Methods

Systematic review of the peer-reviewed literature performed by Intuitive team are at the core of most of the clinical value claims presented in this document.

Published literature on robotic-assisted surgery was queried from PubMed, Scopus and Embase. Below are the searched terms employed to identify robotic assisted surgery related articles in the mentioned databases:

Database	*Search terms*
PubMed	(robotic[All Fields] OR robot*[All Fields] OR "robot assist"[All Fields] OR "robotically assisted"[All Fields] OR robot-assist[All Fields] OR "da vinci"[All Fields] OR davinci[All Fields] OR "intuitive surgical"[All Fields] OR (robot*[All Fields] AND surgery[all fields]))
Scopus	TITLE-ABS-KEY(da*vinci) OR (robotic surgery) OR ('intuitive surgical') OR (robotic assist*) OR (robot*surgery) OR (robotic-assist*)
Embase	'da vinci':de,nc,lnk,cl,ab,ti OR 'davinci':de,nc,lnk,cl,ab,ti OR 'intuitive surgical' OR 'endowrist'/exp OR endowrist OR (robot* NEAR/2 surg*):de,nc,lnk,cl,ab,ti OR (robot* NEXT/1 assist*)

Seven separate systematic literature reviews and meta-analyses were completed for seven different surgical procedures. These included: hysterectomy (endometrial cancer), hysterectomy (cervical cancer)– starting date for all searches was January 1, 2010. All searches were subject to the same specific inclusion and exclusion criteria, outlined below:

Inclusion criteria:

1. Robotic-assisted [procedure name]
2. Publication between January 1, 2010 and [End date of search]
3. Level of Evidence (≤ 2a/2c)
4. Study is a RCT, Meta-Analysis /Systematic Review, or Large Database Study with Comparative Cohorts (Robotic vs Lap and/or Open Surgery)

Exclusion criteria:

1. Not in English
2. Paper reports on a pediatric population
3. Publication is an HTA that was not published in a peer reviewed journal
4. Alternate technique/approach (e.g. transanal, single-port)
5. No stratified analysis by study arm (e.g. combines results from robotic, laparoscopic and/or open cohorts)
6. Procedure data mixed with other procedures (e.g. data from multiple surgical procedures combined)

7. Original research study does not provide quantitative results or a review paper does not provide meta/summary analysis for at least one of the findings relative to the outcomes of interest (i.e, operative time, conversions, estimated blood loss and/or transfusions, complications, length of hospital stay, mortality)
8. Original research publication includes redundant patient population and similar conclusions
9. Study is a review paper that only includes redundant publications and similar conclusions.

The table below has the literature search end dates:

SLR and meta-analysis topic / Procedure Name	*Search end date*
Hysterectomy for Endometrial Cancer	3/5/19
Hysterectomy for Cervical Cancer	3/5/19
Partial Nephrectomy	10/17/18
Prostatectomy	9/30/17
Colectomy	5/15/18
Lower Anterior Resection of the Rectum with Total Mesorectal Excision (LAR /TME)	5/15/18
Lobectomy (lung resection)	12/3/18

All summary measures are shown as odds ratios, relative risks or risk differences when describing binary outcomes, or as weighted mean differences or standardized mean differences when describing continuous outcomes. Where specified, weighted group statistics (percent or mean) are provided. Weights are allocated by sample size of each publications and the variance of the estimate that contributes the specific metric in the forest plot of the meta-analysis.

Level of Evidence Definitions for Scientific Publications

Level 1

a) Systematic reviews of Randomized Control Trials (RCT's)

b) Randomized Controlled Trials (RCT)

c) RCT's for Robotic technique studies (robotic vs other robotic study arm, not comparing to other surgical methods)

Level 2

a) Systematic reviews of comparison studies and higher quality* mixed comparison/single arm analyses. Independent database population studies (comparative and single arm)

b) Prospective non-randomized comparative studies and lower quality* RCT's

c) Independent database population studies

Level 3

a) Systematic reviews that mix comparison studies and single arm studies in the analysis.

b) Retrospective non-randomized comparative studies (includes retrospective reviews of prospective institutional database) and lower quality* prospective comparison studies

Level 4:

a) Systematic reviews of single arm studies and all non-systematic reviews (comparative and single arm)

b) Single arm studies (includes robotic vs other robotic study arm, not comparing to other surgical methods) and lower quality* retrospective studies (includes retrospective reviews of prospective institutional database)

Level 5:

Case reports, Lower quality* single arm studies, Animal studies, Cadaver studies, Bench research, Expert Opinion/Editorial, Technique (with no clinical data)

* Higher quality systematic reviews with mixed comparison/single arm analyses are those that correct for bias and/or differences in patient characteristics between groups. Lower quality is defined as small sample sizes (at least one of comparison arms is <20 subjects).

Results

A meta-analysis for 7 distinct surgical procedures; (hysterectomy for endometrial cancer, hysterectomy for cervical cancer, prostatectomy, partial nephrectomy, colectomy, low anterior resection of the rectum, and lobectomy was conducted with the goal of comparing key clinical outcomes across 3 surgical approaches (robotic-assisted, laparoscopic and open surgery). The key clinical outcomes measured across the 7 procedures included; conversion to open surgery, the rate of blood transfusions, operative time, complications within 30-days of surgery, length of hospital stay, readmissions to hospital within 30-days of surgery and mortality within 30 days post surgery. Each of the clinical outcomes' effect size was described as an odds ratio, risk ratio, risk difference, weighted mean difference or standardized mean difference comparing robotic assistance to laparoscopy or robotic assistance to open surgery.

Table 1: Robotic-assisted versus Laparoscopic / Video-assisted Procedures

Clinical Outcomes	Number of Robotic patients	Number of Laparoscopic or Video-assisted patients	Odds Ratio	95% Confidence Interval
Conversion	198,669	294,537	0.47	[0.37, 0.60]
Conclusion: There is a 53% lower likelihood of a conversion to open surgery during a robotic procedure compared to a laparoscopic/ VATS procedure. This result is statistically significant across all 7 procedures p<0.00001				
Blood Transfusions	83,381	142,287	0.71	[0.61, 0.84]
Conclusion: There is a 29% lower likelihood of receiving a blood transfusion after robotic surgery compared to laparoscopic / VATS. This result is statistically significant across all 7 procedures p<0.0001.				
Postoperative Complications within 30-days	65,794	429,861	0.86	[0.80, 0.92]
Conclusion: There is a 14% lower likelihood of a postoperative complication within 30-days of robotic-assisted surgery compared to laparoscopic /VATS surgery. This result is statistically significant across all 7 procedures pp<0.0001.				
Readmissions within 30-days	41,255	89,199	0.79	[0.60, 1.05]
Conclusion: There is no difference in the likelihood of readmissions within 30-days of surgery between robotic and laparoscopic/VATS surgery. P=0.15				

Mortality within 30 days[1]	63,352	41,168	-0.32	[-0.0025, -0.0005]
Mortality within 30 days[2]	44,070	617303	0.77	[0.55, 1.07]
Conclusion[1]: There is a statistically significant difference in the likelihood of mortality within 30-days of surgery between robotic and laparoscopic surgery. P=0.003. ([1]refers to the pooled results for hysterectomy for endometrial cancer, and cervical cancer, LAR/TME, prostatectomy, partial nephrectomy.) Conclusion[2]: There is no statistically significant difference in the likelihood of mortality within 30-days of surgery between robotic and laparoscopic/VATS surgery. P=0.12. ([2]refers to the pooled results for lobectomy and colectomy)				
Clinical Outcomes	Number of Robotic patients	Number of Laparoscopic or Video-assisted patients	Weighted Mean Difference/ Standardized Mean Difference	95% Confidence Interval
Operative time[3]	42,178	43,970	9.90	[-0.72, 20.51]
Operative time[4]	18,638	115,771	0.40	[0.12, 0.67]
Conclusion[3]: There is no statistically significant difference in operative time between robotic assisted procedures and laparoscopic procedures. ([3] refers to the pooled results (weighted mean difference=9.9 minutes) for the following procedures: prostatectomy, partial nephrectomy, hysterectomy for endometrial cancer and cervical cancer, and LAR/TME) Conclusion[4]: There is a statistically significant difference in operative time between robotic assisted procedures and laparoscopic procedures. ([4] refers to the pooled (standardized mean difference=0.40) results for the following procedures: lobectomy and colectomy)				
Length of Hospital Stay[5]	110,170	53,127	-0.32	[-0.45, -0.18]
Length of Hospital Stay[6]	44,739	590,592	-0.06	[-0.14, 0.03]
Conclusion[5]: There is a statistically significant difference in length of hospital stay between robotic assisted and laparoscopic procedures. Robotic surgery patients have a length of stay on average a third of a day shorter than laparoscopic patients. P<0.00001. ([5] refers to the pooled results (weighted mean difference=-0.32 days) for the following procedures: prostatectomy, partial nephrectomy, hysterectomy for endometrial cancer and cervical cancer, and LAR/TME)				

Conclusion[6]: There is no statistically significant difference in length of hospital stay between robotic and laparoscopic /VATS procedures. P=0.18. ([6] refers to the pooled (standardized mean difference=-0.06) results for the following procedures: lobectomy and colectomy)

Table 2: Robotic-assisted versus Open Procedures

Clinical Outcomes	Number of Robotic patients	Number of Open patients	Odds Ratio	95% Confidence Interval
Blood Transfusions	180,826	325,613	0.28	[0.18, 0.44]
Conclusion: There is a 72% lower likelihood of receiving a blood transfusion after robotic surgery compared to open surgery. This result is statistically significant across all 7 procedures p<0.0001.				
Postoperative Complications within 30-days	91,066	267,665	0.56	[0.47, 0.68]
Conclusion: There is a 44% lower likelihood of a postoperative complication within 30-days of robotic-assisted surgery compared to open surgery. This result is statistically significant across all 7 procedures p<0.0001.				
Readmissions within 30-days	120,046	161,027	0.84	[0.67, 1.07]
Conclusion: There is no difference in the likelihood of readmissions within 30-days of surgery between robotic and open surgery. P=0.17				
Mortality within 30 days[1]	169,310	604,410	0.39	[0.26, 0.58]
Mortality within 30 days[2]	13,245	45,019	-0.0027	[-0.0035, -0.0019]

Conclusion[1]: There is a statistically significant difference in the likelihood of mortality within 30-days of surgery between robotic and open surgery. P<0.00001. ([1]refers to the pooled results for hysterectomy for endometrial cancer, and cervical cancer, colectomy, prostatectomy, lobectomy.)

Conclusion[2]: There is a statistically significant difference in the likelihood of mortality within 30-days of surgery between robotic and open surgery. P<0.00001. ([2]refers to the pooled results for partial nephrectomy and LAR/TME)

Clinical Outcomes	Number of Robotic patients	Number of Laparoscopic or Video-assisted patients	Weighted Mean Difference/ Standardized Mean Difference	95% Confidence Interval
Operative time	126,217	159,425	40.37	[24.11, 56.62]
Conclusion: There is a statistically significant difference in operative time between robotic assisted procedures and open procedures, p<0.00001. (refers to the pooled results for all 7 procedures.) Operative time is on average 40.37 minutes longer for robotic assisted surgery in comparison to open surgery.				
Length of Hospital Stay	244,095	719,056	-2.15	[-2.70, -1.60]
Conclusion: There is a statistically significant difference in length of hospital stay between robotic and open procedures. P<0.00001. (refers to the pooled results for all 7 procedures). Length of hospital stay is on average 2 days shorter for robotic assisted surgery than open surgery.				

Bibliography

(each procedure has a separate reference list with numbering starting at 1)

Colon Resection (to May 15, 2018)

1. Addae, J. K., F. Gani, S. Y. Fang, E. C. Wick, A. A. Althumairi, J. E. Efron, J. K. Canner, D. M. Euhus and E. B. Schneider (2017). "A comparison of trends in operative approach and postoperative outcomes for colorectal cancer surgery." J Surg Res 208: 111-120.

2. Altieri, M. S., J. Yang, D. A. Telem, J. Zhu, C. Halbert, M. Talamini and A. D. Pryor (2016). "Robotic approaches may offer benefit in colorectal procedures, more controversial in other areas: a review of 168,248 cases." Surg Endosc 30(3): 925-933.

3. Benlice, C., E. Aytac, M. Costedio, H. Kessler, M. A. Abbas, F. H. Remzi and E. Gorgun (2017). "Robotic, laparoscopic, and open colectomy: a case-matched comparison from the ACS-NSQIP." Int J Med Robot 13(3).

4. Bhama, A. R., A. M. Wafa, J. Ferraro, S. D. Collins, A. J. Mullard, J. F. Vandewarker, G. Krapohl, J. C. Byrn and R. K. Cleary (2016). "Comparison of Risk Factors for Unplanned Conversion from Laparoscopic and Robotic to Open Colorectal Surgery Using the Michigan Surgical Quality Collaborative (MSQC) Database." J Gastrointest Surg 20(6): 1223-1230.

5. Chang, Y. S., J. X. Wang and D. W. Chang (2015). "A meta-analysis of robotic versus laparoscopic colectomy." J Surg Res 195(2): 465-474.

6. Davis, B. R., A. C. Yoo, M. Moore and C. Gunnarsson (2014). "Robotic-assisted versus laparoscopic colectomy: cost and clinical outcomes." Jsls 18(2): 211-224.

7. Dolejs, S. C., J. A. Waters, E. P. Ceppa and B. L. Zarzaur (2017). "Laparoscopic versus robotic colectomy: a national surgical quality improvement project analysis." Surg Endosc 31(6): 2387-2396.

8. Ezekian, B., Z. Sun, M. A. Adam, J. Kim, M. C. Turner, B. F. Gilmore, C. T. Ong, C. R. Mantyh and J. Migaly (2016). "Robotic-Assisted Versus Laparoscopic Colectomy Results in Increased Operative Time Without Improved Perioperative Outcomes." J Gastrointest Surg 20(8): 1503-1510.

9. Halabi, W. J., C. Y. Kang, M. D. Jafari, V. Q. Nguyen, J. C. Carmichael, S. Mills, M. J. Stamos and A. Pigazzi (2013). "Robotic-assisted Colorectal Surgery in the United States: A Nationwide Analysis of Trends and Outcomes." World J Surg 37(12): 2782- 2790.

10. Juo, Y. Y., O. Hyder, A. H. Haider, M. Camp, A. Lidor and N. Ahuja (2014). "Is minimally invasive colon resection better than traditional approaches?: First comprehensive national examination with propensity score matching." JAMA Surg 149(2): 177-184.

11. Keller, D. S., A. J. Senagore, J. K. Lawrence, B. J. Champagne and C. P. Delaney (2014). "Comparative effectiveness of laparoscopic versus robot-assisted colorectal resection." Surg Endosc 28(1): 212-221.

12. Lee, Y. F., J. Albright, W. M. Akram, J. Wu, J. Ferraro and R. K. Cleary (2018). "Unplanned Robotic-Assisted Conversion-to-Open Colorectal Surgery is Associated with Adverse Outcomes." J Gastrointest Surg 22(6): 1059-1067.

13. Lim, S., J. H. Kim, S. J. Baek, S. H. Kim and S. H. Lee (2016). "Comparison of perioperative and short-term outcomes between robotic and conventional laparoscopic surgery for colonic cancer: A systematic review and meta-analysis." Annals of Surgical Treatment and Research 90(6): 328-339.

14. Lorenzon, L., F. Bini, G. Balducci, M. Ferri, P. F. Salvi and F. Marinozzi (2016). "Laparoscopic versus robotic-assisted colectomy and rectal resection: a systematic review and meta-analysis." Int J Colorectal Dis 31(2): 161-173.

15. Miller, P. E., H. Dao, N. Paluvoi, M. Bailey, D. Margolin, N. Shah and H. D. Vargas (2016). "Comparison of 30-Day Postoperative Outcomes after Laparoscopic vs Robotic Colectomy." J Am Coll Surg 223(2): 369-373.

16. Mirkin, K. A., A. S. Kulaylat, C. S. Hollenbeak and E. Messaris (2018). "Robotic versus laparoscopic colectomy for stage I-III colon cancer: oncologic and long-term survival outcomes." Surg Endosc 32(6): 2894-2901.

17. Moghadamyeghaneh, Z., M. H. Hanna, J. C. Carmichael, A. Pigazzi, M. J. Stamos and S. Mills (2016). "Comparison of open, laparoscopic, and robotic approaches for total abdominal colectomy." Surg Endosc 30(7): 2792-2798.

18. Mungo, B., C. M. Papageorge, M. Stem, D. Molena and A. O. Lidor (2017). "The Impact of Operative Approach on Postoperative Complications Following Colectomy for Colon Caner." World Journal of Surgery 41(8): 2143-2152.

19. Park, J. S., G. S. Choi, S. Y. Park, H. J. Kim and J. P. Ryuk (2012). "Randomized clinical trial of robot-assisted versus standard laparoscopic right colectomy." British Journal of Surgery 99(9): 1219-1226.

20. Petrucciani, N., D. Sirimarco, G. Nigri, P. Magistri, M. La Torre, P. Aurello, F. Dangelo and G. Ramacciato (2014). "Robotic right colectomy: A worthwhile procedure? Results of a meta-analysis of trials comparing robotic versus laparoscopic right colectomy." Journal of Minimal Access Surgery 11(1): 22-28.

21. Rondelli, F., R. Balzarotti, F. Villa, A. Guerra, N. Avenia, E. Mariani and W. Bugiantella (2015). "Is robot-assisted laparoscopic right colectomy more effective than the conventional laparoscopic procedure? A meta-analysis of short-term outcomes." Int J Surg 18: 75-82.

22. Schootman, M., S. Hendren, T. Loux, K. Ratnapradipa, J. M. Eberth and N. O. Davidson (2017). "Differences in Effectiveness and Use of Robotic Surgery in Patients Undergoing Minimally Invasive Colectomy." J Gastrointest Surg 21(8): 1296-1303.

23. Solaini, L., F. Bazzocchi, D. Cavaliere, A. Avanzolini, A. Cucchetti and G. Ercolani (2018). "Robotic versus laparoscopic right colectomy: an updated systematic review and meta-analysis." Surgical Endoscopy and Other Interventional Techniques 32(3): 1104-1110.

24. Tam, M. S., C. Kaoutzanis, A. J. Mullard, S. E. Regenbogen, M. G. Franz, S. Hendren, G. Krapohl, J. F. Vandewarker, R. M. Lampman and R. K. Cleary (2016). "A population-based study comparing laparoscopic and robotic outcomes in colorectal surgery." Surg Endosc 30(2): 455-463.

25. Trastulli, S., R. Cirocchi, J. Desiderio, A. Coratti, S. Guarino, C. Renzi, A. Corsi, C. Boselli, A. Santoro, L. Minelli and A. Parisi (2015). "Robotic versus Laparoscopic Approach in Colonic Resections for Cancer and Benign Diseases: Systematic Review and Meta-Analysis." PLoS One 10(7): e0134062.

26. Tyler, J. A., J. P. Fox, M. M. Desai, W. B. Perry and S. C. Glasgow (2013). "Outcomes and costs associated with robotic colectomy in the minimally invasive era." Dis Colon Rectum 56(4): 458-466.

27. Villamere, J., A. Gebhart, S. Vu and N. T. Nguyen (2015). "Utilization and outcome of laparoscopic versus robotic general and bariatric surgical procedures at Academic Medical Centers." Surg Endosc 29(7): 1729-1736.

28. Xu, H., J. Li, Y. Sun, Z. Li, Y. Zhen, B. Wang and Z. Xu (2014). "Robotic versus laparoscopic right colectomy: a meta-analysis." World J Surg Oncol 12(1): 274.

29. Yang, Y., F. Wang, P. Zhang, C. Shi, Y. Zou, H. Qin and Y. Ma (2012). "Robot - assisted versus conventional laparoscopic surgery for colorectal disease, focusing on rectal cancer: a meta-analysis." Ann Surg Oncol 19(12): 3727-3736.

30. Yeo, H. L., A. J. Isaacs, J. S. Abelson, J. W. Milsom and A. Sedrakyan (2016). "Comparison of Open, Laparoscopic, and Robotic Colectomies Using a Large National Database: Outcomes and Trends Related to Surgery Center Volume." Dis Colon Rectum 59(6): 535-542.

31. Zarak, A., A. Castillo, K. Kichler, L. de la Cruz, L. Tamariz and S. Kaza (2015). "Robotic versus laparoscopic surgery for colonic disease: a meta-analysis of postoperative variables." Surg Endosc 29(6): 1341-1347. Moghadamyeghaneh, Z., M. H. Hanna, J. C. Carmichael, A. Pigazzi, M. J. Stamos and S. Mills (2016). "Comparison of open, laparoscopic, and robotic approaches for total abdominal colectomy." Surg Endosc 30(7): 2792-2798.

LAR/TME (to May 15 2018)

1. Broholm, M., H. C. Pommergaard and I. Gogenur (2015). "Possible benefits of robot-assisted rectal cancer surgery regarding urological and sexual dysfunction: a systematic review and meta-analysis." Colorectal Dis 17(5): 375-381. [urinary dysfunction at 6 and 12 mo, sexual dysfunction at 6 mo]

2. Cui, Y., C. Li, Z. Xu, Y. Wang, Y. Sun, H. Xu, Z. Li and Y. Sun (2017). "Robot- assisted versus conventional laparoscopic operation in anus-preserving rectal cancer: a meta-analysis." Ther Clin Risk Manag 13: 1247-1257. [EBL, Conversions, Bowel function recovery, Complications, OR Time, Pos CRM, LOS]

3. Jayne, D., A. Pigazzi, H. Marshall, J. Croft, N. Corrigan, J. Copeland, P. Quirke, N. West, T. Rautio, N. Thomassen, H. Tilney, M. Gudgeon, P. P. Bianchi, R. Edlin, C. Hulme and J. Brown (2017). "Effect of Robotic-Assisted vs Conventional Laparoscopic Surgery on Risk of Conversion to Open Laparotomy Among Patients Undergoing Resection for Rectal Cancer." Jama 318(16): 1569-1580. [Conversions, complications, OR time, urinary dysfunction at 6 mo, sexual dysfunction at 6 mo, mortality, Pos CRM, LNY, LOS]

4. Kim, M. J., S. C. Park, J. W. Park, H. J. Chang, D. Y. Kim, B. H. Nam, D. K. Sohn and J. H. Oh (2018). "Robot-assisted Versus Laparoscopic Surgery for Rectal Cancer: A Phase II Open Label Prospective Randomized Controlled Trial." Ann Surg 267(2): 243-251. [EBL, LOS, LNY, conversions, complications, OR time, sexual dysfunction at 12 mo, bowel function recovery, DRM, Pos CRM, mortality]

5. Lee, S. H., S. Lim, J. H. Kim and K. Y. Lee (2015). "Robotic versus conventional laparoscopic surgery for rectal cancer: systematic review and meta-analysis." Ann Surg Treat Res 89(4): 190-201. [Urinary dysfunction at 6 and 12 mo, EBL, conversions, bowel function recovery, OR time, sexual dysfunction at 6 mo, LNY, LOS]

6. Li, X., T. Wang, L. Yao, L. Hu, P. Jin, T. Guo and K. Yang (2017). "The safety and effectiveness of robot-assisted versus laparoscopic TME in patients with rectal cancer: A meta-analysis and systematic review." Medicine (Baltimore) 96(29): e7585. [EBL, conversions, bowel function recovery, complications, DRM, OR time, Pos CRM, LNY, LOS]

7. Liao, G., Y. B. Li, Z. Zhao, X. Li, H. Deng and G. Li (2016). "Robotic -assisted surgery versus open surgery in the treatment of rectal cancer: the current evidence." Sci Rep 6: 26981. [Complications, LNY, EBL, OR Time, LOS, Mortality, DRM]

8. Lin, S., H. G. Jiang, Z. H. Chen, S. Y. Zhou, X. S. Liu and J. R. Yu (2011). "Meta- analysis of robotic and laparoscopic surgery for treatment of rectal cancer." World J Gastroenterol 17(47): 5214-5220. [EBL, conversions, bowel function recovery, complications, DRM, OR Time, Pos CRM, LNY, LOS]

9. Memon, S., A. G. Heriot, D. G. Murphy, M. Bressel and A. C. Lynch (2012). "Robotic versus laparoscopic proctectomy for rectal cancer: a meta-analysis." Ann Surg Oncol 19(7): 2095-2101. [conversions, complications, DRM, OR time, Pos CRM, LNY, LOS]

10. Midura, E. F., D. J. Hanseman, R. S. Hoehn, B. R. Davis, D. E. Abbott, S. A. Shah and I. M. Paquette (2015). "The effect of surgical approach on short -term oncologic outcomes in rectal cancer surgery." Surgery 158(2): 453-459. [mortality]

11. Ohtani, H., K. Maeda, S. Nomura, O. Shinto, Y. Mizuyama, H. Nakagawa, H. Nagahara, M. Shibutani, T. Fukuoka, R. Amano, K. Hirakawa and M. Ohira (2018). "Meta-analysis of Robot-assisted Versus Laparoscopic Surgery for Rectal Cancer." In Vivo 32(3): 611-623. [EBL, conversions, complications, OR time, mortality, patients with ED]

12. Prete, F. P., A. Pezzolla, F. Prete, M. Testini, R. Marzaioli, A. Patriti, R. M. Jimenez-Rodriguez, A. Gurrado and G. F. M. Strippoli (2018). "Robotic Versus Laparoscopic Minimally Invasive Surgery for Rectal Cancer: A Systematic Review and Meta-analysis of Randomized Controlled Trials." Ann Surg 267(6): 1034- 1046. [EBL, conversions, bowel function recovery, complications, OR time, mortality, Pos CRM, LNY, LOS]

13. Somashekhar, S. P., K. R. Ashwin, J. Rajashekhar and S. Zaveri (2015). "Prospective Randomized Study Comparing Robotic-Assisted Surgery with Traditional Laparotomy for Rectal Cancer-Indian Study." Indian J Surg 77(Suppl 3): 788-794. [Complications, Pos CRM, LNY, EBL, OR time, LOS, mortality, DRM]

14. Sujatha-Bhaskar, S., M. D. Jafari, J. V. Gahagan, C. S. Inaba, C. Y. Koh, S. D. Mills, J. C. Carmichael, M. J. Stamos and A. Pigazzi (2017). "Defining the Role of Minimally Invasive Proctectomy for Locally Advanced Rectal Adenocarcinoma." Ann Surg 266(4): 574-581. [conversions, mortality, Pos CRM, LNY, LNY]

15. Sun, Y., H. Xu, Z. Li, J. Han, W. Song, J. Wang and Z. Xu (2016). "Robotic versus laparoscopic low anterior resection for rectal cancer: a meta-analysis." World J Surg Oncol 14(1): 61. [conversions, bowel function recovery, complications, OR time, Pos CRM, LNY, LOS]

16. Sun, Z., J. Kim, M. A. Adam, D. P. Nussbaum, P. J. Speicher, C. R. Mantyh and J. Migaly (2016). "Minimally Invasive Versus Open Low Anterior Resection: Equivalent Survival in a National Analysis of 14,033 Patients With Rectal Cancer." Ann Surg 263(6): 1152-1158. [conversions, mortality, Pos CRM, LNY, LOS]

17. Trastulli, S., E. Farinella, R. Cirocchi, D. Cavaliere, N. Avenia, F. Sciannameo, N. Gullà, G. Noya and C. Boselli (2012). "Robotic resection compared with laparoscopic rectal resection for cancer: Systematic review and meta-analysis of short-term outcome." Colorectal Dis 14(4): e134-e156. [conversions, bowel function recovery, complications, DRM, OR time, mortality, Pos CRM, LNY, LOS]

18. Wang, G., Z. Wang, Z. Jiang, J. Liu, J. Zhao and J. Li (2017). "Male urinary and sexual function after robotic pelvic autonomic nerve-preserving surgery for rectal cancer." Int J Med Robot 13(1). [Urinary and sexual dysfunction at 12 mo, bowel function recovery, complications, OR Time, mortality, LNY, patients with ED]

19. Xiong, B., L. Ma, W. Huang, Q. Zhao, Y. Cheng and J. Liu (2015). "Robotic versus laparoscopic total mesorectal excision for rectal cancer: a meta-analysis of eight studies." J Gastrointest Surg 19(3): 516-526. [EBL, conversions, bowel function recovery, complications, DRM, OR time, mortality, Pos CRM, LNY, LOS, patients with ED]

20. Yang, Y., F. Wang, P. Zhang, C. Shi, Y. Zou, H. Qin and Y. Ma (2012). "Robot - assisted versus conventional laparoscopic surgery for colorectal disease, focusing on rectal cancer: a meta-analysis." Ann Surg Oncol 19(12): 3727-3736. [EBL, conversions, bowel function recovery, complications, DRM, OR time, Pos CRM, LNY, LOS]

Gyn – Cervical Cancer (to March 5, 2019)

1. Asciutto, K. C., G. Kalapotharakos, M. Lofgren, T. Hogberg and C. Borgfeldt (2015). "Robot-assisted surgery in cervical cancer patients reduces the time to normal activities of daily living." Acta Obstet Gynecol Scand 94(3): 260-265.

2. Esselen, K. M., A. Vitonis, J. Einarsson, M. G. Muto and S. Cohen (2015). "Health Care Disparities in Hysterectomy for Gynecologic Cancers: Data From the 2012 National Inpatient Sample." Obstet Gynecol 126(5): 1029-1039.

3. Hao, X., S. Han and Y. Wang (2015). "Comparison of conventional laparoscopy and robotic radical hysterectomy for early-stage cervical cancer: A meta- analysis." J Cancer Res Ther 11 Suppl(2015): C258-C264.

4. Iavazzo, C. and I. D. Gkegkes (2017). "Cost-benefit analysis of robotic surgery in gynaecological oncology." Best Pract Res Clin Obstet Gynaecol 45: 7-18.

5. Jin, Y. M., S. S. Liu, J. Chen, Y. N. Chen and C. C. Ren (2018). "Robotic radical hysterectomy is superior to laparoscopic radical hysterectomy and open radical hysterectomy in the treatment of cervical cancer." PLoS One 13(3): e0193033.

6. Liu, Z., X. Li, S. Tian, T. Zhu, Y. Yao and Y. Tao (2017). "Superiority of robotic surgery for cervical cancer in comparison with traditional approaches: A systematic review and meta-analysis." Int J Surg 40: 145-154.

7. Luo, C., M. Liu and X. Li (2018). "Efficacy and safety outcomes of robotic radical hysterectomy in Chinese older women with cervical cancer compared with laparoscopic radical hysterectomy." BMC Women's Health 18(1): 61.

8. Melamed, A., D. J. Margul, L. Chen, N. L. Keating, M. G. Del Carmen, J. Yang, B. L. L. Seagle, A. Alexander, E. L. Barber, L. W. Rice, J. D. Wright, M. Kocherginsky, S. Shahabi and J. A. Rauh-Hain (2018). "Survival after minimally invasive radical hysterectomy for early-stage cervical cancer." New England Journal of Medicine 379(20): 1905-1914.

9. O'Neill, M., P. S. Moran, C. Teljeur, O. E. O'Sullivan, B. A. O'Reilly, M. Hewitt, M. Flattery and M. Ryan (2013). "Robot-assisted hysterectomy compared to open and laparoscopic approaches: systematic review and meta-analysis." Archives of Gynecology and Obstetrics 287(5): 907-918.

10. Park, D. A., J. E. Yun, S. W. Kim and S. H. Lee (2017). "Surgical and clinical safety and effectiveness of robot-assisted laparoscopic hysterectomy compared to conventional laparoscopy and laparotomy for cervical cancer: A systematic review and meta-analysis." Eur J Surg Oncol 43(6): 994-1002.

11. Piedimonte, S., N. Czuzoj-Shulman, W. Gotlieb and H. A. Abenhaim (2019). "Robotic Radical Hysterectomy for Cervical Cancer: A Population-Based Study of Adoption and Immediate Postoperative Outcomes in the United States." J Minim Invasive Gynecol 26(3): 551-557.

12. Ramirez, P. T., M. Frumovitz, R. Pareja, A. Lopez, M. Vieira, R. Ribeiro, A. Buda, X. Yan, Y. Shuzhong, N. Chetty, D. Isla, M. Tamura, T. Zhu, K. P. Robledo, V. Gebski, R. Asher, V. Behan, J. L. Nicklin, R. L. Coleman and A. Obermair (2018). "Minimally Invasive versus Abdominal Radical Hysterectomy for Cervical Cancer." The New England journal of medicine 379(20): 1895-1904.

13. Reza, M., S. Maeso, J. A. Blasco and E. Andradas (2010). "Meta-analysis of observational studies on the safety and effectiveness of robotic gynaecological surgery." Br J Surg 97(12): 1772-1783.

14. Shazly, S. A., M. H. Murad, S. C. Dowdy, B. S. Gostout and A. O. Famuyide (2015). "Robotic radical hysterectomy in early stage cervical cancer: A systematic review and meta-analysis." Gynecol Oncol 138(2): 457-471.

15. Wright, J. D., T. J. Herzog, A. I. Neugut, W. M. Burke, Y. S. Lu, S. N. Lewin and D. L. Hershman (2012). "Comparative effectiveness of minimally invasive and abdominal radical hysterectomy for cervical cancer." Gynecol Oncol 127(1): 11- 17.

16. Yu, J., Y. Wang, Y. Li, X. Li, C. Li and J. Shen (2014). "The safety and effectiveness of Da Vinci surgical system compared with open surgery and laparoscopic surgery: A rapid assessment." Journal of Evidence-Based Medicine 7(2): 121-134.

17. Zhang, S. S., T. Ding, Z. H. Cui, Y. Lv and R. A. Jiang (2019). "Efficacy of robotic radical hysterectomy for cervical cancer compared with that of open and laparoscopic surgery: A separate meta-analysis of high-quality studies." Medicine 98(4): e14171.

18. Zhou, J., B. H. Xiong, L. Ma, Y. Cheng, W. Huang and L. Zhao (2016). "Robotic vs laparoscopic radical hysterectomy for cervical cancer: a meta-analysis." Int J Med Robot 12(1): 145-154.

Gyn – Endometrial Cancer (to March 5, 2019)

1. Beck, T. L., M. A. Schiff, B. A. Goff and R. R. Urban (2018). "Robotic, Laparoscopic, or Open Hysterectomy: Surgical Outcomes by Approach in Endometrial Cancer." J Minim Invasive Gynecol 25(6): 986-993.

2. Borgfeldt, C., G. Kalapotharakos, K. C. Asciutto, M. Lofgren and T. Hogberg (2016). "A population-based registry study evaluating surgery in newly diagnosed uterine cancer." Acta Obstet Gynecol Scand 95(8): 901-911.

3. Bregar, A. J., A. Melamed, E. Diver, J. T. Clemmer, S. Uppal, J. O. Schorge, L. W. Rice, M. G. Del Carmen and J. A. Rauh-Hain (2017). "Minimally Invasive Staging Surgery in Women with Early-Stage Endometrial Cancer: Analysis of the National Cancer Data Base." Ann Surg Oncol 24(6): 1677-1687.

4. Chan, J. K., A. B. Gardner, K. Taylor, C. A. Thompson, K. Blansit, X. Yu and D. S. Kapp (2015). "Robotic versus laparoscopic versus open surgery in morbidly obese endometrial cancer patients - a comparative analysis of total charges and complication rates." Gynecol Oncol 139(2): 300-305.

5. Chen, S. H., Z. A. Li, R. Huang and H. Q. Xue (2016). "Robot-assisted versus conventional laparoscopic surgery for endometrial cancer staging: A meta- analysis." Taiwan J Obstet Gynecol 55(4): 488-494.

6. Dubeshter, B., C. Angel, E. Toy, S. Thomas and J. C. Glantz (2013). "Current role of robotic hysterectomy." Journal of Gynecologic Surgery 29(4): 174-178.

7. Esselen, K. M., A. Vitonis, J. Einarsson, M. G. Muto and S. Cohen (2015). "Health Care Disparities in Hysterectomy for Gynecologic Cancers: Data From the 2012 National Inpatient Sample." Obstet Gynecol 126(5): 1029-1039.

8. Guy, M. S., J. Sheeder, K. Behbakht, J. D. Wright and S. R. Guntupalli (2016). "Comparative outcomes in older and younger women undergoing laparotomy or robotic surgical staging for endometrial cancer." Am J Obstet Gynecol 214(3): 350 e351-350 e310.

9. Iavazzo, C. and I. D. Gkegkes (2017). "Cost-benefit analysis of robotic surgery in gynaecological oncology." Best Pract Res Clin Obstet Gynaecol 45: 7-18.

10. Ind, T., A. Laios, M. Hacking and M. Nobbenhuis (2017). "A comparison of operative outcomes between standard and robotic laparoscopic surgery for endometrial cancer: A systematic review and meta-analysis." Int J Med Robot 13(4).

11. Jorgensen, S. L., O. Mogensen, C. Wu, K. Lund, M. Iachina, M. Korsholm and P. T. Jensen (2019). "Nationwide Introduction of Minimally Invasive Robotic Surgery for Early-Stage Endometrial Cancer and Its Association With Severe Complications." JAMA Surg. In Press.

12. Jørgensen, S. L., O. Mogensen, C. S. Wu, M. Korsholm, K. Lund and P. T. Jensen (2019). "Survival after a nationwide introduction of robotic surgery in women with early-stage endometrial cancer: a population-based prospective cohort study." European Journal of Cancer 109: 1-11.

13. Maenpaa, M. M., K. Nieminen, E. I. Tomas, M. Laurila, T. H. Luukkaala and J. U. Maenpaa (2016). "Robotic-assisted vs traditional laparoscopic surgery for endometrial cancer: a randomized controlled trial." Am J Obstet Gynecol 215(5): 588 e581-588 e587.

14. O'Neill, M., P. S. Moran, C. Teljeur, O. E. O'Sullivan, B. A. O'Reilly, M. Hewitt, M. Flattery and M. Ryan (2013). "Robot-assisted hysterectomy compared to open and laparoscopic approaches: systematic review and meta-analysis." Archives of Gynecology and Obstetrics 287(5): 907-918.

15. Park, D. A., D. H. Lee, S. W. Kim and S. H. Lee (2016). "Comparative safety and effectiveness of robot-assisted laparoscopic hysterectomy versus conventional laparoscopy and laparotomy for endometrial cancer: A systematic review and meta-analysis." Eur J Surg Oncol 42(9): 1303-1314.

16. Ran, L., J. Jin, Y. Xu, Y. Bu and F. Song (2014). "Comparison of robotic surgery with laparoscopy and laparotomy for treatment of endometrial cancer: a meta- analysis." PLoS One 9(9): e108361.

17. Reza, M., S. Maeso, J. A. Blasco and E. Andradas (2010). "Meta-analysis of observational studies on the safety and effectiveness of robotic gynaecological surgery." Br J Surg 97(12): 1772-1783.

18. Safdieh, J., Y. C. Lee, A. Wong, A. Lee, J. P. Weiner, D. Schwartz and D. Schreiber (2017). "A Comparison of Outcomes Between Open Hysterectomy and Robotic-Assisted Hysterectomy for Endometrial Cancer Using the National Cancer Database." Int J Gynecol Cancer 27(7): 1508-1516.

19. Salehi, S., E. Avall-Lundqvist, Y. Brandberg, H. Johansson, C. Suzuki and H. Falconer (2019). "Lymphedema, serious adverse events, and imaging 1 year after comprehensive staging for endometrial cancer: results from the RASHEC trial." Int J Gynecol Cancer 29(1): 86-93.

20. Salehi, S., E. Åvall-Lundqvist, B. Legerstam, J. W. Carlson and H. Falconer (2017). "Robot-assisted laparoscopy versus laparotomy for infrarenal paraaortic lymphadenectomy in women with high-risk endometrial cancer: A randomised controlled trial." European Journal of Cancer 79: 81-89.

21. Salehi, S., Y. Brandberg, E. Åvall-Lundqvist, C. Suzuki, H. Johansson, B. Legerstam and H. Falconer (2018). "Long-term quality of life after comprehensive surgical staging of high-risk endometrial cancer–results from the RASHEC trial." Acta Oncologica 57(12): 1671-1676.

22. Silva, E. S. A., J. P. M. de Carvalho, C. Anton, R. P. Fernandes, E. C. Baracat and J. P. Carvalho (2018). "Introduction of robotic surgery for endometrial cancer into a Brazilian cancer service: a randomized trial evaluating perioperative clinical outcomes and costs." Clinics (Sao Paulo) 73(suppl 1): e522s.

23. Somashekhar, S. P., R. C. Jaka and S. S. Zaveri (2014). "Prospective Randomized Study Comparing Robotic-Assisted Hysterectomy and Regional Lymphadenectomy with Traditional Laparotomy for Staging of Endometrial Carcinoma -Initial Indian Experience." Indian J Surg Oncol 5(3): 217-223.

24. Wright, J. D., W. M. Burke, A. I. Tergas, J. Y. Hou, Y. Huang, J. C. Hu, G. C. Hillyer, C. V. Ananth, A. I. Neugut and D. L. Hershman (2016). "Comparative Effectiveness of Minimally Invasive Hysterectomy for Endometrial Cancer." J Clin Oncol 34(10): 1087-1096.

25. Wright, J. D., W. M. Burke, E. T. Wilde, S. N. Lewin, A. S. Charles, J. H. Kim, N. Goldman, A. I. Neugut, T. J. Herzog and D. L. Hershman (2012). "Comparative effectiveness of robotic versus laparoscopic hysterectomy for endometrial cancer." J Clin Oncol 30(8): 783-791.

26. Wright, J. D., L. J. Havrilesky, D. E. Cohn, Y. Huang, J. Rathbun, L. W. Rice, C. L. Brown, R. D. Alvarez and E. M. Ko (2018). "Estimating potential for savings for low risk endometrial cancer using the Endometrial Cancer Alternative Payment Model (ECAP): A companion paper to the Society of Gynecologic Oncology Report on the Endometrial Cancer Alternative Payment Model." Gynecologic Oncology 149(2): 241-247.

27. Xie, W., D. Cao, J. Yang, K. Shen and L. Zhao (2016). "Robot-assisted surgery versus conventional laparoscopic surgery for endometrial cancer: a systematic review and meta-analysis." J Cancer Res Clin Oncol 142(10): 2173-2183.

28. Yu, X., D. Lum, T. K. Kiet, K. C. Fuh, J. Orr, Jr., R. A. Brooks, S. M. Ueda, L. M. Chen, D. S. Kapp and J. K. Chan (2013). "Utilization of and charges for robotic versus laparoscopic versus open surgery for endometrial cancer." J Surg Oncol 107(6): 653-658.

29. Zakhari, A., N. Czuzoj-Shulman, A. R. Spence, W. H. Gotlieb and H. A. Abenhaim (2015). "Laparoscopic and robot-assisted hysterectomy for uterine cancer: a comparison of costs and complications." Am J Obstet Gynecol 213(5): 665 e661- 667.

30. Zakhari, A., N. Czuzoj-Shulman, A. R. Spence, W. H. Gotlieb and H. A. Abenhaim (2016). "Hysterectomy for Uterine Cancer in the Elderly: A Comparison Between Laparoscopic and Robot-Assisted Techniques." Int J Gynecol Cancer 26(7):1222-1227.

Lobectomy (to Dec 3, 2018)

1. Adams, R. D., W. D. Bolton, J. E. Stephenson, G. Henry, E. T. Robbins and E. Sommers (2014). "Initial multicenter community robotic lobectomy experience: comparisons to a national database." Ann Thorac Surg **97**(6): 1893-1898; discussion 1899-1900.

2. Agzarian, J., C. Fahim, Y. Shargall, K. Yasufuku, T. K. Waddell and W. C. Hanna (2016). "The Use of Robotic-Assisted Thoracic Surgery for Lung Resection: A Comprehensive Systematic Review." Semin Thorac Cardiovasc Surg **28**(1): 182-192.

3. Emmert, A., C. Straube, J. Buentzel and C. Roever (2017). "Robotic versus thoracoscopic lung resection: A systematic review and meta-analysis." Medicine (Baltimore) **96**(35): e7633.

4. Kent, M., T. Wang, R. Whyte, T. Curran, R. Flores and S. Gangadharan (2014). "Open, video-assisted thoracic surgery, and robotic lobectomy: review of a national database." Ann Thorac Surg **97**(1): 236-244.

5. Kneuertz, P. J., D. M. D'Souza, S. D. Moffatt-Bruce and R. E. Merritt (2018). "Robotic lobectomy has the greatest benefit in patients with marginal pulmonary function." J Cardiothorac Surg **13**(1): 56.

6. Liang, H., W. Liang, L. Zhao, D. Chen, J. Zhang, Y. Zhang, S. Tang and J. He (2018). "Robotic Versus Video-assisted Lobectomy/Segmentectomy for Lung Cancer: A Meta-analysis." Ann Surg **268**(2): 254-259.

7. Louie, B. E., J. L. Wilson, S. Kim, R. J. Cerfolio, B. J. Park, A. S. Farivar, E. Vallieres, R. W. Aye, W. R. Burfeind, Jr. and M. I. Block (2016). "Comparison of Video-Assisted Thoracoscopic Surgery and Robotic Approaches for Clinical Stage I and Stage II Non-Small Cell Lung Cancer Using The Society of Thoracic Surgeons Database." Ann Thorac Surg **102**(3): 917-924.

8. Oh, D. S., R. M. Reddy, M. L. Gorrepati, S. Mehendale and M. F. Reed (2017). "Robotic-Assisted, Video-Assisted Thoracoscopic and Open Lobectomy: Propensity-Matched Analysis of Recent Premier Data." Ann Thorac Surg **104**(5): 1733-1740.

9. Paul, S., J. Jalbert, A. J. Isaacs, N. K. Altorki, O. W. Isom and A. Sedrakyan (2014). "Comparative effectiveness of robotic-assisted vs thoracoscopic lobectomy." Chest **146**(6): 1505-1512.

10. Rajaram, R., S. Mohanty, D. J. Bentrem, E. S. Pavey, D. D. Odell, A. Bharat, K. Y. Bilimoria and M. M. DeCamp (2017). "Nationwide Assessment of Robotic Lobectomy for Non-Small Cell Lung Cancer." Ann Thorac Surg **103**(4): 1092- 1100.

11. Reddy, R. M., M. L. Gorrepati, D. S. Oh, S. Mehendale and M. F. Reed (2018). "Robotic-Assisted Versus Thoracoscopic Lobectomy Outcomes from High Volume Thoracic Surgeons." Ann Thorac Surg.

12. Swanson, S. J., D. L. Miller, R. J. McKenna, Jr., J. Howington, M. B. Marshall, A. C. Yoo, M. Moore, C. L. Gunnarsson and B. F. Meyers (2014). "Comparing robot- assisted thoracic surgical lobectomy with conventional video-assisted thoracic surgical lobectomy and wedge resection: results from a multihospital database (Premier)." J Thorac Cardiovasc Surg **147**(3): 929-937.

13. Wei, S., M. Chen, N. Chen and L. Liu (2017). "Feasibility and safety of robot - assisted thoracic surgery for lung lobectomy in patients with non-small cell lung cancer: A systematic review and meta-analysis." World J Surg Oncol **15**(1): 98.

14. Yang, C. F., Z. Sun, P. J. Speicher, S. M. Saud, B. C. Gulack, M. G. Hartwig, D.H. Harpole, Jr., M. W. Onaitis, B. C. Tong, T. A. D'Amico and M. F. Berry (2016). "Use and outcomes of minimally invasive lobectomy for stage i non-small cell lung cancer in the national cancer data base." Ann Thorac Surg **101**(3): 1037-1042.

15. Yu, Z., Q. Xie, L. Guo, X. Chen, C. Ni, W. Luo, W. Li and L. Ma (2017). "Perioperative outcomes of robotic surgery for the treatment of lung cancer compared to a conventional video-assisted thoracoscopic surgery (VATS) technique." Oncotarget **8**(53): 91076-91084.

16. Zhang, L. and S. Gao (2015). "Robot-assisted thoracic surgery versus open thoracic surgery for lung cancer: A system review and meta-analysis." Int J Clin Exp Med **8**(10): 17804-17810.

Radical Prostatectomy (to Sept 2017)

1. Anderson, J. E., D. C. Chang, J. K. Parsons and M. A. Talamini (2012). "The first national examination of outcomes and trends in robotic surgery in the United States." J Am Coll Surg 215(1): 107-114; discussion 114-106.

2. Asimakopoulos, A. D. P. F., C. T.; Annino, F.; Pasqualetti, P.; Calado, A. A.; Mugnier, C. (2011). "Randomized Comparison between Laparoscopic and Robot- Assisted Nerve-Sparing Radical Prostatectomy." Journal of Sexual Medicine 8(5): 1503-1512.

3. Basto, M., N. Sathianathen, L. Te Marvelde, S. Ryan, J. Goad, N. Lawrentschuk, J. Costello, D. A. Moon, A. G. Heriot, J. Butler and D. G. Murphy (2016). "Patterns-of-care and health economic analysis of robot-assisted radical prostatectomy in the Australian public health system." BJU Int 117(6): 930-939.

4. Davis, J. W., U. S. Kreaden, J. Gabbert and R. Thomas (2014). "Learning curve assessment of robot-assisted radical prostatectomy compared with open-surgery controls from the premier perspective database." J Endourol 28(5): 560-566.

5. De Carlo, F., F. Celestino, C. Verri, F. Masedu, E. Liberati and S. M. Di Stasi (2014). "Retropubic, laparoscopic, and robot-assisted radical prostatectomy: surgical, oncological, and functional outcomes: a systematic review." Urol Int 93(4): 373-383.

6. Ellimoottil, C., F. Roghmann, R. Blackwell, A. Kadlec, K. Greco, M. L. Quek, M. Sun, Q. D. Trinh and G. Gupta (2015). "Open versus robotic radical prostatectomy in obese men." Curr Urol 8(3): 156-161.

7. Fridriksson, J. O., Y. Folkvaljon, K. J. Lundström, D. Robinson, S. Carlsson and P. Stattin (2017). "Long-term adverse effects after retropubic and robot-assisted radical prostatectomy. Nationwide, population-based study." Journal of Surgical Oncology.

8. Gandaglia, G., J. D. Sammon, S. L. Chang, T. K. Choueiri, J. C. Hu, P. I. Karakiewicz, A. S. Kibel, S. P. Kim, R. Konijeti, F. Montorsi, P. L. Nguyen, S. Sukumar, M. Menon, M. Sun and Q. D. Trinh (2014). "Comparative effectiveness of robot-assisted and open radical prostatectomy in the postdissemination era." J Clin Oncol 32(14): 1419-1426.

9. Herlemann, A., J. E. Cowan, P. R. Carroll and M. R. Cooperberg (2018). "Community-based Outcomes of Open versus Robot-assisted Radical Prostatectomy." Eur Urol 73(2): 215-223.

10. Huang, X., L. Wang, X. Zheng and X. Wang (2017). "Comparison of perioperative, functional, and oncologic outcomes between standard laparoscopic and robotic-assisted radical prostatectomy: a systemic review and meta-analysis." Surg Endosc 31(3): 1045-1060.

11. Hyams, E. S., J. K. Mullins, P. M. Pierorazio, A. W. Partin, M. E. Allaf and B. R. Matlaga (2013). "Impact of robotic technique and surgical volume on the cost of radical prostatectomy." Journal of Endourology 27(3): 298-303.

12. Ilic, D., S. M. Evans, C. A. Allan, J. H. Jung, D. Murphy and M. Frydenberg (2017). "Laparoscopic and robotic-assisted versus open radical prostatectomy for the treatment of localised prostate cancer." Cochrane Database Syst Rev 9: Cd009625.

13. Kim, S. P., N. D. Shah, R. J. Karnes, C. J. Weight, N. D. Shippee, L. C. Han, S. A. Boorjian, M. C. Smaldone, I. Frank, M. T. Gettman, M. K. Tollefson and R. H. Thompson (2013). "Hospitalization costs for radical prostatectomy attributable to robotic surgery." Eur Urol 64(1): 11-16.

14. Laird, A., S. Fowler, D. W. Good, G. D. Stewart, V. Srinivasan, D. Cahill, S. F. Brewster, S. A. McNeill and S. British Association of Urological (2015). "Contemporary practice and technique-related outcomes for radical prostatectomy in the UK: a report of national outcomes." BJU Int 115(5): 753-763

15. Lee, S. H., H. J. Seo, N. R. Lee, S. K. Son, D. K. Kim and K. H. Rha (2017). "Robot-assisted radical prostatectomy has lower biochemical recurrence than laparoscopic radical prostatectomy: Systematic review and meta-analysis." Investigative and Clinical Urology 58(3): 152-163.

16. Lundstrom, K. J., Y. Folkvaljon, S. Loeb, A. B. Axelson, P. Stattin and P. Nordin (2016). "Small bowel obstruction and abdominal pain after robotic versus open radical prostatectomy." Scandinavian Journal of Urology 50(3): 155-159.

17. Monn, M. F., K. R. Jaqua, A. C. Calaway, M. J. Mellon, M. O. Koch and R. S. Boris (2016). "Impact of Obesity on Wound Complications Following Radical Prostatectomy Is Mitigated by Robotic Technique." J Endourol 30(8): 890-895.

18. Moran, P. S., M. O'Neill, C. Teljeur, M. Flattery, L. A. Murphy, G. Smith and M. Ryan (2013). "Robot-assisted radical prostatectomy compared with open and laparoscopic approaches: A systematic review and meta-analysis." Int J Urol 20(3): 312-321.

19. Novara, G., V. Ficarra, R. C. Rosen, W. Artibani, A. Costello, J. A. Eastham, M. Graefen, G. Guazzoni, S. F. Shariat, J. U. Stolzenburg, H. Van Poppel, F. Zattoni, F. Montorsi, A. Mottrie and T. G. Wilson (2012). "Systematic review and meta- analysis of perioperative outcomes and complications after robot-assisted radical prostatectomy." Eur Urol 62(3): 431-452.

20. Pan, X. W., X. M. Cui, J. F. Teng, D. X. Zhang, Z. J. Wang, F. J. Qu, Y. Gao, X. G. Cui and D. F. Xu (2015). "Robot-Assisted Radical Prostatectomy vs. Open Retropubic Radical Prostatectomy for Prostate Cancer: A Systematic Review and Meta-analysis." Indian Journal of Surgery 77(Suppl 3): 1326-1333.

21. Pearce, S. M., J. J. Pariser, T. Karrison, S. G. Patel and S. E. Eggener (2016). "Comparison of Perioperative and Early Oncologic Outcomes between Open and Robotic Assisted Laparoscopic Prostatectomy in a Contemporary Population Based Cohort." J Urol 196(1): 76-81.

22. Pilecki, M. A., B. B. McGuire, U. Jain, J. Y. Kim and R. B. Nadler (2014). "National multi-institutional comparison of 30-day postoperative complication and readmission rates between open retropubic radical prostatectomy and robot- assisted laparoscopic prostatectomy using NSQIP." J Endourol 28(4): 430-436.

23. Porpiglia, F., C. Fiori, R. Bertolo, M. Manfredi, F. Mele, E. Checcucci, S. De Luca,R. Passera and R. M. Scarpa (2016). "Five-year Outcomes for a Prospective Randomised Controlled Trial Comparing Laparoscopic and Robot-assisted Radical Prostatectomy." Eur Urol Focus.

24. Porpiglia, F., I. Morra, M. Lucci Chiarissi, M. Manfredi, F. Mele, S. Grande, F. Ragni, M. Poggio and C. Fiori (2013). "Randomised controlled trial comparing laparoscopic and robot-assisted radical prostatectomy." Eur Urol 63(4): 606-614.

25. Retel, V. P., C. Bouchardy, M. Usel, I. Neyroud-Caspar, F. Schmidlin, G. Wirth, C. Iselin, R. Miralbell and E. Rapiti (2014). "Determinants and effects of positive surgical margins after prostatectomy on prostate cancer mortality: A population- based study." BMC Urology 14(1): 86.

26. Robertson, C., A. Close, C. Fraser, T. Gurung, X. Jia, P. Sharma, L. Vale, C. Ramsay and R. Pickard (2013). "Relative effectiveness of robot-assisted and standard laparoscopic prostatectomy as alternatives to open radical prostatectomy for treatment of localised prostate cancer: a systematic review and mixed treatment comparison meta-analysis." BJU International 112(6): 798-812.

27. Seo, H. J., N. R. Lee, S. K. Son, D. K. Kim, K. H. Rha and S. H. Lee (2016). "Comparison of Robot-Assisted Radical Prostatectomy and Open Radical Prostatectomy Outcomes: A Systematic Review and Meta-Analysis." Yonsei Med J 57(5): 1165-1177.

28. Simon, R. M., L. E. Howard, D. M. Moreira, M. K. Terris, C. J. Kane, W. J. Aronson, C. L. Amling, M. R. Cooperberg and S. J. Freedland (2017). "Predictors of operative time during radical retropubic prostatectomy and robot-assisted laparoscopic prostatectomy." Int J Urol 24(8): 618-623.

29. Srougi, V., J. Bessa, Jr., M. Baghdadi, I. Nunes-Silva, J. B. da Costa, S. Garcia- Barreras, E. Barret, F. Rozet, M. Galiano, R. Sanchez-Salas and X. Cathelineau (2017). "Surgical method influences specimen margins and biochemical recurrence during radical prostatectomy for high-risk prostate cancer: a systematic review and meta-analysis." World J Urol 35(10): 1481-1488.

30. Steffens, D., R. Thanigasalam, S. Leslie, B. Maneck, J. M. Young and M. Solomon (2017). "Robotic Surgery in Uro-Oncology: a Systematic Review and Meta-Analysis of Randomised Controlled Trials." Urology.

31. Stolzenburg, J. U., I. Kyriazis, C. Fahlenbrach, C. Gilfrich, C. Gunster, E. Jeschke, G. Popken, L. Weissbach, C. von Zastrow and H. Leicht (2016). "National trends and differences in morbidity among surgical approaches for radical prostatectomy in Germany." World J Urol 34(11): 1515-1520.

32. Sugihara, T., H. Yasunaga, H. Horiguchi, H. Matsui, T. Fujimura, H. Nishimatsu, Fukuhara, H. Kume, Y. Changhong, M. W. Kattan, K. Fushimi and Y. Homma (2014). "Robot-assisted versus other types of radical prostatectomy: population- based safety and cost comparison in Japan, 2012-2013." Cancer Sci 105(11): 1421-1426.

33. Sujenthiran, A., S. C. Charman, M. Parry, J. Nossiter, A. Aggarwal, P. Dasgupta, Payne, N. W. Clarke, P. Cathcart and J. van der Meulen (2017). "Quantifying severe urinary complications after radical prostatectomy: the development and validation of a surgical performance indicator using hospital administrative data." BJU Int.

34. Tang, K., K. Jiang, H. Chen, Z. Chen, H. Xu and Z. Ye (2017). "Robotic vs. Retropubic radical prostatectomy in prostate cancer: A systematic review and an meta-analysis update." Oncotarget 8(19): 32237-32257.

35. Tewari, A., P. Sooriakumaran, D. A. Bloch, U. Seshadri-Kreaden, A. E. Hebert and P. Wiklund (2012). "Positive Surgical Margin and Perioperative Complication Rates of Primary Surgical Treatments for Prostate Cancer: A Systematic Review and Meta-Analysis Comparing Retropubic, Laparoscopic, and Robotic Prostatectomy." Eur Urol 62(1): 1-15.

36. Trinh, Q. D., J. Sammon, M. Sun, P. Ravi, K. R. Ghani, M. Bianchi, W. Jeong, S. Shariat, J. Hansen, J. Schmitges, C. Jeldres, C. G. Rogers, J. O. Peabody, F. Montorsi, M. Menon and P. I. Karakiewicz (2012). "Perioperative outcomes of robot-assisted radical prostatectomy compared with open radical prostatectomy: results from the nationwide inpatient sample." Eur Urol 61(4): 679-685.

37. Weiner, A. B., P. Murthy, K. A. Richards, S. G. Patel and S. E. Eggener (2015). "Population based analysis of incidence and predictors of open conversion during minimally invasive radical prostatectomy." J Urol 193(3): 826-831.

38. Wen, T., C. M. Deibert, F. S. Siringo and B. A. Spencer (2014). "Positioning- related complications of minimally invasive radical prostatectomies." Journal of Endourology 28(6): 660-667.

39. Yaxley, J. W., G. D. Coughlin, S. K. Chambers, S. Occhipinti, H. Samaratunga, L. Zajdlewicz, N. Dunglison, R. Carter, S. Williams, D. J. Payton, J. Perry-Keene, M. Lavin and R. A. Gardiner (2016). "Robot-assisted laparoscopic prostatectomy versus open radical retropubic prostatectomy: early outcomes from a randomised controlled phase 3 study." Lancet 388(10049): 1057-1066.

40. Yu, H. Y., N. D. Hevelone, S. R. Lipsitz, K. J. Kowalczyk and J. C. Hu (2012). "Use, Costs and Comparative Effectiveness of Robotic Assisted, Laparoscopic and Open Urological Surgery." J Urol 187(4): 1392-1398.

Partial Nephrectomy (to Oct 17, 2018)

1. Aboumarzouk, O. M., R. J. Stein, R. Eyraud, G. P. Haber, P. L. Chlosta, B. K. Somani and J. H. Kaouk (2012). "Robotic versus laparoscopic partial nephrectomy: a systematic review and meta-analysis." Eur Urol 62(6): 1023- 1033.

2. Ayangbesan, A., D. M. Golombos, R. Golan, P. O'Malley, P. Lewicki, X. Wu and D. S. Scherr (2019). "Surgical Approach Does Not Impact Margin Status After Partial Nephrectomy for Large Renal Masses." J Endourol 33(1): 50-60.

3. Bahler, C. D., M. F. Monn, C. K. Flack, A. R. Gramm, T. A. Gardner and C. P. Sundaram (2018). "Assessing Cost of Robotic Utilization in Partial Nephrectomy with Increasing Utilization." J Endourol 32(8): 710-716.

4. Cacciamani, G. E., L. G. Medina, T. Gill, A. Abreu, R. Sotelo, W. Artibani and I. S. Gill (2018). "Impact of Surgical Factors on Robotic Partial Nephrectomy Outcomes: Comprehensive Systematic Review and Meta-Analysis." J Urol 200(2): 258-274.

5. Camp, C., J. O'Hara, D. Hughes and J. Adshead (2018). "Short-term Outcomes and Costs Following Partial Nephrectomy in England: A Population-based Study." Eur Urol Focus 4(4): 579-585.

6. Choi, J. E., J. H. You, D. K. Kim, K. H. Rha and S. H. Lee (2015). "Comparison of perioperative outcomes between robotic and laparoscopic partial nephrectomy: a systematic review and meta-analysis." Eur Urol 67(5): 891-901.

7. Froghi, S., K. Ahmed, M. S. Khan, P. Dasgupta and B. Challacombe (2013). "Evaluation of robotic and laparoscopic partial nephrectomy for small renal tumours (T1a)." BJU International 112(4): E322-333.

8. Ghani, K. R., S. Sukumar, J. D. Sammon, C. G. Rogers, Q. D. Trinh and M. Menon (2014). "Practice patterns and outcomes of open and minimally invasive partial nephrectomy since the introduction of robotic partial nephrectomy: results from the nationwide inpatient sample." J Urol 191(4): 907-912.

9. Hadjipavlou, M., F. Khan, S. Fowler, A. Joyce, F. X. Keeley and S. Sriprasad (2016). "Partial vs radical nephrectomy for T1 renal tumours: an analysis from the British Association of Urological Surgeons Nephrectomy Audit." BJU Int 117(1): 62-71.

10. Kates, M., M. W. Ball, H. D. Patel, M. A. Gorin, P. M. Pierorazio and M. E. Allaf (2015). "The financial impact of robotic technology for partial and radical nephrectomy." J Endourol 29(3): 317-322.

11. Leow, J. J., N. H. Heah, S. L. Chang, Y. L. Chong and K. S. Png (2016). "Outcomes of Robotic versus Laparoscopic Partial Nephrectomy: an Updated Meta-Analysis of 4,919 Patients." J Urol 196(5): 1371-1377.

12. Mari, A., A. Antonelli, R. Bertolo, G. Bianchi, M. Borghesi, V. Ficarra, C. Fiori, M. Furlan, S. Giancane, N. Longo, V. Mirone, G. Morgia, F. Porpiglia, B. Rovereto, R. Schiavina, S. Serni, C. Simeone, A. Volpe, M. Carini and A. Minervini (2017). "Predictive factors of overall and major postoperative complications after partial nephrectomy: Results from a multicenter prospective study (The RECORd 1 project)." Eur J Surg Oncol 43(4): 823-830.

13. Pak, J. S., J. J. Lee, K. Bilal, M. Finkelstein and M. A. Palese (2017). "Utilization trends and outcomes up to 3 months of open, laparoscopic, and robotic partial nephrectomy." J Robot Surg 11(2): 223-229.

14. Shen, Z., L. Xie, W. Xie, H. Hu, T. Chen, C. Xing, X. Liu, H. Xu, Y. Zhang, Z. Wu, D. Tian and C. Wu (2016). "The comparison of perioperative outcomes of robot - assisted and open partial nephrectomy: a systematic review and meta-analysis." World J Surg Oncol 14(1): 220.

15. Tsai, S. H., P. T. Tseng, B. A. Sherer, Y. C. Lai, P. Y. Lin, C. K. Wu and M. L. Stoller (2019). "Open versus robotic partial nephrectomy: Systematic review and meta-analysis of contemporary studies." Int J Med Robot 15(1): e1963.

16. Wu, Z., M. Li, B. Liu, C. Cai, H. Ye, C. Lv, Q. Yang, J. Sheng, S. Song, L. Qu, L. Xiao, Y. Sun and L. Wang (2014). "Robotic versus Open Partial Nephrectomy: A Systematic Review and Meta-Analysis." PLoS One 9(4): e94878.

17. Xia, L., X. Wang, T. Xu and T. J. Guzzo (2017). "Systematic Review and Meta- Analysis of Comparative Studies Reporting Perioperative Outcomes of Robot- Assisted Partial Nephrectomy Versus Open Partial Nephrectomy." J Endourol 31(9): 893-909.

18. Zhang, X., Z. Shen, S. Zhong, Z. Zhu, X. Wang and T. Xu (2013). "Comparison of peri-operative outcomes of robot-assisted vs laparoscopic partial nephrectomy: a meta-analysis." BJU Int 112(8): 1133-1142.

19. Zhang, X., J. Yan, Y. Ren, C. Shen, X. Ying and S. Pan (2014). "Robot-assisted versus laparoscopic partial nephrectomy for localized renal tumors: a meta- analysis." Int J Clin Exp Med 7(12): 4770-4779.