with no difference in comparison to the laparoscopic cohort (184 min, 108.6 min, 171 min, $p<0.0001$, $p=0.14$). Estimated blood loss was significantly reduced for the robotic cohort in comparison to the laparotomy cohort and comparable to laparoscopic cohort (166 cc, 316 cc, 253 cc, $p=0.01$, $p=0.25$). Lymph node retrieval did not differ between the 3 groups (robotic 17 nodes, laparotomy 14 nodes, laparoscopic 17 nodes). The operative times were longest for the robotic group with an average time of 184.0 min. This was followed by standard laparoscopy at 171.1 min, and 108.6 min for the laparotomy cohort (Table 2). The average length of stay was longest for the laparotomy group at an average of 4.0 days, followed by robotic at 2.3 days and the laparoscopy group at 2.0 days. The difference between the laparotomy and robotic cohort's length of stay was statistically different ($p=0.01$). The average return to normal activity for the robotic patients was significantly shorter than in the laparotomy cohort (24.1 days versus 52 days, $p<0.0001$) and the laparoscopic cohort (31.6 days, $p=0.005$) (Table 3). The complications assessed were major and minor and included post-operative ileus, wound infection, lymphedema, damage to internal structures, vaginal cuff dehiscence, post-operative bleeding, and transfusions. The complication rate was highest for laparotomy cases at 27.5% followed by laparoscopy at 20.0% and lowest for the robotic cohort at 7.5%. The complication rate was significantly lower between the robotic and laparotomy groups, and between the laparoscopic and robotic groups (Table 4). The direct and indirect costs associated with laparotomy compared to robotic hysterectomy with staging were on average over $4500.00 more expensive. This difference was statistically significant ($p=0.0001$). When comparing the indirect and direct costs associated with laparoscopy to robotics, the differential was $642.00 accounting for the amortization of the robot and disposable instruments. This difference was not statistically significant ($p=0.06$).

Discussion

The conversion to minimally invasive surgery for endometrial cancer has increased in the field of gynecologic oncology. Barakat et al. published their analysis of the technique used for endometrial cancer. They found that there was an increase in the use of laparoscopy for staging between 1995–2004 [2]. Likewise, Naumann et al. surveyed the Society of Gynecologic Oncologists and found that about 50% of gynecologic oncologists utilize laparoscopy for endometrial cancer staging [3]. As robotic surgery is more widely available, published data

Table 3
Charges and detailed costs in U.S. dollars for hysterectomy with staging

	Laparotomy $N=40$	Laparoscopic $N=30$	Robotic $N=40$	p-value
Total average charges	$37,173.70	$28,642.60	$30,388.80	0.0002 [a]
	(±2218.10)	(±4025.20)	(±2808.00)	0.166 [b]
Total average indirect overhead cost	$5539.80	$2005.80	$2209.90	0.0001 [a]
	(±2589.3)	(±249.0)	(±417.7)	0.06 [b]
Total average direct cost	$7403.80	$5564.00	$6002.10	0.15 [a]
	(±3310.6)	(±1297.9)	(±733.9)	0.26 [b]
Radiology	$142.2	$27.2	$104.0	0.66 [a]
	(±204.3)	(±34.0)	(±148.1)	0.01 [b]
Pharmacy	$550.7	$105.1	$164.9	0.04 [a]
	(±661.5)	(±64.1)	(±71.3)	0.011 [b]
Lab	$1301.0	$411.6	$395.5	0.0001 [a]
	(±541.7)	(±54.5)	(±140.9)	0.60 [b]
Supplies	$703.8	$1978.5	$2160	0.0001 [a]
	(±124.5)	(±633.3)	(±466.0)	0.36 [b]
Surgery	$902.4	$1131.5	$1234.2	0.01 [a]
	(±284.5)	(±183.8)	(±206.9)	0.11 [b]
PACU	$343.1	$316.5	$286.3	0.32 [a]
	(±135.1)	(±127.9)	(±94.5)	0.45 [b]
Anesthesia	$1188.3	$1160.5	$1156.4	0.85 [a]
	(±555.8)	(±182.6)	(±194.0)	0.94 [b]
Room and board	$2156.0	$428.8	$552.0	0.0001 [a]
	(±842.2)	(±149.6)	(±193.9)	0.06 [b]
Total average (direct+indirect) cost	$12,943.60	$7569.80	$8212.00	0.0001 [a]
	(±)	(±)	(±)	0.06 [b]
Average length of stay	4.0±1.5	2.0±1.2	2.3±1.3	0.0001 [a]
				0.60 [b]
Days to return to normal activity	52.0±71.8	31.6±11.2	24.1±6.9	<0.0001 [a]
				0.005 [b]
Estimated lost wages+household productivity [c]	$7540.00	$4582.00	$3495.00	–

[a] Refers to comparison made between laparotomy and robotic groups.
[b] Refers to comparison made between laparoscopy and robotic groups.
[c] Based upon Lewin Inc.'s estimate of $1015/week.

Table 4
Complications

	Laparotomy (n=40)	Laparoscopic (n=30)	Robotic (n=40)
Ileus	5		
Wound infection	2	3	
Lymphedema	1		
Damage to genital formal nerve	1		
Vaginal cuff hematoma	1		
Incisional hernia	1		
Port site hernia			1
Re-op for bleeding			1
Delayed voiding			1
Injury of vena cava		1	
DVT		1	
Vaginal cuff dehiscence		1	
Superficial phlebitis		1	
Atrial fibrillation		1	
Total complications [a]	11/40	8/30	3/40
	27.5%	20.0%	7.5%
Transfusion [b]	6/40	3/30	2/40
	15%	10%	5%

Fisher's exact test used for statistical comparisons.
[a] Complications p-value for Open versus Robotic — P=0.015 and Lap versus Robotic — P=0.03.
[b] Transfusion p-value for Open versus Robotic — P=0.10 and Lap versus Robotic — P=0.40.

is needed in order to demonstrate outcomes and cost-effectiveness of robotic surgery in order to justify utilizing this new technology. This is the first publication comparing a single surgeon's experience between laparotomy, standard laparoscopic, and robotic hysterectomies with staging for endometrial cancer as well as a cost comparison. We have compared operative and peri-operative outcomes and the direct and indirect costs of these three modalities.

The demographics of our groups did differ with regard to age. The robotic cohort was younger than either the laparoscopic or laparotomy groups. It is unclear why this occurred. It is not the practice of the surgeon to offer robotic surgery to younger patients however this occurrence must be taken into consideration when discussing complications. The size of the uterus was largest in the laparotomy group; however, this difference did not reach statistical significance. The surgeon's experience is that it is difficult to remove the uterus vaginally if the uterus is larger than a 14 week size, and thus a patient with a uterine malignancy with larger than a 14 week size uterus is not offered robotic or laparoscopic hysterectomy.

Our data indicates that robotics or standard laparoscopic staging were about 1 h longer than laparotomy. These data are similar to several other investigators who compared standard laparoscopic hysterectomy and staging to laparotomy hysterectomy and staging. Frigerio et al. compared laparoscopic assisted vaginal hysterectomies with staging to laparotomy hysterectomy and staging. Their results showed an average time of 220 min for the laparoscopic approach versus 175 min for the laparotomy approach [4]. Fiorentino published a single institution 10 case robotic total laparoscopic hysterectomy series for benign disease. In this case series, the mean operative time was 3.2 h for hysterectomy alone [5]. In summary, our data indicate that robotic hysterectomy with staging can be done in a reasonable time frame, although longer than laparotomy.

Complications

Our data indicate that the peri-operative complications are significantly higher for laparotomy procedures than compared to robotic surgery. Furthermore, robotic surgery had resulted in fewer complications than standard laparoscopy. This is similar to other investigators. Frigerio et al. compared laparoscopic assisted hysterectomy with staging to laparotomy and found fewer post-operative complications in the Laparoscopic Assisted Vaginal Hysterectomy group (6 vs. 11 cases; $p<0.001$) [4]. Gil-Moreno et al. compared laparoscopic hysterectomy with staging versus laparotomy and found that blood loss, blood transfusions required, and length of stay were significantly lower in the laparoscopic group, but surgical time was significantly longer [6]. Our data demonstrated a significantly lower blood loss when comparing robotics to the laparotomy group; however the transfusion rate was not statistically different. This finding is similar to that of other investigators [5]. While our study has demonstrated reduced complications in the robotic cohort relative to the laparotomy and laparoscopic cohorts, we have not fully captured the financial impact this has on cost.

Length of stay

Our data, like others, demonstrate a significant decrease in hospital stay for both standard laparoscopy and robotic cases compared to laparotomy. Frigerio et al. demonstrated a shorter hospital stay for laparoscopic assisted surgery compared to laparotomy (4 vs. 8.5 days; $p<0.001$) [4]. Obermair found the mean post-operative hospital stay was 4.4 (+/−3.9) days in the Total Laparoscopic Hysterectomy group and 7.9 (+/−3.0) days in the Total Abdominal Hysterectomy group ($P<0.0001$) [7].

Cost

Certainly, the length of stay is directly related to the cost, and length of stay is the driving force behind the increased cost of laparotomy. Actual cost to the institution is difficult to obtain. Charges are more readily obtainable and should reflect the cost but may not. In our data, both charge data and cost data rank laparotomy as the most expensive modality followed by robotic and laparoscopy. The validity of charge comparisons, however, depends upon the charge structure of the health system. Assuming that charges are based upon cost, charge comparisons of modalities inside one health system (as in this case) could be a useful proxy for actual cost comparisons. Comparisons of charges between systems would require similar charge structures and thus are even more difficult. While charge data can be used for broad comparisons, we were able to obtain and use cost data for a more accurate reflection of the financial impact of the modalities on the health system.

Each of the measured costs associated with longer stays including room and board, pharmacy, laboratory, and radiology, increased with procedures completed via laparotomy. With laparotomy procedures, these length of stay costs comprised over half of the total cost whereas laparoscopic and robotic procedures had less than one third of their total cost resulting from length of stay costs. PACU and anesthesia costs did not vary significantly among the surgical modalities. Cost for the robotic and laparoscopic procedures was increased for the actual surgery costs as well as the surgical supplies. These comprised nearly half of the cost for the robotic cases whereas they only contributed 19% to the laparotomy procedures.

Advicula et al. assessed charge and reimbursement data between myomectomies completed via laparotomy versus robotic assistance. The charges were significantly higher for the professional and hospital in the case of robotic procedures. The professional reimbursement was not higher for robotic procedures; however, the hospital reimbursement was higher for robotic surgery. Although the authors indicate that they are reporting cost data, they only report charge and reimbursement data [8]. Magrina reported the cost of laparoscopic hysterectomy for endometrial cancer versus hysterectomy completed via laparotomy and reported a reduced cost for the laparoscopic approach [9]. Miroschnichenko analyzed cost between laparoscopic hysterectomy and staging and robotic hysterectomy and staging for endometrial cancer patients. His findings indicate a statistically significantly increased cost for robotic hysterectomy and staging. However, his data indicate that the robotic patients had a statistically significantly higher BMI (35.3) than the laparoscopic cohort (27.8). Additionally, the operative times were longer for the robotic cohort (192.5 min versus 156.2 min). Our data did not show any differences in BMI between cohorts, and we surmise that the similar operating times between our laparoscopic and robotic cohort is explained by the similar BMI. Although Miroschnichenko et al. attribute the higher cost of robotic surgery to the disposable instruments, in our cost assignment structure, the increased operative time would have created the cost difference [10]. We were surprised to see the overall decreased cost for robotic surgery. Furthermore, the differential of $642.00 in comparison to laparoscopic surgery was not statistically significant. One could argue that a surgeon's investment of time (1 h more for standard laparoscopy or robotic surgery) which is not reimbursed at a higher level than with laparotomy, is a money losing proposition. We prefer to look at this as time (money) invested up front, which is recouped by less time rounding due to decreased hospital stay and less time taking care of complications which in general are costly and not reimbursed well.

Additionally, the societal costs are much less with robotic surgery as evidenced by our data which indicate a significant decrease in the days to return to normal activity for patients undergoing robotic surgery. A true discussion of cost must address the cost to the employer and family of the patient. The financial benefit of reduced loss of time from normal activities is difficult to quantify and varies with each patient's situation. One might ask "Why would patients undergoing robotic hysterectomy with nodes recover faster than a laparoscopic hysterectomy with nodes?" We pondered the same question, but routinely we see faster recoveries in patients undergoing robotic hysterectomy. Perhaps the remote centering of the trocars with robotic surgery affords the patient less trauma to the abdominal wall and thus a more expeditious recovery. Our standard follow-up appointment for our patients after laparotomy is 4 weeks. When we started performing laparoscopic hysterectomies with staging, our follow-up was 4 weeks, however when we started performing robotic hysterectomies, the patients were routinely calling in to be seen earlier in the post-operative course so they could return to work earlier. With that in mind, we routinely see our robotic hysterectomy patients 3 weeks post-operatively, but allow the patients to go back to work part time at 2 weeks and full time at 3 weeks. In our calculations of time back to work, we took the date in which the physician examined the patient and released them to full time work even though the patient may have already gone back to work part time.

In summary, this is the first publication comparing total hysterectomy with pelvic and para-aortic lymph node dissection by three different modalities of treatment; laparotomy, laparoscopy and robotic assistance. The robotic approach took longer to perform but compared favorably with regard to cost and complications. In the future, prospective studies will need to be performed to validate our findings and assess long term oncologic outcomes for endometrial cancer treatment/staging.

Conflicts of interest statement

The authors have no conflicts of interest to declare.

References

[1] The Lewin Group. Cost-effectiveness Comparisons of Treatments for Pelvic Health Disorders among US Women; 2007.

[2] Barakat RR, Lev G, Hummer AJ, Sonoda Y, Chi DS, Alektiar KM, et al. Twelve-year experience in the management of endometrial cancer: a change in surgical and postoperative radiation approaches. Gynecol Oncol 2007;105(1):150–6.

[3] Naumann RW, Coleman RL. The use of adjuvant radiation therapy in early endometrial cancer by members of the Society of Gynecologic Oncologists in 2005. Gynecol Oncol 2007;105(1):7–12.

[4] Frigerio L, Gallo A, Ghezzi F, Trezzi G, Lussana M, Franchi M. Laparoscopic-assisted vaginal hysterectomy versus abdominal hysterectomy in endometrial cancer. Int J Gynaecol Obstet 2006;93(3):209–13.

[5] Fiorentino RP, Zepeda MA, Goldstein BH, John CR, Rettenmaier MA. Pilot study assessing robotic laparoscopic hysterectomy and patient outcomes. J Minim Invasive Gynecol 2006;13(1):60–3.

[6] Gil-Moreno A, Diaz-Feijoo B, Morchon S, Xercavins J. Analysis of survival after laparoscopic-assisted vaginal hysterectomy compared with the conventional abdominal approach for early-stage endometrial carcinoma: a review of the literature. J Minim Invasive Gynecol 2006;13 (1):26–35.

[7] Obermair A, Manolitsas TP, Leung Y, Hammond IG, McCartney AJ. Total laparoscopic hysterectomy versus total abdominal hysterectomy for obese women with endometrial cancer. Int J Gynecol Cancer 2005;15 (2):319–24.

[8] Advincula AP, Xu X, Goudeau St, Ransom SB. Robot-assisted laparoscopic myomectomy versus abdominal myomectomy: a comparison of short-term surgical outcomes and immediate costs. J Minim Invasive Gynecol 2007;14(6):698–705.

[9] Magrina JF. Outcomes of laparoscopic treatment for endometrial cancer. Curr Opin Obstet Gynecol 2005;17(4):343–6.

[10] Miroshnichenko G., Endometrial cancer surgery costs: robot versus laparoscopy. J Minim Invasive Gynecol In Press.