**da Vinci® Surgery**

**High Level of Evidence (LOE) Publications**

At Intuitive Surgical, our highest priority is and always has been to provide patient benefit – creating products that in a surgeon’s hands are safe, effective and minimally invasive.

Intuitive Surgical is pleased to highlight the attached compendium of clinical literature. With over 7,000 peer reviewed, published studies and reports examining the use of the *da Vinci* System in a wide variety of surgeries, the breadth and depth of literature regarding *da Vinci* Surgery is extensive. The following compendium is based upon the following criteria

- Search Pubmed and Scopus database for all da Vinci robotic surgery publication
- High Level of Evidence (LOE) papers (see definitions below)
- Publications comparing *da Vinci* Surgery to open surgery
- This list of publications will be updated and released on a semi-annual basis.

**High LOE articles (level 1, 1b and 2 a)**

The following definitions are used to generate the above list of High LOE publications.

**Level 1: Randomized Studies**

1a) Systematic reviews* of Randomized Controlled Studies

1b) Randomized Controlled Trials (RCT)

**Level 2: Higher Quality Comparison Studies**

2a) Systematic reviews* of comparison studies only or independent database population studies

*includes meta-analysis studies

**Definitions**

Systematic Review (SR): A systematic review is a summary of the scientific literature that uses explicit methods to perform a comprehensive literature search and critical appraisal of individual studies and that uses appropriate statistical techniques to combine these valid studies.

Randomized Controlled Trial (RCT): An epidemiological experiment in which subjects in a population are randomly allocated into groups, usually called study and control groups, to receive or not receive an experimental preventive or therapeutic procedure, maneuver, or intervention. The results are assessed by rigorous comparison of rates of disease, death, recovery, or other appropriate outcome in the study and control groups. Generally, a very small sample sized (N < 25) or heterogeneous patient populations will result in a lower quality study.
Bibliography for high level LOE robotic publications
2008 - 3Q 2013 (includes da Vinci vs. open surgery)*

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*may include data from laparoscopic cohort (if all three surgical approaches exist in articles or MIS is not separated into laparoscopic or robotic surgery)

Cardiac (1)
Level 2a (1)

The mitral valve has been traditionally approached through a median sternotomy. However, significant advances in surgical optics, instrumentation, tissue telemanipulation, and perfusion technology have allowed for mitral valve surgery to be performed using progressively smaller incisions including the minithoracotomy and hemisternotomy. Due to reports of excellent results, minimally invasive mitral valve surgery has become a standard of care at certain specialized centers worldwide. This meta-analysis quantifies the effects of minimally invasive mitral valve surgery on morbidity and mortality compared with conventional mitral surgery and demonstrates equivalent perioperative mortality (1641 patients, odds ratio (OR) 0.46, 95% confidence interval 0.15-1.42, p = 0.18), reduced need for reoperation for bleeding (1553 patients, OR 0.56, 95% CI 0.35-0.90, p = 0.02) and a trend towards shorter hospital stays (350 patients, weighted mean difference (WMD) -0.73, 95% CI -1.52 to 0.05, p = 0.07). These benefits were evident despite longer cardiopulmonary bypass (WMD 25.81, 95% CI 13.13-38.50, p < 0.0001) and cross-clamp times (WMD 20.91, 95% CI 8.79-33.04, p = 0.0007) in the minimally invasive group. Case-control studies show consistently less pain and faster recovery compared to those having a conventional approach. Data for minimally invasive mitral valve surgery after previous cardiac surgery are limited but consistently demonstrate reduced blood loss, fewer transfusions and faster recovery compared to reoperative sternotomy. Long-term follow-up data from multiple cohort studies are also examined revealing equivalent survival and freedom from reoperation.
Thus, current clinical data suggest that minimally invasive mitral valve surgery is a safe and a durable alternative to a conventional approach and is associated with less morbidity. © 2008.

General Surgery (2)

Level 2a (2)


OBJECTIVE: The aim of this systematic review is to determine the potential advantages of robotic distal pancreatectomy (RDP). STUDY SELECTION: Both randomized and non-randomized studies. DATA EXTRACTION: Two investigators independently selected studies for inclusion by article abstraction and full text reviewing. DATA SYNTHESIS: Five non-RCTs were included in the review. The feasibility of RDP (95.4%) and spleen-preserving rate is between 50% and 100%. Mean OT varied between 298 min and 398 min with only completely robotic procedures, whereas mean OT was 293 in "laparoscopic/robotic" technique. Postoperative length of hospital stay ranged from 7 days to 13.7 days. The 30-day postoperative overall morbidity resulted between 0 and 18% of patients. CONCLUSIONS: RDP is an emergent technology for which there are not yet sufficient data to draw definitive conclusions with respect to conventional or laparoscopic surgery. The mean duration of RDP is longer with Da Vinci robot, but hospital stay is shorter even if it is influenced by hospital protocols. We cannot make any conclusions comparing the outcomes to laparoscopic or open procedures here, since none of these studies are randomized, and we all know that most of these surgeons selected the easier cases for robotic procedures. For these reasons randomized controlled trials are recommended to better evaluate RDP cost-effectiveness.


Since its introduction in 1997, robotic surgery has overcome many limitations, including setup costs and surgeon training. The use of robotics in general surgery remains unknown. This study evaluates robotic-assisted procedures in general surgery by comparing characteristics with its nonrobotic (laparoscopic and open) counterparts. Weighted Healthcare Cost and Utilization Project Nationwide Inpatient Sample data (2008, 2009) were used to identify the top 12 procedures for robotic general surgery. Robotic cases were identified by Current Procedural Termination codes 17.41 and 17.42. Procedures were grouped: esophagogastric, colorectal, adrenalectomy, lysis of adhesion, and cholecystectomy. Analyses were descriptive, t tests, chi(2)s, and logistic regression. Charges and length of stay were adjusted for gender, age, race, payer, hospital bed size, hospital location, hospital region, median household income, Charlson score, and procedure type. There were 1,389,235 (97.4%) nonrobotic and 37,270 (2.6%) robotic cases. Robotic cases increased from 0.8 per cent (2008) to 4.3 per cent (2009, P < 0.001). In all subgroups, robotic surgery had significantly shorter lengths of stay (4.9 days) than open surgery (6.1 days) and lower charges (median $30,540) than
laparoscopic ($34,537) and open ($46,704) surgery. Fewer complications were seen in robotic-assisted colorectal, adrenalectomy and lysis of adhesion; however, robotic cholecystectomy and esophagogastroic procedures had higher complications than nonrobotic surgery (P < 0.05). Overall robotic surgery had a lower mortality rate (0.097%) than nonrobotic surgeries per 10,000 procedures (laparoscopic 0.48%, open 0.92%; P < 0.001). The cost of robotic surgery is generally considered a prohibitive factor. In the present study, when overall cost was considered, including length of stay, robotic surgery appeared to be cost-effective and as safe as nonrobotic surgery except in cholecystectomy and esophagogastroic procedures. Further study is needed to fully understand the long-term implications of this new technology.

Gynecology (6)

Level 2a (6)

OBJECTIVE:: To summarize comparative studies describing clinical outcomes of robotic-assisted surgeries compared with traditional laparoscopic or laparotomy techniques for the treatment of endometrial cancer. DATA SOURCES:: Using search words "robotic hysterectomy" and "endometrial cancer," 22 citations were identified from Medline and PubMed (2005 to February 2010). METHODS OF STUDY SELECTION:: We selected English language studies reporting at least 25 robotic cases compared with laparoscopic or laparotomy cases that also addressed surgical technique, complications, and perioperative outcomes. Patients underwent total hysterectomy, bilateral salpingooophorectomy, and lymphadenectomy. TABULATION, INTEGRATION, AND RESULTS:: Eight eligible comparative studies were identified that included 1,591 patients (robotic=589, laparoscopic=396, and laparotomy=606). Pooled means of the resected aortic lymph nodes for robotic hysterectomy and laparoscopy were 10.3 and 7.8 (P=.15), and robotic hysterectomy and laparotomy were 9.4 and 5.7 (P=.28). Pooled means of pelvic lymph nodes for robotic and laparoscopic hysterectomy were 18.5 and 17.8 (P=.95) and 18.0 compared with 14.5 (P=.11) for robotic hysterectomy compared with laparotomy. Estimated blood loss was reduced in robotic hysterectomy compared with laparotomy (P<.005) and laparoscopy (P=.001). Length of stay was shorter for both robotic and laparoscopic cases compared with laparotomy (P<.01). Operative time for robotic hysterectomy was similar to laparoscopic cases but was greater than laparotomy (P<.005). Conversion to laparotomy for laparoscopic hysterectomy was 9.9% compared with 4.9% for robotic cases (P=.06). Vascular, bowel, and bladder injuries; cuff dehiscence; and thromboembolic complications were similar for each surgical method. Transfusions for robotic hysterectomy compared with laparotomy was 1.7% and 7.2% (P=.06) and robotic hysterectomy compared were laparoscopy was 2.6% and 5.0% (P=.22). CONCLUSION:: Perioperative clinical outcomes for robotic and laparoscopic hysterectomy appear similar with the exception of less blood loss for robotic cases and longer operative times for robotic and laparoscopy cases.

Background: Over the last two decades, numerous studies have indicated the feasibility of minimally invasive surgery for early cervical cancer without compromising the oncological outcome. Objective: Systematic literature review and meta analysis aimed at evaluating the outcome of laparoscopic and robotic radical hysterectomy (LRH and RRH) and comparing the results with abdominal radical hysterectomy (ARH). Search Strategy: Medline, PubMed, Embase, Cochrane library and Reference lists were searched for articles published until January 31st 2011, using the terms radical hysterectomy, laparoscopic radical hysterectomy, robotic radical hysterectomy, surgical treatment of cervical cancer and complications of radical hysterectomy. Selection Criteria: Studies that reported outcome measures of radical hysterectomy by open method, laparoscopic and robotic methods were selected. Data collection and analysis: Two independent reviewers selected studies, abstracted and tabulated the data and pooled estimates were obtained on the surgical and oncological outcomes. Results: Mean sample size, age and body mass index across the three types of RH studies were similar. Mean operation time across the three types of RH studies was comparable. Mean blood loss and transfusion rate are significantly higher in ARH compared to both LRH and RRH. Duration of stay in hospital for RRH was significantly less than the other two methods. The mean number of lymph nodes obtained, nodal metastasis and positive margins across the three types of RH studies were similar. Post operative infectious morbidity was significantly higher among patients who underwent ARH compared to the other two methods and a higher rate of cystotomy in LRH.

Conclusions: Minimally invasive surgery especially robotic radical hysterectomy may be a better and safe option for surgical treatment of cervical cancer. The laparoscopic method is not free from complications. However, experience of surgeon may reduce the complications rate.


Purpose: To review the safety and effectiveness of robot-assisted hysterectomy compared to traditional open and conventional laparoscopic surgery, differentiating radical, simple total with node staging, and simple total hysterectomy. Methods: Medline, Embase, the Cochrane library, and the Journal of Robotic Surgery were searched for controlled trials and observational studies with historic or concurrent controls. Data were pooled using random effects meta-analysis. Results: Compared to open surgery, robot-assisted radical hysterectomy is associated with reduced hospital stay and blood transfusions. For simple total hysterectomy with node staging, robot-assisted surgery is associated with reduced hospital stay, complications, and blood transfusions compared to open surgery. Compared to conventional laparoscopic surgery, robot-assisted simple total hysterectomy with node staging is associated with complications and conversions. Conclusions: Compared to open surgery, robot-assisted hysterectomy offers benefits for reduced length of hospital stay and blood transfusions. The best evidence of improved outcomes is for simple total hysterectomy with node staging. Study quality was poor. © 2013 Springer-Verlag Berlin Heidelberg.
Herein is presented a systematic review and meta-analysis of evidence related to operative outcomes associated with robotic-assisted laparoscopic myomectomy (RLM) compared with abdominal myomectomy (AM) and laparoscopic myomectomy (LM). Outcome measures included estimated blood loss (EBL), blood transfusion, operating time, complications, length of hospital stay (LOHS), and costs. Meta-analysis 1 compared RLM vs AM, and meta-analysis 2 compared RLM vs LM. Studies scored moderately well on the Newcastle-Ottawa Quality Assessment Scale. No significant differences were found in age, body mass index, or number, diameter, and weight of myomas. In meta-analysis 1, EBL, blood transfusion, and LOHS were significantly lower; risk of complications was similar; and operating time and costs were significantly higher with RLM. In meta-analysis 2, no significant differences were noted in EBL, operating time, complications, and LOHS with RLM; however, blood transfusion risk and costs were higher. It was concluded that insofar as operative outcomes, RLM has significant short-term benefits compared with AM and no benefits compared with LM. Long-term benefits such as recurrence, fertility, and obstetric outcomes remain uncertain.


BACKGROUND:: The safety and effectiveness of robotic, open and conventional laparoscopic surgery in gynaecological surgery was assessed in a systematic review of the literature. This will enable the general surgical community to understand where robotic surgery stands in gynaecology. METHODS:: A search was made for previous systematic reviews in the Abstracts of Reviews of Effects, Health Technology Assessment, Cochrane Collaboration and Hayes Inc. databases. In addition, the MEDLINE, Embase and CINAHL databases were searched for primary studies. The quality of studies was assessed and meta-analyses were performed. RESULTS:: Twenty-two studies were included in the review. All were controlled but none was randomized. The majority were retrospective with historical controls. The settings in which robotic surgery was used included hysterectomy for malignant and benign disease, myomectomy, sacrocolpopexy, fallopian tube reanastomosis and adnexectomy. Robotic surgery achieved a shorter hospital stay and less blood loss than open surgery. Compared with conventional laparoscopic surgery, robotic surgery achieved reduced blood loss and fewer conversions during the staging of endometrial cancer. No clinically significant differences were recorded for the other indications tested. CONCLUSION:: The available evidence shows that robotic surgery offers limited advantages with respect to short-term outcomes. However, the clinical outcomes should be interpreted with caution owing to the methodological quality of the studies. Copyright (c) 2010 British Journal of Surgery Society Ltd. Published by John Wiley & Sons, Ltd.


OBJECTIVE: We analyzed the uptake, morbidity, and cost of laparoscopic and robotic radical hysterectomy for cervical cancer. METHODS: We identified women recorded in the Perspective database with cervical cancer who underwent radical hysterectomy
(abdominal, laparoscopic, robotic) from 2006-2010. The associations between patient, surgeon, and hospital characteristic and use of minimally invasive hysterectomy as well as complications and cost were estimated using multivariable logistic regression models.

RESULTS: We identified 1894 patients including 1610 (85.0%) who underwent abdominal, 217 (11.5%) who underwent laparoscopic, and 67 (3.5%) who underwent robotic radical hysterectomy were analyzed. In 2006, 98% of the procedures were abdominal and 2% laparoscopic; by 2010 abdominal radical hysterectomy decreased to 67%, while laparoscopic increased to 23% and robotic radical hysterectomy was performed in 10% of women (p<0.0001). Patients treated at large hospitals were more likely to undergo a minimally invasive procedure (OR=4.80; 95% CI, 1.28-18.01) while those with more medical comorbidities (OR=0.60; 95% CI, 0.41-0.87) were less likely to undergo a minimally invasive surgery. Perioperative complications were noted in 15.8% of patients who underwent abdominal surgery, 9.2% who underwent laparoscopy, and 13.4% who had a robotic procedure (p=0.04). Both laparoscopic and robotic radical hysterectomy were associated with lower transfusion requirements and shorter hospital stays than abdominal hysterectomy (p<0.05). Median costs were $9618 for abdominal, $11,774 for laparoscopic, and $10,176 for robotic radical hysterectomy (p<0.0001).

CONCLUSION: Uptake of minimally invasive radical hysterectomy for cervical cancer has been slow. Both laparoscopic and robotic radical hysterectomy are associated with favorable morbidity profiles.

Head & Neck (3)

Level 2a (3)

Objective Robot-assisted endoscopic surgery has been increasingly accepted because of its unique three-dimensional vision and precise simulation-based technology. However, the utilization of robotic systems in thyroid surgery is limited. We conducted a systematic review to assess the application and development of robot-assisted endoscopic surgical technique in thyroid surgery. Data sources Articles published in PubMed before June, 2011 about robot-assisted endoscopic surgery were selected. Study selection Original articles and critical reviews selected were related to robot-assisted (thyroid) surgery or endoscopic thyroid surgery, and a total of 3540 relevant articles were retrieved and 34 were finally cited. Results Robot-assisted operation of benign thyroid diseases were successfully performed, although the operation time is too long to exhibit its advantages. Nevertheless, the superiority of robot-assisted endoscopic surgical technique compared to conventional endoscopic surgery in the treatment of thyroid carcinoma were obvious, since robotic radical thyroidectomy with central and lateral neck lymph node dissection could be achieved while maintaining operative results and cosmetic outcomes equivalent to or better than conventional endoscopic surgery. Furthermore, the learning curve duration of robot-assisted endoscopic thyroid surgery was shorter than that of conventional endoscopy, especially for the novices without any endoscopic surgical basis. Conclusion Robot-assisted endoscopic thyroid surgery, with its safety, feasibility, thoroughness, cosmetic benefits, and ability to overcome the
limitations of conventional endoscopic surgery, will be further improved and applied, and is worthy of attention.


BACKGROUND: This study compared the efficacy of robotic thyroidectomy via a gasless, axillary approach with conventional cervical and endoscopic techniques by meta-analysis.

METHODS: Articles were identified from the following keyword searches: robotic/robot-assisted thyroidectomy/thyroid surgery. Outcomes included operative time, hospital stay, complications, and cosmetic satisfaction after surgery. Between-group outcome differences were calculated using random-effects models. RESULTS: In all, 87 publications were identified and 9 studies met inclusion criteria, totaling 2881 patients, 1122 of whom underwent robotic thyroidectomy. Those who underwent robotic surgery reported greater cosmetic satisfaction, with a pooled net mean difference of -1.35 (95% confidence interval [CI]: -1.69, -1.09). Robotic approach operative time was longer than that of the conventional approach (95% CI: 29.23, 54.87), with a trend to be shorter than the endoscopic approaches. Robotic surgery had similar risks to open and endoscopic approaches. CONCLUSIONS: Our meta-analysis suggests that robotic thyroidectomy is as safe, feasible, and efficacious as conventional cervical and endoscopic thyroidectomy, showing superior cosmetic satisfaction than that of conventional thyroidectomy. (c) 2012 Wiley Periodicals, Inc. Head Neck, 2012.


ABSTRACT: BACKGROUND: To conduct a meta-analysis to determine the relative merits of robotic thyroidectomy (RT) and endoscopic thyroidectomy (ET). METHODS: A literature search was performed to identify comparative studies reporting peri-operative outcomes for RT and ET. Pooled odds ratios (ORs) and weighted mean differences (WMDs) with 95% confidence interval (95% CI) were calculated using either a fixed-effects or a random-effects model. RESULTS: Six studies matched the selection criteria, which reported on 2048 subjects, of whom 978 underwent RT and 1070 underwent ET. Comparing the outcomes of RT with ET, this meta-analysis indicated that RT was associated with more complications (WMD = 1.51, 95% CI 1.18 to 1.94) and greater amount of drainage fluid (WMD = 17.10, 95% CI 5.69 to 28.51). Meanwhile, operating time (WMD = 1.50, 95% CI -39.59 to 42.58), conversion (WMD = 0.63, 95% CI 0.07 to 6.17), post-operative hospital stay (WMD = -0.05; 95% CI -0.18 to 0.08), and the number of lymph nodes harvested (WMD = 0.62, 95% CI -0.29 to 1.53) were similar for both procedures. CONCLUSION: The results of this meta-analysis indicated that RT is associated with an increased risk of complications and a greater amount of drainage fluid. Therefore, RT does not appear to have any advantage over ET. Further studies are required to confirm these results.

Urology (31)

Level 1b (1)

BACKGROUND: In recent years, surgeons have begun to report case series of minimally invasive approaches to radical cystectomy, including robotic-assisted techniques demonstrating the surgical feasibility of this procedure with the potential of lower blood loss and more rapid return of bowel function and hospital discharge. Despite these experiences and observations, at this point high levels of clinical evidence with regard to the benefits of robotic cystectomy are absent, and the current experiences represent case series with limited comparisons to historical controls at best. OBJECTIVE: We report our results on a prospective randomized trial of open versus robotic-assisted laparoscopic radical cystectomy with regard to perioperative outcomes, complications, and short-term narcotic usage. DESIGN, SETTING, AND PARTICIPANTS: A prospective randomized single-center noninferiority study comparing open versus robotic approaches to cystectomy in patients who are candidates for radical cystectomy for urothelial carcinoma of the bladder. Of the 41 patients who underwent surgery, 21 were randomized to the robotic approach and 20 to the open technique. INTERVENTION: Radical cystectomy, bilateral pelvic lymphadenectomy, and urinary diversion by either an open approach or by a robotic-assisted laparoscopic technique. MEASUREMENTS: The primary end point was lymph node (LN) yield with a noninferiority margin of four LNs. Secondary end points included demographic characteristics, perioperative outcomes, pathologic results, and short-term narcotic use. RESULTS AND LIMITATIONS: On univariate analysis, no significant differences were found between the two groups with regard to age, sex, body mass index, American Society of Anesthesiologists classification, anticoagulation regimen of aspirin, clinical stage, or diversion type. Significant differences were noted in operating room time, estimated blood loss, time to flatus, time to bowel movement, and use of inpatient morphine sulfate equivalents. There was no significant difference in regard to overall complication rate or hospital stay. On surgical pathology, in the robotic group 14 patients had pT2 disease or higher; 3 patients had pT3/T4 disease; and 4 patients had node-positive disease. In the open group, eight patients had pT2 disease or higher; five patients had pT3/T4 disease; and seven patients had node-positive disease. The mean number of LNs removed was 19 in the robotic group versus 18 in the open group. Potential study limitations include the limited clinical and oncologic follow-up and the relatively small and single-institution nature of the study. CONCLUSIONS: We present the results of a prospective randomized controlled noninferiority study with a primary end point of LN yield, demonstrating the robotic approach to be noninferior to the open approach. The robotic approach also compares favorably with the open approach in several perioperative parameters.

Level 2a  (30)


Study Type - Therapy (systematic review) Level of Evidence 1a What's known on the subject? and What does the study add? Research on the subject has shown that robotic surgery is more costly than both laparoscopic and open approaches due to the initial cost of purchase, annual maintenance and disposable instruments. However, both
robotic and laparoscopic approaches have reduced blood loss and hospital stay and robotic procedures have better short term post-operative outcomes such as continence and sexual function. Some studies indicate that the robotic approach may have a shorter learning curve. However, factors such as reduced learning curve, shorter hospital stay and reduced length of surgery are currently unable to compensate for the excess costs of robotic surgery. This review concludes that robotic surgery should be targeted for cost efficiency in order to fully reap the benefits of this advanced technology. The excess cost of robotic surgery may be compensated by improved training of surgeons and therefore a shorter learning curve; and minimising costs of initial purchase and maintenance. The review finds that only a few studies gave an itemised breakdown of costs for each procedure, making accurate comparison of costs difficult. Furthermore, there is a lack of long term follow up of clinical outcomes, making it difficult to accurately assess long term post-operative outcomes. A breakdown of costs and studies of long term outcomes are needed to accurately assess the effectiveness of robotic surgery in urology. OBJECTIVES: * Although robotic technology is becoming increasingly popular for urological procedures, barriers to its widespread dissemination include cost and the lack of long term outcomes. This systematic review analyzed studies comparing the use of robotic with laparoscopic and open urological surgery. * These three procedures were assessed for cost efficiency in the form of direct as well as indirect costs that could arise from length of surgery, hospital stay, complications, learning curve and postoperative outcomes. METHODS: * A systematic review was performed searching Medline, Embase and Web of Science databases. Two reviewers identified abstracts using online databases and independently reviewed full length papers suitable for inclusion in the study. RESULTS: * Laparoscopic and robot assisted radical prostatectomy are superior with respect to reduced hospital stay (range 1-1.76 days and 1-5.5 days, respectively) and blood loss (range 482-780 mL and 227-234 mL, respectively) when compared with the open approach (range 2-8 days and 1015 mL). Robot assisted radical prostatectomy remains more expensive (total cost ranging from US $2000-$39 215) than both laparoscopic (range US $740-$29 771) and open radical prostatectomy (range US $1870-$31 518). * This difference is due to the cost of robot purchase, maintenance and instruments. The reduced length of stay in hospital (range 1-1.5 days) and length of surgery (range 102-360 min) are unable to compensate for the excess costs. * Robotic surgery may require a smaller learning curve (20-40 cases) although the evidence is inconclusive. CONCLUSIONS: * Robotic surgery provides similar postoperative outcomes to laparoscopic surgery but a reduced learning curve. * Although costs are currently high, increased competition from manufacturers and wider dissemination of the technology could drive down costs. * Further trials are needed to evaluate long term outcomes in order to evaluate fully the value of all three procedures in urological surgery.


There are scant national outcomes data for robot-assisted laparoscopic surgery. We assessed costs and length of stay (LOS) related to robot-assisted radical and partial nephrectomy in a nationally representative population database. We performed a cohort analysis of the US Nationwide Inpatient Sample database. Using ICD-9 procedure codes, we identified patients who underwent radical or partial nephrectomy for kidney cancer
from October 2008 to December 2008. We excluded patients with non-robot-assisted laparoscopic procedures and those under age 18 years. We performed multivariate analyses of LOS and total hospital charges, adjusting for age, race, gender, Charlson comorbidity index, and teaching hospital status. Records of 2,242 patients were analyzed. On adjusted multivariate analysis, robot-assisted partial nephrectomy was associated with shorter LOS compared with open surgery (-2.0 days, \( P = 0.032 \)). Robot-assisted radical nephrectomy was associated with shorter LOS compared with open surgery (-1.8 days, \( P = 0.077 \)). There were no significant differences in total charges for robot-assisted compared with open surgery for either radical (\( P = 0.631 \)) or partial (\( P = 0.713 \)) nephrectomy. In this large, population-based analysis, robot-assisted radical and partial nephrectomy were associated with shorter LOS and equivalent hospital charges compared with their open surgery counterparts. These data suggest that, for renal surgery, diminished LOS offsets other hospital costs associated with robot-assisted procedures. © 2011 Springer-Verlag London Ltd.


CONTEXT: Over the last two decades, minimally invasive treatment options for ureteropelvic junction obstruction (UPJO) have been developed and popularized.

OBJECTIVE: To critically analyze the current status of laparoscopic and robotic repair of UPJO.

EVIDENCE ACQUISITION: A systematic literature review was performed in November 2012 using PubMed. Article selection proceeded according to the search strategy based on Preferred Reporting Items for Systematic Reviews and Meta-analyses criteria.

EVIDENCE SYNTHESIS: Multiple series of laparoscopic pyeloplasty have demonstrated high success rates and low perioperative morbidity in pediatric and adult populations, with both the transperitoneal and retroperitoneal approaches. Data on pediatric robot-assisted pyeloplasty are increasingly becoming available. A larger number of cases have also been reported for adult patients, confirming that robotic pyeloplasty represents a viable option for either primary or secondary repair. Robot-assisted redo pyeloplasty has been mostly described in the pediatric population. Different technical variations have been implemented with the aim of tailoring the procedure to each specific case. The type of stenting, retrograde versus antegrade, continues to be debated. Internal-external stenting as well as a stentless approach have been used, especially in the pediatric population. Comparative studies demonstrate similar success and complication rates between minimally invasive and open pyeloplasty in both the adult and pediatric setting. A clear advantage in terms of hospital stay for minimally invasive over open pyeloplasty was observed only in the adult population.

CONCLUSIONS: Laparoscopy represents an efficient and effective less invasive alternative to open pyeloplasty. Robotic pyeloplasty is likely to emerge as the new minimally invasive standard of care whenever robotic technology is available because its precise suturing and shorter learning curve represent unique attractive features. For both laparoscopy and robotics, the technique can be tailored to the specific case according to intraoperative findings and personal surgical experience.

Context: Robot-assisted laparoscopic radical prostatectomy (RALP) has been rapidly adopted as a new approach for radical prostatectomy (RP) in patients with prostate cancer (PCa). The use of new technology may increase costs for RP. Objective: To summarize data on direct costs of various approaches to RP and to discuss the consequences of cost differences. Evidence acquisition: A systematic literature search was performed in March 2012 using the PubMed, Web of Science, and Cochrane Library databases. A complex search strategy was applied. Articles were selected according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses criteria. Articles reporting on direct costs of RP (open retropubic [RRP], radical perineal [RPP], laparoscopic [LRP], RALP) in men with clinically localized PCa were eligible for study inclusion. Evidence synthesis: Of 1218 articles initially screened by title, the multistep, systematic search identified 11 studies presenting direct costs of different approaches to RP. Of the 11 studies, 7 compared the costs of different RP approaches. Minimally invasive RP (MIRP) (ie, LRP or RALP) was more expensive than RRP in most studies, mainly due to increased surgical instrumentation costs. In the comparative studies, costs ranged from (in US dollars) $5058 to $11 806 for MIRP and from $4075 to $6296 for RRP, with RALP having the highest direct costs. In one study applying standardized, health economic-evaluation criteria, RALP was not found to be cost effective. Limitations of this review include significant differences in observational study designs and an absence of prospective comparative studies. Moreover, there are limited post-RP data on the costs of adjuvant treatments and other health care-related expenses after PCa surgery. Conclusions: Few studies compared direct costs of different approaches to RP. The use of new technology, particularly RALP, results in added costs for the procedure. Cost effectiveness of new technologies should be assessed before widespread adoption. To date, in the lone study to evaluate this, RALP was not found to be cost effective from a health care, economic standpoint. However, longer follow-up of patients is required to better evaluate its impact on overall costs and quality of PCa care. © 2012 European Association of Urology.


Context: Despite the wide diffusion of laparoscopic radical prostatectomy (LRP) and robot-assisted laparoscopic radical prostatectomy (RALP), only few studies comparing the results of these techniques with the retropubic radical prostatectomy (RRP) are currently available. Objective: To evaluate the perioperative, functional, and oncologic results in the comparative studies evaluating RRP, LRP, and RALP. Evidence acquisition: A systematic review of the literature was performed in January 2008, searching Medline, Embase, and Web of Science databases. A "free-text" protocol using the term radical prostatectomy was applied. Some 4000 records were retrieved from the Medline database; 2265 records were retrieved from the Embase database; and 4219 records were retrieved from the Web of Science database. Three of the authors reviewed the records to identify comparative studies. A cumulative analysis was conducted using Review Manager software v.4.2 (Cochrane Collaboration, Oxford, UK). Evidence synthesis: Thirty-seven comparative studies were identified in the literature search, including a single, randomised, controlled trial. With regard to the perioperative outcome, LRP and RALP were more time consuming than RRP, especially in the initial steps of the
learning curve, but blood loss, transfusion rates, catheterisation time, hospitalisation duration, and complication rates all favoured LRP. With regard to the functional results, LRP and RRP showed similar continence and potency rates. Similarly, no significant differences were identified between LRP and RALP, while a single, nonrandomised, prospective study suggested advantages in terms of both continence and potency recovery after RALP, compared with RRP. With regard to the oncologic outcome, LRP and RALP were associated with positive surgical margin rates similar to those of RRP.

Conclusions: The quality of the available comparative studies was not excellent. LRP and RALP are followed by significantly lower blood loss and transfusion rates, but the available data were not sufficient to prove the superiority of any surgical approach in terms of functional and oncologic outcomes. Further high-quality, prospective, multicentre, comparative studies are needed. © 2009 European Association of Urology.


Background: Although the initial robot-assisted radical prostatectomy (RARP) series showed 12-mo potency rates ranging from 70% to 80%, the few available comparative studies did not permit any definitive conclusion about the superiority of this technique when compared with retropubic radical prostatectomy (RRP) and laparoscopic radical prostatectomy (LRP). Objectives: The aims of this systematic review were (1) to evaluate the current prevalence and the potential risk factors of erectile dysfunction after RARP, (2) to identify surgical techniques able to improve the rate of potency recovery after RARP, and (3) to perform a cumulative analysis of all available studies comparing RARP versus RRP or LRP. Evidence acquisition: A literature search was performed in August 2011 using the Medline, Embase, and Web of Science databases. Only comparative studies or clinical series including >100 cases reporting potency recovery outcomes were included in this review. Cumulative analysis was conducted using Review Manager v.4.2 software designed for composing Cochrane Reviews (Cochrane Collaboration, Oxford, UK). Evidence synthesis: We analyzed 15 case series, 6 studies comparing different techniques in the context of RARP, 6 studies comparing RARP with RRP, and 4 studies comparing RARP with LRP. The 12- and 24-mo potency rates ranged from 54% to 90% and from 63% to 94%, respectively. Age, baseline potency status, comorbidities index, and extension of the nerve-sparing procedure represent the most relevant preoperative and intraoperative predictors of potency recovery after RARP. Available data seem to support the use of cautery-free dissection or the use of pinpointed low-energy cauterization. Cumulative analyses showed better 12-mo potency rates after RARP in comparison with RRP (odds ratio [OR]: 2.84; 95% confidence interval [CI]: 1.46-5.43; p = 0.002). Only a nonstatistically significant trend in favor of RARP was reported after comparison with LRP (OR: 1.89; p = 0.21).

Conclusions: The incidence of potency recovery after RARP is influenced by numerous factors. Data coming from the present systematic review support the use of a cautery-free technique. This update of previous systematic reviews of the literature showed, for the first time, a significant advantage in favor of RARP in comparison with RRP in terms of 12-mo potency rates. © 2012.

Context: Robot-assisted radical prostatectomy (RARP) was proposed to improve functional outcomes in comparison with retropubic radical prostatectomy (RRP) or laparoscopic radical prostatectomy (LRP). In the initial RARP series, 12-mo urinary continence recovery rates ranged from 84% to 97%. However, the few available studies comparing RARP with RRP or LRP published before 2008 did not permit any definitive conclusions about the superiority of any one of these techniques in terms of urinary continence recovery. Objective: The aims of this systematic review were (1) to evaluate the prevalence and risk factors for urinary incontinence after RARP, (2) to identify surgical techniques able to improve urinary continence recovery after RARP, and (3) to perform a cumulative analysis of all available studies comparing RARP versus RRP or LRP in terms of the urinary continence recovery rate. Evidence acquisition: A literature search was performed in August 2011 using the Medline, Embase, and Web of Science databases. The Medline search included only a free-text protocol using the term radical prostatectomy across the title and abstract fields of the records. The following limits were used: humans; gender (male); and publication date from January 1, 2008. Searches of the Embase and Web of Science databases used the same free-text protocol, keywords, and search period. Only comparative studies or clinical series including >100 cases reporting urinary continence outcomes were included in this review. Cumulative analysis was conducted using the Review Manager v.4.2 software designed for composing Cochrane Reviews (Cochrane Collaboration, Oxford, UK). Evidence synthesis: We analyzed 51 articles reporting urinary continence rates after RARP: 17 case series, 17 studies comparing different techniques in the context of RARP, 9 studies comparing RARP with RRP, and 8 studies comparing RARP with LRP. The 12-mo urinary incontinence rates ranged from 4% to 31%, with a mean value of 16% using a no pad definition. Considering a no pad or safety pad definition, the incidence ranged from 8% to 11%, with a mean value of 9%. Age, body mass index, comorbidity index, lower urinary tract symptoms, and prostate volume were the most relevant preoperative predictors of urinary incontinence after RARP. Only a few comparative studies evaluated the impact of different surgical techniques on urinary continence recovery after RARP. Posterior musculofascial reconstruction with or without anterior reconstruction was associated with a small advantage in urinary continence recovery 1 mo after RARP. Only complete reconstruction was associated with a significant advantage in urinary continence 3 mo after RARP (odds ratio [OR]: 0.76; p = 0.04). Cumulative analyses showed a better 12-mo urinary continence recovery after RARP in comparison with RRP (OR: 1.53; p = 0.03) or LRP (OR: 2.39; p = 0.006). Conclusions: The prevalence of urinary incontinence after RARP is influenced by preoperative patient characteristics, surgeon experience, surgical technique, and methods used to collect and report data. Posterior musculofascial reconstruction seems to offer a slight advantage in terms of 1-mo urinary continence recovery. Update of a previous systematic review of literature shows, for the first time, a statistically significant advantage in favor of RARP in comparison with both RRP and LRP in terms of 12-mo urinary continence recovery. © 2012.

Laparoscopic and especially robot-assisted minimally invasive prostatectomy (MIP) has increased in popularity over the past decade. We analyzed how the increasing prevalence of MIP has affected the outcomes of MIP and open radical prostatectomy (RRP). In the Nationwide Inpatient Sample, 23,473 patients undergoing MIP and 118,266 undergoing RRP between 2002-2008 are reported. We analyzed length-of-stay (LOS), hospital charges (THC), complication rates (CR) and socio-economic characteristics. We utilized the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) to identify complication rates (RRP n=666, and MIP n=2205). The proportion of MIP increased from 1.4% in 2002 to 29.5% in 2008. Mean LOS decreased for MIP (2.4d in 2002, 1.6d in 2008) and RRP (3.1d in 2002, 2.1d in 2008). Mean THC for MIP decreased ($46k in 2002, $34k in 2008) and increased for RRP ($18k in 2002, $32k in 2008). After 2005, overall CR of MIP was lower than for RRP. High-volume centers reported lower CR for both procedures. MIP was associated with fewer transfusions and wound complications. Men living in ZIP codes with the top quartile of yearly mean household income were more likely to undergo MIP than RRP (p<0.001). Although there were more white patients receiving MIP and black or Hispanic patients more frequently underwent RRP there was no statistically significant difference. Increasing use of MIP led to decreased hospital stay for all patients, increase charges for RRP and decreased complication rates for both MIP and RRP. In recent years, MIP was associated with fewer complications. Charges for RRP have increased over time to approach those for MIP and patients with increased socio-economic status were more likely to receive MIP.


Purpose: We described population level trends in radical prostatectomy for patients with prostate cancer by hospitals with robotic surgery, and assessed whether socioeconomic disparities exist in access to such hospitals. Materials and Methods: After merging the NIS (Nationwide Inpatient Sample) and the AHA (American Hospital Association) survey from 2006 to 2008, we identified 29,837 patients with prostate cancer who underwent radical prostatectomy. The primary outcome was treatment with radical prostatectomy at hospitals that have adopted robotic surgery. The primary outcome was treatment with radical prostatectomy at hospitals that have adopted robotic surgery. The primary outcome was treatment with radical prostatectomy at hospitals that have adopted robotic surgery. The primary outcome was treatment with radical prostatectomy at hospitals that have adopted robotic surgery. The primary outcome was treatment with radical prostatectomy at hospitals that have adopted robotic surgery. The primary outcome was treatment with radical prostatectomy at hospitals that have adopted robotic surgery. Results: Overall 20,424 (68.5%) patients were surgically treated with radical prostatectomy at hospitals with robotic surgery, while 9,413 (31.5%) underwent radical prostatectomy at hospitals without robotic surgery. There was a marked increase in radical prostatectomy at hospital adopters from 55.8% in 2006 and 70.7% in 2007 to 76.1% in 2008 (p <0.001 for trend). After adjusting for patient and hospital features, lower odds of undergoing radical prostatectomy at hospitals with robotic surgery were seen in black patients (OR 0.81, p <0.001) and Hispanic patients (OR 0.77, p <0.001) vs white patients. Compared to having private health insurance, being primarily insured with Medicaid (OR 0.70, p
<0.001) was also associated with lower odds of being treated at hospitals with robotic surgery. Conclusions: Although there was a rapid shift of patients who underwent radical prostatectomy to hospitals with robotic surgery from 2006 to 2008, black and Hispanic patients or those primarily insured by Medicaid were less likely to undergo radical prostatectomy at such hospitals. © 2013 American Urological Association Education and Research, Inc.


Background: With health technology innovation responsible for higher health care costs, it is essential to have accurate estimates regarding the differential costs between robot-assisted radical prostatectomy (RARP) and open radical prostatectomy (ORP). Objective: To describe the total hospitalization costs attributable to robotic and open surgery for radical prostatectomy (RP). Design, setting, and participants: Using a population-based cohort by merging the Nationwide Inpatient Sample (NIS) and the American Hospital Association (AHA) survey from 2006 to 2008, we identified 29,837 prostate cancer patients who underwent RP. Interventions: ORP and RARP. Outcome measurements and statistical analysis: The primary outcome was total hospitalization costs adjusted to year 2008 US dollars. Generalized estimating equations were used to identify patient and hospital characteristics associated with total hospitalization costs and to estimate costs of ORP and RARP adjusted for case mix and hospital teaching status, location, and annual case volume. Results and limitations: Overall, 20,424 (68.5%) patients were surgically treated with RARP, and 9,413 (31.5%) patients underwent ORP. Compared to ORP, patients undergoing RARP had shorter median length of stay (1 d vs 2 d; p < 0.001) and were less likely to experience any postoperative complications (8.2% vs 11.3%; p < 0.001). However, patients undergoing RARP had higher median hospitalization costs ($10,409 vs $8,862; p < 0.001). After adjusting for patient and hospital features, RARP was associated with higher total hospitalization costs compared to ORP ($11,932 vs $9,390; p < 0.001). Our results are limited by a study design using retrospective population-based data. Conclusions: Despite RARP having lower complications and shorter length of stay than ORP, total hospitalization costs are higher for patients treated with RARP compared with those treated with ORP. © 2012 European Association of Urology.


Background: Robot-assisted radical cystectomy (RARC) is increasingly being used in the management of bladder cancer. Studies comparing RARC and open radical cystectomy (ORC) have reported conflicting results. We conducted a systematic review and meta-analysis of the literature on the efficacy and advantages of RARC compared with ORC. Methods: An electronic database search of PubMed, Scopus, and the Cochrane Library was performed up to July 8, 2012. This systematic review and meta-analysis was performed based on all randomized controlled trials (RCTs) and observational comparative studies assessing the two techniques. Results: One RCT, eight studies with prospectively collected data, and four retrospective studies were identified, including 962
cases. Although RARC was associated with longer operative time (p<0.001), patients in this group might benefit from less overall perioperative complications (p=0.04), more lymph node yield (p=0.009), less estimated blood loss (p<0.001), a lower need for perioperative transfusion (p<0.001), and shorter length of hospital stay (p<0.001). Positive surgical margins did not differ significantly between techniques. Sensitivity analysis with prospective studies showed similar results to the original analysis, but no significant difference of lymph node yield and length of stay between two techniques. Conclusions: RARC is a mini-invasive alternative to ORC with less overall perioperative complications, more lymph node yields, less estimated blood loss, less need for a perioperative transfusion, and shorter length of stay.


Context: For the treatment of localised renal cell carcinoma (RCC), uncertainties remain over the perioperative and quality-of-life (QoL) outcomes for the many different surgical techniques and approaches of nephrectomy. Controversy also remains on whether newer minimally invasive nephron-sparing interventions offer better QoL and perioperative outcomes, and whether adrenalectomy and lymphadenectomy should be performed simultaneously with nephrectomy. These non-oncological outcomes are important because they may have a considerable impact on localised RCC treatment decision making. Objective: To review systematically all the relevant published literature comparing perioperative and QoL outcomes of surgical management of localised RCC (T1-2N0M0). Evidence acquisition: Relevant databases including Medline, Embase, and the Cochrane Library were searched up to January 2012. Randomised controlled trials (RCTs) or quasi-randomised controlled trials, prospective observational studies with controls, retrospective matched-pair studies, and comparative studies from well-defined registries/databases were included. The outcome measures were QoL, analgesic requirement, length of hospital stay, time to normal activity level, surgical morbidity and complications, ischaemia time, renal function, blood loss, length of operation, need for blood transfusion, and perioperative mortality. The Cochrane risk of bias tool was used to assess RCTs, and an extended version was used to assess nonrandomised studies (NRSs). The quality of evidence was assessed using Grading of Recommendations, Assessment, Development, and Evaluation. Evidence synthesis: A total of 4580 abstracts and 380 full-text articles were assessed, and 29 studies met the inclusion criteria (7 RCTs and 22 NRSs). There were high risks of bias and low-quality evidence for studies meeting the inclusion criteria. There is good evidence indicating that partial nephrectomy results in better preservation of renal function and better QoL outcomes than radical nephrectomy regardless of technique or approach. Regarding radical nephrectomy, the laparoscopic approach has better perioperative outcomes than the open approach, and there is no evidence of a difference between the transperitoneal and retroperitoneal approaches. Alternatives to standard laparoscopic radical nephrectomy (LRN) such as hand-assisted, robot-assisted, or single-port techniques appear to have similar perioperative outcomes. There is no good evidence to suggest that minimally invasive procedures such as cryotherapy or radiofrequency ablation have superior perioperative or QoL outcomes to nephrectomy. Regarding concomitant
lymphadenectomy during nephrectomy, there were low event rates for complications, and no definitive difference was observed. There was no evidence to base statements about concomitant ipsilateral adrenalectomy during nephrectomy. Conclusions: Partial nephrectomy results in significantly better preservation of renal function over radical nephrectomy. For tumours where partial nephrectomy is not technically feasible, there is no evidence that alternative procedures or techniques are better than LRN in terms of perioperative or QoL outcomes. In making treatment decisions, perioperative and QoL outcomes should be considered in conjunction with oncological outcomes. Overall, there was a paucity of data regarding QoL outcomes, and when reported, both QoL and perioperative outcomes were inconsistently defined, measured, or reported. The current evidence base has major limitations due to studies of low methodological quality marked by high risks of bias. © 2012 European Association of Urology.


Abstract Purpose: To compare direct costs associated with open partial nephrectomy (OPN), laparoscopic partial nephrectomy (LPN), and robot-assisted LPN (RALPN).

Methods: A meta-analysis of nonoverlapping studies was performed to determine operating room (OR) time, equipment use, and length of stay (LOS) for OPN, LPN, and RALPN. Cost models using cost data obtained from our institution were created, and robotic cost and maintenance were amortized over 7 years. One- and two-way sensitivity analyses were performed to evaluate the effect of changing variables on the cost effectiveness of each approach. Results: Seven RALPN, 18 LPN, and 8 OPN data series were identified, comprising a total of 477, 2220, and 2745 procedures, respectively. Weighted mean OR time was 188, 200, 193 minutes; weighted mean LOS was 2.6, 3.2, and 5.9 days for RALPN, LPN, and OPN, respectively. LPN was the most cost-effective approach at a mean direct cost of $10,311, with a cost advantage of $1116 and $1652 over OPN ($11,427) and RALPN ($11,962), respectively. Sensitivity analyses demonstrate that significant decreases in robotic costs are required for RALPN to be cost effective. Conclusion: Despite similar OR times, LPN is more cost effective than OPN because of shorter LOS. Because of lower instrumentation costs, LPN is the most cost effective despite a longer LOS than RALPN. RALPN has high cost of maintenance and instrumentation, which is partially compensated by the shorter LOS. Evidence of oncological and functional equivalence to OPN is warranted to determine the future role of RALPN.


PURPOSE: We evaluated trends and associated characteristics in the use of robotics for pyeloplasty as treatment for ureteropelvic junction obstruction. MATERIALS AND METHODS: Data from the Nationwide Inpatient Sample were used to evaluate pyeloplasty trends from 2005 to 2010. Patients treated with pyeloplasty and procedure method (robotic, laparoscopic or open) were identified by ICD-9-CM codes. Coding for robotics was initiated in the fourth quarter of 2008. Multivariable analysis was performed to examine characteristics affecting the odds of undergoing robotic pyeloplasty vs other approaches to pyeloplasty. RESULTS: We identified 3,947 pyeloplasties performed between 2005 and 2010, including 1,642 since the fourth quarter of 2008. There was a statistically significant increase in the number of robotic pyeloplasties (p <0.001). Mean...
total charges for robotic vs nonrobotic procedures were $40,200 vs $37,817 (p = 0.106). Characteristics related to undergoing a robotic procedure included surgery at a teaching hospital (OR 1.29, 95% CI 1.04-1.59, p = 0.021) and in the Northeast (OR 1.54, 95% CI 1.17-2.04, p = 0.002) or Midwest (OR 1.62, 95% CI 1.23-2.12, p <0.001) compared with the South. When the primary payer was Medicaid vs private insurance, patients were 46% less likely to undergo the procedure robotically (p <0.001). There was no significant difference in charges between robotic and open pyeloplasty. CONCLUSIONS: The number of robotic pyeloplasties performed quarterly in the United States is increasing, although there are disparities in the adoption of the robotic approach among geographic regions and hospital types.


Context: Radical retropubic prostatectomy (RRP) has long been the most common surgical technique used to treat clinically localized prostate cancer (PCa). More recently, robot-assisted radical prostatectomy (RARP) has been gaining increasing acceptance among patients and urologists, and it has become the dominant technique in the United States despite a paucity of prospective studies or randomized trials supporting its superiority over RRP. Objective: A 2-d consensus conference of 17 world leaders in prostate cancer and radical prostatectomy was organized in Pasadena, California, and at the City of Hope Cancer Center, Duarte, California, under the auspices of the European Association of Urology Robotic Urology Section to systematically review the currently available data on RARP, to critically assess current surgical techniques, and to generate best practice recommendations to guide clinicians and related medical personnel. No commercial support was obtained for the conference. Evidence acquisition: A systematic review of the literature was performed in agreement with the Preferred Reporting Items for Systematic Reviews and Meta-analysis statement. Evidence synthesis: The results of the systematic literature review were reviewed, discussed, and refined over the 2-d conference. Key recommendations were generated using a Delphi consensus approach. RARP is associated with less blood loss and transfusion rates compared with RRP, and there appear to be minimal differences between the two approaches in terms of overall postoperative complications. Positive surgical margin rates are at least equivalent with RARP, but firm conclusions about biochemical recurrence and other oncologic end points are difficult to draw because the follow-up in existing studies is relatively short and the overall experience with RARP in locally advanced PCa is still limited. RARP may offer advantages in postoperative recovery of urinary continence and erectile function, although there are methodological limitations in most studies to date and a need for well-controlled comparative outcomes studies of radical prostatectomy surgery following best practice guidelines. Surgeon experience and institutional volume of procedures strongly predict better outcomes in all relevant domains. Conclusions: Available evidence suggests that RARP is a valuable therapeutic option for clinically localized PCa. Further research is needed to clarify the actual role of RARP in patients with locally advanced disease. © 2012.

Medline and Embase were searched for studies comparing robot-assisted radical prostatectomy with open prostatectomy and conventional laparoscopic prostatectomy. Random effects meta-analysis was used to calculate a pooled estimate of effect. The 95% prediction intervals are also reported. One randomized study and 50 observational studies were identified. The results show that compared with open surgery, robot-assisted surgery is associated with fewer positive surgical margins for pT2 tumors (relative risk 0.63, 95% confidence interval 0.49-0.81, P < 0.001) and improved outcomes for sexual function at 12 months (relative risk 1.60, 95% confidence interval 1.33-1.93, P = <0.001), and, to a lesser extent, urinary function at 12 months (relative risk 1.06, 95% confidence interval 1.02-1.11, P < 0.01). Compared with conventional laparoscopic prostatectomy, robot-assisted surgery is associated with a slight increase in urinary function at 12 months (relative risk 1.09, 95% confidence interval 1.02 to 1.17, P = 0.013). The overall methodological quality of the included studies was low, with high levels of heterogeneity. The use of prediction intervals as an aid to decision making in regard to the introduction of this technology is examined. Clinically significant improvements in positive surgical margins rates for pT2 tumors and sexual function at 12 months associated with robot-assisted surgery in comparison with open surgery should be interpreted with caution given the limitations of the evidence. Differences between robot-assisted and conventional laparoscopic surgery are minimal.


Context: Perioperative complications are a major surgical outcome for radical prostatectomy (RP). Objective: Evaluate complication rates following robot-assisted RP (RARP), risk factors for complications after RARP, and surgical techniques to improve complication rates after RARP. We also performed a cumulative analysis of all studies comparing RARP with retropubic RP (RRP) or laparoscopic RP (LRP) in terms of perioperative complications. Evidence acquisition: A systematic review of the literature was performed in August 2011, searching Medline, Embase, and Web of Science databases. A free-text protocol using the term radical prostatectomy was applied. The following limits were used: humans; gender (male); and publications dating from January 1, 2008. A cumulative analysis was conducted using Review Manager software v.4.2 (Cochrane Collaboration, Oxford, UK). Evidence synthesis: We retrieved 110 papers evaluating oncologic outcomes following RARP. Overall mean operative time is 152 min; mean blood loss is 166 ml; mean transfusion rate is 2%; mean catheterization time is 6.3 d; and mean in-hospital stay is 1.9 d. The mean complication rate was 9%, with most of the complications being of low grade. Lymphocele/lymphorrea (3.1%), urine leak (1.8%), and reoperation (1.6%) are the most prevalent surgical complications. Blood loss (weighted mean difference: 582.77; p < 0.00001) and transfusion rate (odds ratio [OR]: 7.55; p < 0.00001) were lower in RARP than in RRP, whereas only transfusion rate (OR: 2.56; p = 0.005) was lower in RARP than in LRP. All the other analyzed parameters were similar, regardless of the surgical approach. Conclusions: RARP can be performed routinely with a relatively small risk of complications. Surgical
experience, clinical patient characteristics, and cancer characteristics may affect the risk of complications. Cumulative analyses demonstrated that blood loss and transfusion rates were significantly lower with RARP than with RRP, and transfusion rates were lower with RARP than with LRP, although all other features were similar regardless of the surgical approach. © 2012.


Context: Despite the large diffusion of robot-assisted radical prostatectomy (RARP), literature and data on the oncologic outcome of RARP are limited. Objective: Evaluate lymph node yield, positive surgical margins (PSMs), use of adjuvant therapy, and biochemical recurrence (BCR)-free survival following RARP and perform a cumulative analysis of all studies comparing the oncologic outcomes of RARP and retropubic radical prostatectomy (RRP) or laparoscopic radical prostatectomy (LRP). Evidence acquisition: A systematic review of the literature was performed in August 2011, searching Medline, Embase, and Web of Science databases. A free-text protocol using the term radical prostatectomy was applied. The following limits were used: humans; gender (male); and publications dating from January 1, 2008. A cumulative analysis was conducted using Review Manager software v.4.2 (Cochrane Collaboration, Oxford, UK) and Stata 11.0 SE software (StataCorp, College Station, TX, USA). Evidence synthesis: We retrieved 79 papers evaluating oncologic outcomes following RARP. The mean PSM rate was 15% in all comers and 9% in pathologically localized cancers, with some tumor characteristics being the most relevant predictors of PSMs. Several surgeon-related characteristics or procedure-related issues may play a major role in PSM rates. With regard to BCR, the very few papers with a follow-up duration >5 yr demonstrated 7-yr BCR-free survival estimates of approximately 80%. Finally, all the cumulative analyses comparing RARP with RRP and comparing RARP with LRP demonstrated similar overall PSM rates (RARP vs RRP: odds ratio [OR]: 1.21; p = 0.19; RARP vs LRP: OR: 1.12; p = 0.47), pT2 PSM rates (RARP vs RRP: OR: 1.25; p = 0.31; RARP vs LRP: OR: 0.99; p = 0.97), and BCR-free survival estimates (RARP vs RRP: hazard ratio [HR]: 0.9; p = 0.526; RARP vs LRP: HR: 0.5; p = 0.141), regardless of the surgical approach. Conclusions: PSM rates are similar following RARP, RRP, and LRP. The few data available on BCR from high-volume centers are promising, but definitive comparisons with RRP or LRP are not currently possible. Finally, significant data on cancer-specific mortality are not currently available. © 2012.


Introduction and Objective: Open radical prostatectomy (RRP) is the gold standard and most widespread treatment for clinically localized prostate cancer. However, in recent years robot-assisted laparoscopic prostatectomy (RARP) is rapidly gaining acceptance among urologists worldwide. We sought to outline our surgical technique of robotic radical prostatectomy and provide practical recommendations based on available reports and personal experience. We also critically review the current experience on RARP worldwide and compare the available data with the gold standard open RRP series. Material and Methods: A systematic review of the literature was performed for all
published manuscripts between 1997 and 2008 using the keywords - 'robotic radical prostatectomy', 'robot-assisted radical prostatectomy', 'laparoscopic radical prostatectomy' and 'robotic' using the Medline database. Results: A total of 226 original manuscripts on RARP were identified. Manuscripts were selected according to their relevance to the current topic (i.e. original articles, number of patients in the series, prospective data collection) and incorporated into this review. Conclusions: Eight years after the first RARP, multiple series are mature enough to demonstrate safety, efficiency and reproducibility of the procedure, as well as oncologic and functional outcomes comparable to its open counterpart. Further prospective, randomized studies comparing both surgical techniques are necessary in order to draw more definitive conclusions.


Objectives: To compare outcomes of radical retropubic, laparoscopic, and robotic-assisted prostatectomy using evidence-based analysis. Methods: We performed meta-analysis of observational studies directly comparing radical retropubic, laparoscopic, and robotic-assisted prostatectomy for the treatment of localized prostate cancer. The primary outcomes were operative blood loss, perioperative transfusion, surgical margin status, postoperative urinary incontinence, and postoperative erectile dysfunction. Based on established similarities in surgical principles, we combined laparoscopic and robotic-assisted data into a single group. We estimated standardized mean differences (SMD), risk ratios (RR), and risk differences (RD) using random effects models. Results: Nineteen studies (n = 3893 patients) met inclusion criteria for this analysis. Compared with those undergoing retropubic prostatectomy, patients undergoing laparoscopic or robotic-assisted prostatectomy experienced less operative blood loss (SMD -1.74, 95% confidence interval [CI] -1.74 to -1.49, P <0.001) and were 77% less likely to receive a perioperative transfusion (RR 0.23, 95% CI 0.11 to 0.49, P <0.001). There was no significant difference in overall risk of positive surgical margin (RR 0.88, 95% CI 0.74 to 1.06, P = 0.17). There were also no significant differences in 1-year urinary continence (P = 0.49) and 1-year erectile function (P = 0.09); however, these outcomes were measured using nonvalidated instruments. Conclusions: Our results suggest that, compared with retropubic prostatectomy, laparoscopic and robotic-assisted prostatectomy are associated with decreased operative blood loss, decreased risk of transfusion, and similar risk of positive surgical margin. Further comparative studies using consistent, validated outcomes measures are needed to further assess postoperative urinary continence and potency. © 2008 Elsevier Inc. All rights reserved.


OBJECTIVE: To compare the effectiveness of robot-assisted and standard laparoscopic prostatectomy. METHODS: A care pathway was described. We performed a systematic literature review based on a search of Medline, Medline in Process, Embase, Biosis, Science Citation Index, Cochrane Controlled Trials Register, Current Controlled Trials, Clinical Trials, WHO International Clinical Trials Registry and NIH Reporter, the Health Technology Assessment databases, the Database of Abstracts of Reviews of Effects, and relevant conference abstracts up to 31st October 2010). Additionally, reference lists were scanned, an expert panel consulted, and websites of manufacturers, professional
organisations, and regulatory bodies were checked. We selected randomised controlled trials (RCTs) and non-randomised comparative studies, published after 1st January 1995, including men with localised prostate cancer undergoing robot-assisted or laparoscopic prostatectomy compared with the other procedure or with open prostatectomy. Studies where at least 90% of included men had clinical tumour stages T1 to T2 and which reported at least one of our specified outcomes were eligible for inclusion. A mixed-treatment comparison meta-analysis was performed to generate comparative statistics on specified outcomes. RESULTS: We included data from 19 064 men across one RCT and 57 non-randomised comparative reports. Robotic prostatectomy had a lower risk of major intra-operative harms such as organ injury [0.4% robotic vs 2.9% laparoscopic], odds ratio ([OR] 0.16 [95% credible interval [CrI] 0.03 to 0.76]), and a lower rate of surgical margins positive for cancer [17.6% robotic vs 23.6% laparoscopic], OR [95% CrI] 0.69 [0.51 to 0.96]). There was no evidence of a difference in the proportion of men with urinary incontinence at 12 months (OR [95% CrI] 0.55 [0.09 to 2.84]). There were insufficient data on sexual dysfunction. Surgeon learning rates for the procedures did not differ, although data were limited. CONCLUSIONS: Men undergoing robotic prostatectomy appear to have reduced surgical morbidity, and a lower risk of a positive surgical margin, which may reduce rates of cancer recurrence and the need for further treatment, but considerable uncertainty surrounds these results. We found no evidence that men undergoing robotic prostatectomy are disadvantaged in terms of early outcomes. We were unable to determine longer-term relative effectiveness.


OBJECTIVES: Radical prostatectomy is worldwide accepted as treatment for clinically localized prostate cancer. Its oncological results are excellent, so nowadays the functional outcomes: continence and potency, have become essential factors when evaluating the results. Open radical prostatectomy (ORP) is the gold standard against the new techniques, Laparoscopic (LRP) and robotic (RRP) must be compared. A systematic review of the literature is done to evaluate functional outcomes between the three approaches. METHODS: Systematic review in the databases: PubMed; EMBASE; Cochrane; SCOPUS; Science Citation Index for: "radical retropubic prostatectomy", "open radical prostatectomy"; "laparoscopic prostatectomy"; "laparoscopic radical prostatectomy"; "robotic prostatectomy"; "robotic radical prostatectomy and functional assessment"; "continence"; "urinary function"; "incontinence"; "erectile function"; "sexual function"; "quality of life"; "functional assessment"; "minimally invasive treatment was performed". RESULTS: The lack of randomized trials for this issue forces us to evaluate the functional results comparing the most important series of each approach, so the value of the results are very limited. Accepting 0 pads per day as continence definition and evaluated 12 months following surgery, the continence rates for each approach ORP, LRP and RRP are respectively: 81% (60-93%); 87% (82-95%) and 91% (84-98%). For erectile function admitting the capability for intercourse as potency definition, with or without the use of oral drugs and evaluated 12 months following surgery; the potency rates for each approach are: 68% (62-75%), 69% (52-78%) y 60% (20-97%). CONCLUSIONS: Due the lack of randomized trials, we have to evaluate the most important contemporaneous series. The lack of homogeneity in evaluating and reporting results is evident in the urological community. With the
limitations of the data available it seems to exist no differences between the three groups for functional outcomes. It is mandatory to develop randomized trials and achieve a consensus for the criteria at the time of evaluating the functional outcomes.


OBJECTIVE: To assess erectile dysfunction in patients with prostate cancer undergoing surgery by radical prostatectomy, laparoscopic prostatectomy or robotic prostatectomy.

MATERIAL AND METHODS: Systematic Review of literature based on a search strategy (2000-10) in MedLine, Embase, Cochrane Library, CRD, ECRI, and Hayes. Mesh terms used were Prostatectomy, "Prostatic Neoplasm, Transuretral Resection Prostate, Impotence and as free terms erectile dysfunction and prostatectomy. Studies included patients with prostate cancer underwent by prostatectomy radical with open surgery (retropubic), laparoscopic or robotic surgery. RESULTS: Ten observational studies with moderate quality and 29 case series with low quality were selected. Observational studies showed lower percentages of erectile dysfunction after intervention in the patients underwent robotic surgery (3-51%). Radical surgery (36-91%) and laparoscopic surgery showed higher values of impotence. In the studies that compared surgery versus radiotherapy, the results were better for radiotherapy (3-72% erectile dysfunction). In the case series, lower percentages of erectile dysfunction were shown in patients underwent to robotic surgery (22%), the following was for laparoscopic surgery (40%) and open radical prostatectomy (41.4%). CONCLUSIONS: This result should be considered with caution because of the low methodological quality of the studies included. However, the different surgical techniques assessed showed similar effects in the two types of studies included and we found that robotic surgery presented lower percentages of sexual impotence.


BACKGROUND: Utilization of robot-assisted radical prostatectomy (RARP) has increased rapidly, despite the absence of randomized controlled trials demonstrating the superiority of this approach. While recent studies suggest an advantage in perioperative complication rates, they fail to account for the volume-outcome relationship. We sought to compare perioperative outcomes after RARP vs. ORP, whilst fully considering the impact of this established relationship. METHODS: Using the Nationwide Inpatient Sample, patients undergoing RP in 2009 were abstracted. Univariable and multivariable logistic regression analyses compared rates of blood transfusions, intraoperative and postoperative complications, prolonged length of stay (pLOS), elevated hospital charges (EHC), and mortality between RARP and ORP, overall and across volume quartiles. RESULTS: An estimated 77616 men underwent RP (RARP: 63.9%, ORP: 36.1%). Low-volume centers averaged 26.2 (RARP) and 5.2 (ORP) cases, very high-volume centers averaged 578.8 (RARP) and 150.2 (ORP) cases. Overall, RARP-treated patients experienced lower rates of adverse outcomes than ORP patients, in all measured categories. Across equivalent volume quartiles, RARP outcomes were generally favorable; however ORP at very high-volume centers produced lower rates of
postoperative complications (OR: 0.59 (95%CI: 0.46-0.75)), EHC (0.75 (0.64-0.87)) and comparable rates of blood transfusions (1.38 (0.93-2.02)) relative to RARP at low-volume centers. CONCLUSION: Regionalization has occurred to a greater extent for RARP than ORP, with an associated benefit in overall outcomes. Nonetheless, low volume institutions experienced inferior outcomes relative to the highest volume centers irrespective of approach. These findings demonstrate the importance of accounting for hospital volume when examining the benefit of a surgical technique.


Purpose: The use of robot-assisted radical prostatectomy has increased rapidly despite the absence of randomized, controlled trials showing the superiority of this approach. While recent studies suggest an advantage for perioperative complication rates, they fail to account for the volume-outcome relationship. We compared perioperative outcomes after robot-assisted and open radical prostatectomy, while considering the impact of this established relationship.

Materials and Methods: Using the NIS (Nationwide Inpatient Sample), we abstracted data on patients treated with radical prostatectomy in 2009. Univariable and multivariable logistic regression analyses were done to compare the rates of blood transfusion, intraoperative and postoperative complications, prolonged length of stay, increased hospital charges and mortality between robot-assisted and open radical prostatectomy overall and across volume quartiles. Results: An estimated 77,616 men underwent radical prostatectomy, including a robot-assisted and an open procedure in 63.9% and 36.1%, respectively. Low volume centers averaged 26.2 robot-assisted and 5.2 open cases, while very high volume centers averaged 578.8 robot-assisted and 150.2 open cases. Overall, patients treated with the robot-assisted procedure experienced a lower rate of adverse outcomes than those treated with the open procedure for all measured categories. Across equivalent volume quartiles robot-assisted radical prostatectomy outcomes were generally favorable. However, the open procedure at high volume centers resulted in a lower postoperative complication rate (OR 0.59, 95% CI 0.46-0.75), elevated hospital charges (OR 0.75, 95% CI 0.64-0.87) and a comparable blood transfusion rate (OR 1.38, 95% CI 0.93-2.02) relative to the robot-assisted procedure at low volume centers. Conclusions: Regionalization has occurred to a greater extent for robot-assisted than for open radical prostatectomy with an associated benefit in overall outcomes. Nonetheless, low volume institutions experienced inferior outcomes relative to the highest volume centers irrespective of approach. These findings demonstrate the importance of accounting for hospital volume when examining the benefit of a surgical technique. © 2013 American Urological Association Education and Research, Inc.


Background: Costs and benefits of emerging prostate cancer treatments for young men (age < 65 years) in the United States are not well understood. We compared utilization, clinical outcomes, and costs between two types of radical prostatectomy (RP) - minimally invasive prostatectomy (MIRP) and retropubic prostatectomy (RRP) - among
young patients. Methods: We extracted from LifeLink Health Plan Claims Database, a commercial claims database, information on 10,669 patients receiving either MIRP or RRP between 2003 and 2007. In unadjusted analyses, we used chi-square tests to compare clinical outcomes and nonparametric bootstrapping method to compare costs between the MIRP and RRP groups. We applied logistic, Cox proportional hazard, and extended estimation equation methods to examine the association between surgical modality and perioperative complications, anastomotic stricture, and costs while controlling for age, comorbidity, and health plan characteristics. Results: The percentage of prostatectomies performed as MIRP increased from 5.7% in 2003 to 50.3% in 2007. Patients with more comorbidity were more likely to undergo RRP than MIRP. Compared with the RRP group, the MIRP group had a significantly lower rate of perioperative complications (23.0% vs. 30.4%; P < 0.001) and a lesser tendency for anastomotic strictures (hazard ratio 0.42; 95% CI 0.35-0.50) within the first postoperative year but had higher hospitalization costs ($19,998 vs. $18,424; P < 0.001) despite shorter hospitalizations (1.7 days vs. 3.1 days; P < 0.001). Similar findings were reported in the subgroup analysis of patients with comorbidity score 0. Conclusion: MIRP among nonelderly patients increased substantially over time. MIRP was found to have fewer complications. Lower costs of complications appeared to have offset higher hospitalization costs of MIRP. Copyright © 2012, International Society for Pharmacoeconomics and Outcomes Research (ISPOR). Published by Elsevier Inc.


Purpose: Minimally invasive pyeloplasty might have several advantages compared to open pyeloplasty in the management of ureteropelvic junction obstruction. Nonetheless, minimally invasive pyeloplasty appears to be underused in North America. We examined specific patient and hospital characteristics that may be associated with these disparities.

Materials and Methods: The Nationwide Inpatient Sample was used to identify a national estimate of 29,456 patients with ureteropelvic junction obstruction treated with minimally invasive pyeloplasty (laparoscopic or robotic) and open pyeloplasty between 1998 and 2009. The rates of use of minimally invasive and open pyeloplasty were assessed according to year of surgery, and patient and hospital characteristics. The determinants of minimally invasive pyeloplasty were evaluated using logistic regression models adjusted for clustering. Results: Overall 15.3% of patients underwent minimally invasive pyeloplasty between 1998 and 2009. The use of minimally invasive pyeloplasty increased remarkably during the study period from 2.4% to 55.3%, a 23-fold increase. On multivariable logistic regression analysis African-American race (OR 0.584, p = 0.015) and other insurance status (including uninsured patients, OR 0.613, p = 0.013) were associated with a lower rate of minimally invasive pyeloplasty. Patients treated at teaching (OR 1.788, p = 0.003) and/or urban (OR 4.819, p <0.001) institutions were significantly more likely to undergo minimally invasive pyeloplasty. Conclusions: In the last decade there has been a dramatic increase in the use of minimally invasive pyeloplasty in the United States and in 2009 a slight majority underwent minimally invasive pyeloplasty. Nonetheless, treatment disparities exist. African-American patients with other insurance status (including those uninsured) treated at nonteaching, rural hospitals were less likely to undergo minimally invasive pyeloplasty. Efforts should be
made to understand these treatment disparities and broaden the availability of minimally invasive pyeloplasty. © 2012 American Urological Association Education and Research, Inc.


Context: Radical prostatectomy (RP) approaches have rarely been compared adequately with regard to margin and perioperative complication rates. Objective: Review the literature from 2002 to 2010 and compare margin and perioperative complication rates for open retropubic RP (ORP), laparoscopic RP (LRP), and robot-assisted LRP (RALP).

Evidence acquisition: Summary data were abstracted from 400 original research articles representing 167 184 ORP, 57 303 LRP, and 62 389 RALP patients (total: 286 876). Articles were found through PubMed and Scopus searches and met a priori inclusion criteria (eg, surgery after 1990, reporting margin rates and/or perioperative complications, study size >25 cases). The primary outcomes were positive surgical margin (PSM) rates, as well as total intra- and perioperative complication rates. Secondary outcomes included blood loss, transfusions, conversions, length of hospital stay, and rates for specific individual complications. Weighted averages were compared for each outcome using propensity adjustment. Evidence synthesis: After propensity adjustment, the LRP group had higher positive surgical margin rates than the RALP group but similar rates to the ORP group. LRP and RALP showed significantly lower blood loss and transfusions, and a shorter length of hospital stay than the ORP group. Total perioperative complication rates were higher for ORP and LRP than for RALP. Total intraoperative complication rates were low for all modalities but lowest for RALP. Rates for readmission, reoperation, nerve, ureteral, and rectal injury, deep vein thrombosis, pneumonia, hematoma, lymphocele, anastomotic leak, fistula, and wound infection showed significant differences between groups, generally favoring RALP. The lack of randomized controlled trials, use of margin status as an indicator of oncologic control, and inability to perform cost comparisons are limitations of this study. Conclusions: This meta-analysis demonstrates that RALP is at least equivalent to ORP or LRP in terms of margin rates and suggests that RALP provides certain advantages, especially regarding decreased adverse events. © 2012 European Association of Urology.


Prostate cancer is the most frequent in men: 71000 new cases were diagnosed in France in 2011. Early diagnosis allows treatments with curative intent. Risk groups by D'Amico classification system were validated to estimate progression risk after radical prostatectomy, external beam radiotherapy and brachytherapy. Radical prostatectomy is one of the reference treatments for localized prostate cancer. There are many surgical approaches: open retropubic approach, perineal, trans peritoneal or extra peritoneal laparoscopic approach, robotic assisted or not. Main surgical steps are the same between retropubic or laparoscopic approaches. Regarding oncologic (positive surgical margins rate, progression free survival) and functional results (continence and erections), no difference was reported between different surgical approaches.

CONTEXT: The clinical significance of positive surgical margins (PSMs) in radical prostatectomy (RP) specimens and the management of affected patients remain unclear.

OBJECTIVE: To address pitfalls in the pathologic interpretation of margin status; provide an update on the incidence, predictors, and long-term oncologic implications of PSMs in the era of robot-assisted laparoscopic RP (RALRP); and suggest a practical evidence-based approach to patient management.

EVIDENCE ACQUISITION: A systematic review of the literature was performed in April 2013 using Medline/PubMed, Web of Science, and Scopus databases and the Cochrane Database of Systematic Reviews. Studies focusing on PSMs in RP pertinent to the objectives of this review were included. Particular attention was paid to publications within the last 5 yr and those concerning RALRP.

EVIDENCE SYNTHESIS: A total of 74 publications were retrieved. Standardized measures to overcome variability in the pathologic interpretation of surgical margins have recently been established by the International Society of Urological Pathology. The average rate of PSMs in contemporary RALRP series is 15% (range: 6.5-32%), which is higher in men with a more advanced pathologic stage and equivalent to the rate reported in prior open and laparoscopic prostatectomy series. The likelihood of PSMs is strongly influenced by the surgeon's experience irrespective of the surgical approach. Technical modifications using the robotic platform and the role of frozen-section analysis to reduce the margin positivity rate continue to evolve. Positive margins are associated with a twofold increased hazard of biochemical relapse, but their association with more robust clinical end points is controversial. Level 1 evidence suggests that adjuvant radiation therapy (RT) may favorably affect prostate-specific antigen recurrence rates, but whether the therapy also affects systemic progression, prostate cancer-specific mortality, and overall survival remains debatable.

CONCLUSIONS: Although positive margins in prostate cancer are considered an adverse oncologic outcome, their long-term impact on survival is highly variable and largely influenced by other risk modifiers. Adjuvant RT appears to be effective, but further study is required to determine whether early salvage RT is an equivalent alternative.

**General Robotic (9)**

**Level 2a** (9)
(2009). "HTA_AUS_Asernip_RPT_2009-12-09_Robotic-assisted_Surgery."

(2009). "Robot-assisted surgery: HTA (Belgium)."

This health technology assessment (HTA) examined the evidence of the effectiveness, safety, costs and budget impact of robot-assisted surgery for a number of procedures. The HTA focussed on the procedures where there is sufficient evidence around the effectiveness of robot-assisted surgery. The organisational and other issues that would need to be considered in order to implement the technology as effectively and efficiently as possible have also been taken into account. The key findings of this HTA which precede and inform the Authority’s advice below were: 1) Although robot-assistance is reported for a range of surgeries, prostatectomy and hysterectomy are the two surgical procedures where there is sufficient evidence, albeit of low quality, to inform decision making. Evidence continues to emerge of its use in a broad range of other procedures.; 2) Robot-assisted prostatectomy is superior to open prostatectomy across a range of outcomes evaluated in this HTA. Improved outcomes include urinary continence, sexual function and surgical margins. Peri-operative improved outcomes include lower risk of transfusion and shorter hospital stays. The benefits of robot-assisted prostatectomy over conventional laparoscopic approaches are minor.; 3) Robot-assisted hysterectomy, when compared with open surgery, is associated with improved peri-operative outcomes. These include lower risk of transfusion, and shorter hospital stays. Compared to conventional laparoscopic hysterectomy, the benefits of robot-assistance are less pronounced.; 4) Robot-assisted surgery is more ergonomic than conventional laparoscopic surgery for the operating surgeon, thereby allowing the surgeon to operate more easily. ; 5) The current capital cost of a new surgical robot is €1.45 million, and an annual maintenance fee of €150,000 applies from year 2. This maintenance fee and the amortised capital costs of the robot over its lifetime have been included in the economic models.; 6) The incremental costs of robot-assisted surgery per procedure range from €2,487 to €3,019 for prostatectomy and hysterectomy respectively based on volumes per robot of 200 prostatectomies or 300 hysterectomies per annum. National demand for robot-assisted prostatectomy could be approximately 300 cases per annum and national demand for robot-assisted hysterectomy would be significantly higher. A single robot may not meet demand in either programme.; 7) A cost utility analysis of the prostatectomy-only model (based on 200 procedures annually) predicted an incremental cost effectiveness ratio (ICER) of €26,647/quality-adjusted life years (QALY) (95% CI: €14,241 - €61,220/QALY). Based on ‘willingness to pay’ thresholds, the probability of robot-assisted surgery being cost-effective is 0.20 at a threshold of €20,000 per QALY, 0.63 at €30,000 per QALY and 0.85 at €40,000 per QALY.


Background: There are few population-based data describing outcomes of robotic-assisted surgery. We compared outcomes of robotic-assisted, laparoscopic, and open surgery in a nationally representative population database. Study Design: A retrospective analysis of the Nationwide Inpatient Sample database from October 2008 to December 2009 was performed. We identified the most common robotic procedures by ICD-9 procedure codes and grouped them into categories by procedure type. Multivariate analyses examined mortality, length of stay (LOS), and total hospital charges, adjusting for age, race, sex, Charlson comorbidity index, and teaching hospital
status. Results: A total of 368,239 patients were identified. On adjusted analysis, compared with open, robotic-assisted laparoscopic surgery was associated with decreased odds of mortality (odds ratio = 0.1; 95% CI, 0.0-0.2; p < 0.001), decreased mean LOS (-2.4 days; 95% CI, -2.5 to 2.3; p < 0.001), and increased mean total charges in all procedures (range $3,852 to $15,329) except coronary artery bypass grafting ($-17,318; 95% CI, -34,492 to -143; p = 0.048) and valvuloplasty (not statistically significant). Compared with laparoscopic, robotic-assisted laparoscopic surgery was associated with decreased odds of mortality (odds ratio = 0.1; 95% CI, 0.0-0.6; p = 0.008), decreased LOS overall (-0.6 days; 95% CI, -0.7 to -0.5; p < 0.001), but increased LOS in prostatectomy and other kidney/bladder procedures (0.3 days; 95% CI, 0.1-0.4; p = 0.006; 0.8 days; 95% CI, 0.0-1.6; p = 0.049), and increased total charges ($1,309; 95% CI, 519-2,099; p = 0.001). Conclusions: Data suggest that, compared with open surgery, robotic-assisted surgery results in decreased LOS and diminished likelihood of death. However, these benefits are not as apparent when comparing robotic-assisted laparoscopic with nonrobotic laparoscopic procedures. © 2012 American College of Surgeons.


OBJECTIVE: An application was received to review the evidence on the 'The Da Vinci Surgical System' for the treatment of gynecologic malignancies (e.g. endometrial and cervical cancers). Limitations to the current standard of care include the lack of trained physicians on minimally invasive surgery and limited access to minimally invasive surgery for patients. The potential benefits of 'The Da Vinci Surgical System' include improved technical manipulation and physician uptake leading to increased surgeries, and treatment and management of these cancers. The demand for robotic surgery for the treatment and management of prostate cancer has been increasing due to its alleged benefits of recovery of erectile function and urinary continence, two important factors of men's health. The potential technical benefits of robotic surgery leading to improved patient functional outcomes are surgical precision and vision. CLINICAL NEED: Uterine and cervical cancers represent 5.4% (4,400 of 81,700) and 1.6% (1,300 of 81,700), respectively, of incident cases of cancer among female cancers in Canada. Uterine cancer, otherwise referred to as endometrial cancer is cancer of the lining of the uterus. The most common treatment option for endometrial cancer is removing the cancer through surgery. A surgical option is the removal of the uterus and cervix through a small incision in the abdomen using a laparoscope which is referred to as total laparoscopic hysterectomy. Risk factors that increase the risk of endometrial cancer include taking estrogen replacement therapy after menopause, being obese, early age at menarche, late age at menopause, being nulliparous, having had high-dose radiation to the pelvis, and use of tamoxifen. Cervical cancer occurs at the lower narrow end of the uterus. There are more treatment options for cervical cancer compared to endometrial cancer, however total laparoscopic hysterectomy is also a treatment option. Risk factors that increase the risk for cervical cancer are multiple sexual partners, early sexual
activity, infection with the human papillomavirus, and cigarette smoking, whereas barrier-type of contraception as a risk factor decreases the risk of cervical cancer. Prostate cancer is ranked first in men in Canada in terms of the number of new cases among all male cancers (25,500 of 89,300 or 28.6%). The impact on men who develop prostate cancer is substantial given the potential for erectile dysfunction and urinary incontinence. Prostate cancer arises within the prostate gland, which resides in the male reproductive system and near the bladder. Radical retropubic prostatectomy is the gold standard treatment for localized prostate cancer. Prostate cancer affects men above 60 years of age. Other risk factors include a family history of prostate cancer, being of African descent, being obese, consuming a diet high in fat, physical inactivity, and working with cadmium.

THE DA VINCI SURGICAL SYSTEM: The Da Vinci Surgical System is a robotic device. There are four main components to the system: 1) the surgeon's console, where the surgeon sits and views a magnified three-dimensional image of the surgical field; 2) patient side-cart, which sits beside the patient and consists of three instrument arms and one endoscope arm; 3) detachable instruments (endowrist instruments and intuitive masters), which simulate fine motor human movements. The hand movements of the surgeon's hands at the surgeon's console are translated into smaller ones by the robotic device and are acted out by the attached instruments; 4) three-dimensional vision system: the camera unit or endoscope arm. The main advantages of use of the robotic device are: 1) the precision of the instrument and improved dexterity due to the use of "wristed" instruments; 2) three-dimensional imaging, with improved ability to locate blood vessels, nerves and tissues; 3) the surgeon's console, which reduces fatigue accompanied with conventional laparoscopy surgery and allows for tremor-free manipulation. The main disadvantages of use of the robotic device are the costs including instrument costs ($2.6 million in US dollars), cost per use ($200 per use), the costs associated with training surgeons and operating room personnel, and the lack of tactile feedback, with the trade-off being increased visual feedback.

RESEARCH QUESTIONS: For endometrial and cervical cancers, 1. What is the effectiveness of the Da Vinci Surgical System vs. laparoscopy and laparotomy for women undergoing any hysterectomy for the surgical treatment and management of their endometrial and cervical cancers? 2. What are the incremental costs of the Da Vinci Surgical System vs. laparoscopy and laparotomy for women undergoing any hysterectomy for the surgical treatment and management of their endometrial and cervical cancers? For prostate cancer, 3. What is the effectiveness of robotically-assisted radical prostatectomy using the Da Vinci Surgical System vs. laparoscopic radical prostatectomy and retropubic radical prostatectomy for the surgical treatment and management of prostate cancer? 4. What are the incremental costs of robotically-assisted radical prostatectomy using the Da Vinci Surgical System vs. laparoscopic radical prostatectomy and retropubic radical prostatectomy for the surgical treatment and management of prostate cancer?

RESEARCH METHODS: LITERATURE SEARCH: SEARCH STRATEGY: A literature search was performed on May 12, 2010 using OVID MEDLINE, MEDLINE In-Process and Other Non-Indexed Citations, OVID EMBASE, Wiley Cochrane, CINAHL, Centre for Reviews and Dissemination/International Agency for Health Technology Assessment for studies published from January 1, 2000 until May 12, 2010. Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search. Articles with unknown eligibility were reviewed with a second clinical epidemiologist, then a group of
epidemiologists until consensus was established. The quality of evidence was assessed as high, moderate, low or very low according to GRADE methodology. INCLUSION CRITERIA: English language articles (January 1, 2000-May 12, 2010)Journal articles that report on the effectiveness or cost-effectiveness for the comparisons of interest using a primary data source (e.g. obtained in a clinical setting)Journal articles that report on the effectiveness or cost-effectiveness for the comparisons of interest using a secondary data source (e.g. hospital- or population-based registries)Study design and methods must be clearly describedHealth technology assessments, systematic reviews, randomized controlled trials, non-randomized controlled trials and/or cohort studies, case-case studies, regardless of sample size, cost-effectiveness studies EXCLUSION CRITERIA: Duplicate publications (with the more recent publication on the same study population included)Non-English papersAnimal or in-vitro studiesCase reports or case series without a referent or comparison groupStudies on long-term survival which may be affected by treatmentStudies that do not examine the cancers (e.g. advanced disease) or outcomes of interest OUTCOMES OF INTEREST: For endometrial and cervical cancers, Primary outcomes: Morbidity factors- Length of hospitalization- Number of complicationsPeri-operative factors- Operation time- Amount of blood loss- Number of conversions to laparotomyNumber of lymph nodes recoveredFor prostate cancer, Primary outcomes: Morbidity factors- Length of hospitalization- Amount of morphine use/painPeri-operative factors- Operation time- Amount of blood loss- Number of transfusions- Duration of catheterization- Number of complications- Number of anastomotic stricturesNumber of lymph nodes recoveredOncologic factors- Proportion of positive surgical marginsLong-term outcomes- Urinary continence- Erectile function SUMMARY OF FINDINGS: Robotic use for gynecologic oncology compared to: LAPAROTOMY: benefits of robotic surgery in terms of shorter length of hospitalization and less blood loss. These results indicate clinical effectiveness in terms of reduced morbidity and safety, respectively, in the context of study design limitations. The beneficial effect of robotic surgery was shown in pooled analysis for complications, owing to increased sample size. More work is needed to clarify the role of complications in terms of safety, including improved study designs, analysis and measurement. LAPAROSCOPY: benefits of robotic surgery in terms of shorter length of hospitalization, less blood loss and fewer conversions to laparotomy likely owing to the technical difficulty of conventional laparoscopy, in the context of study design limitations. Clinical significance of significant findings for length of hospitalizations and blood loss is low. Fewer conversions to laparotomy indicate clinical effectiveness in terms of reduced morbidity. Robotic use for urologic oncology, specifically prostate cancer, compared to: RETROPUBLIC SURGERY: benefits of robotic surgery in terms of shorter length of hospitalization and less blood loss/fewer individuals requiring transfusions. These results indicate clinical effectiveness in terms of reduced morbidity and safety, respectively, in the context of study design limitations. There was a beneficial effect in terms of decreased positive surgical margins and erectile dysfunction. These results indicate clinical effectiveness in terms of improved cancer control and functional outcomes, respectively, in the context of study design limitations. Surgeon skill had an impact on cancer control and functional outcomes. The results for complications were inconsistent when measured as either total number of complications, pain management or anastomosis. (ABSTRACT TRUNCATED)


Background: Health technology assessment (HTA) is frequently used when a new and expensive technology is being introduced into clinical practice. This certainly is the case with the da Vinci surgical robot, with costs ranging from $1 to $2.5 million for each unit. This systematic review documents major variability in the reported cost evaluation studies of da Vinci robot-assisted operations compared with those performed by the direct manual laparoscopic approach. Methods: Published studies in the English language related to the period 2000-2010 were searched using economic and clinical electronic databases. Results: All 11 reports included some form of cost analysis, which made it possible for the authors to extract information on certain specific economic outcomes: operating room time, hospital stay, and total costs. With the exception of two studies, the reported operating room time was higher with the robotic approach than with manual laparoscopic surgery, and the hospital stay was the same for the two techniques. Robotic surgery is significantly more expensive if the purchase and maintenance costs of the robot system are included in the total costs. Only 3 of the 11 publications included these costs. Conclusions: The disadvantage of robotic surgery is its higher costs related to purchase and maintenance of technology and its longer operating room time. However, emerging evidence shows that operating room time decreases with experience using the robot. From the HTA viewpoint, the result of this review is that the jury still is out on the HTA of da Vinci-assisted robotic surgery. © 2011 Springer Science+Business Media, LLC.

MIS vs Open (14)

Level 2a (14)


Objective: To determine the effect of minimally invasive radical prostatectomy (MIRP) surgeon volume on outcomes, and correlate with those of open radical prostatectomy retropubic (ORP). Methods and materials: Observational population-based study of 8,831 men undergoing MIRP and ORP by 1,457 low, medium, and high volume surgeons from SEER-Medicare linked data from 2003 to 2007. After stratifying by surgeon ORP and MIRP volume, the following outcomes were studied: length of stay, transfusions, post-operative 30-day and anastomotic stricture complications, and use of additional cancer therapies. Results: Men undergoing MIRP with high and medium vs. low volume surgeons were less likely to require additional cancer therapies (4.5% and 4.7% vs. 7%, P = 0.020). Similarly, men undergoing ORP with high vs. medium and low volume surgeons were less likely to require additional cancer therapies (5.7% vs. 6.8% and 7.1%, P = 0.044). Men undergoing ORP with high vs. medium and low volume surgeons
experienced shorter lengths of stay (2.9 vs. 3.3 and 3.6 days, P < 0.001), and fewer transfusions (15.4% vs. 21.3% and 22.7%, P = 0.017), 30-day complications (18.4% vs. 25.6% and 25.7%, P < 0.001), and anastomotic strictures (10.1% vs. 15.6% and 16.3%, P = 0.003). However, MIRP surgeon volume did not affect these outcomes.

Conclusions: Men undergoing MIRP or ORP with high volume surgeons were less likely to require additional cancer therapies. Additionally, patients of high volume ORP surgeons were more likely to experience shorter hospital stays, fewer transfusions, 30-day complications, and anastomotic strictures, while MIRP surgeon volume did not affect these peri-operative outcomes. © 2010 Elsevier Inc. All rights reserved.


IMPORTANCE As many surgical procedures have undergone a transition from a standard, open surgical approach to a minimally invasive one in the past 2 decades, the diffusion of minimally invasive surgery may have had sizeable but overlooked effects on medical expenditures and worker productivity. OBJECTIVE To examine the impact of standard vs minimally invasive surgery on health plan spending and workplace absenteeism for 6 types of surgery. DESIGN Cross-sectional regression analysis. SETTING National health insurance claims data and matched workplace absenteeism data from January 1, 2000, to December 31, 2009. PARTICIPANTS A convenience sample of adults with employer-sponsored health insurance who underwent either standard or minimally invasive surgery for coronary revascularization, uterine fibroid resection, prostatectomy, peripheral revascularization, carotid revascularization, or aortic aneurysm repair. MAIN OUTCOMES AND MEASURE Health plan spending and workplace absenteeism from 14 days before through 352 days after the index surgery. RESULTS There were 321 956 patients who underwent surgery; 23 814 were employees with workplace absenteeism data. After multivariable adjustment, mean health plan spending was lower for minimally invasive surgery for coronary revascularization (-$30 850; 95% CI, -$31 629 to -$30 091), uterine fibroid resection (-$1509; 95% CI, -$1754 to -$1280), and peripheral revascularization (-$12 031; 95% CI, -$15 552 to -$8717) and higher for prostatectomy ($1350; 95% CI, $611 to $2212) and carotid revascularization ($4900; 95% CI, $1772 to $8370). Undergoing minimally invasive surgery was associated with missing significantly fewer days of work for coronary revascularization (mean difference, -37.7 days; 95% CI, -41.1 to -34.3), uterine fibroid resection (mean difference, -11.7 days; 95% CI, -14.0 to -9.4), prostatectomy (mean difference, -9.0 days; 95% CI, -14.2 to -3.7), and peripheral revascularization (mean difference, -16.6 days; 95% CI, -28.0 to -5.2). CONCLUSIONS AND RELEVANCE For 3 of 6 types of surgery studied, minimally invasive procedures were associated with significantly lower health plan spending than standard surgery. For 4 types of surgery, minimally invasive procedures were consistently associated with significantly fewer days of absence from work.


Background: Pelvic lymph node dissection (PLND) is an important component of prostate cancer staging and treatment, especially for surgical patients who have high-risk tumor features. It is not clear how the shift from open radical prostatectomy (ORP) to
minimally invasive radical prostatectomy (MIRP) has affected the use of PLND. The objectives of this study were to identify predictors of PLND and to assess the impact of surgical technique in a contemporary, population-based cohort. Methods: In Surveillance, Epidemiology, and End Results (SEER) cancer registry data linked with Medicare claims, the authors identified men who underwent ORP or MIRP for prostate cancer during 2003 to 2007. The impact of surgical approach on PLND was evaluated, and interactions were examined between surgical procedure, prostate-specific antigen (PSA), and Gleason score with the analysis controlled for patient and tumor characteristics. Results: Of 6608 men who underwent ORP or MIRP, 70% (n = 4600) underwent PLND. The use of PLND declined over time both overall and within subgroups defined by procedure type. PLND was 5 times more likely in men who underwent ORP than in men who underwent MIRP when the analysis was controlled for patient and tumor characteristics. Elevated PSA and biopsy Gleason score, but not clinical stage, were associated with a greater odds of PLND in both the ORP group and the MIRP group. However, the magnitude of the association between these factors and PLND was significantly greater for patients in the ORP group. Conclusions: PLND was less common among men who underwent MIRP, independent of tumor risk factors. A decline in PLND rates was not fully explained by an increase in MIRP. The authors concluded that these trends may signal a surgical approach-dependent disparity in prostate cancer staging and therapy. © 2011 American Cancer Society.


Context: Minimally invasive radical prostatectomy (MIRP) has diffused rapidly despite limited data on outcomes and greater costs compared with open retropubic radical prostatectomy (RRP). Objective: To determine the comparative effectiveness of MIRP vs RRP. Design, Setting, and Patients: Population-based observational cohort study using US Surveillance, Epidemiology, and End Results Medicare linked data from 2003 through 2007. We identified men with prostate cancer who underwent MIRP (n=1938) vs RRP (n=6899). Main Outcome Measures: We compared postoperative 30-day complications, anastomotic stricture 31 to 365 days postoperatively, long-term incontinence and erectile dysfunction more than 18 months postoperatively, and postoperative use of additional cancer therapies, a surrogate for cancer control. Results: Among men undergoing prostatectomy, use of MIRP increased from 9.2% (95% confidence interval [CI], 8.1%-10.5%) in 2003 to 43.2% (95% CI, 39.6%-46.9%) in 2006-2007. Men undergoing MIRP vs RRP were more likely to be recorded as Asian (6.1% vs 3.2%), less likely to be recorded as black (6.2% vs 7.8%) or Hispanic (5.6% vs 7.9%), and more likely to live in areas with at least 90% high school graduation rates (50.2% vs 41.0%) and with median incomes of at least $60 000 (35.8% vs 21.5%) (all P<.001). In propensity score-adjusted analyses, MIRP vs RRP was associated with shorter length of stay (median, 2.0 vs 3.0 days; P<.001) and lower rates of blood transfusions (2.7% vs 20.8%; P<.001), postoperative respiratory complications (4.3% vs 6.6%; P=.004), miscellaneous surgical complications (4.3% vs 5.6%; P=.03), and anastomotic stricture (5.8% vs 14.0%; P<.001). However, MIRP vs RRP was associated with an increased risk of genitourinary complications (4.7% vs 2.1%; P=.001) and diagnoses of incontinence (15.9 vs 12.2 per 100 person-years; P=.02) and erectile dysfunction (26.8 vs 19.2 per 100 person-years; P=.009). Rates of use of additional cancer therapies did not differ by
surgical procedure (8.2 vs 6.9 per 100 person-years; P=.35). Conclusion: Men undergoing MIRP vs RRP experienced shorter length of stay, fewer respiratory and miscellaneous surgical complications and strictures, and similar postoperative use of additional cancer therapies but experienced more genitourinary complications, incontinence, and erectile dysfunction. ©2009 American Medical Association. All rights reserved.


PURPOSE: Demand for minimally invasive radical prostatectomy (MIRP) to treat prostate cancer is increasing; however, outcomes remain unclear. We assessed utilization, complications, lengths of stay, and salvage therapy rates for MIRP versus open radical prostatectomy assessed whether MIRP surgeon volume is associated with better outcomes. METHODS: We identified 2,702 men undergoing MIRP and open radical prostatectomy during 2003 to 2005 from a national 5% sample of Medicare beneficiaries. We assessed the association between surgical approach and outcomes, adjusting for surgeon volume, age, race, comorbidity, and geographic region. RESULTS: MIRP utilization increased from 12.2% in 2003 to 31.4% in 2005. Men undergoing MIRP versus open radical prostatectomy had fewer perioperative complications (29.8% v 36.4%; P = .002) and shorter lengths of stay (1.4 v 4.4 days; P < .001); however, they were more likely to receive salvage therapy (27.8% v 9.1%, P < .001). In adjusted analyses, MIRP versus open radical prostatectomy was associated with fewer perioperative complications (odds ratio [OR], 0.73; 95% CI, 0.60 to 0.90), shorter lengths of stay (parameter estimate, -2.99; 95% CI, -3.45 to -2.53) but more anastomotic strictures (OR, 1.40; 95% CI, 1.04 to 1.87) and higher rates of salvage therapy (OR, 3.67; 95% CI, 2.81 to 4.81). Patients of high-volume MIRP experienced fewer anastomotic strictures (OR, 0.93; 95% CI, 0.87 to 0.99) and less salvage therapy (OR, 0.92; 95% CI, 0.88 to 0.98). CONCLUSION: Men undergoing MIRP versus open radical prostatectomy have lower risk for perioperative complications and shorter lengths of stay, but are at higher risk for salvage therapy and anastomotic strictures. However, risk for these unfavorable outcomes decreases with increasing MIRP surgical volume.


Purpose: We determined therapeutic trends in the management of adenocarcinoma of the prostate, and in the case of intensity modulated radiation therapy we investigated whether site of service influenced those trends. Materials and Methods: A variety of CPT codes to treat adenocarcinoma of the prostate were extracted from the Medicare Part B 5% sample for the years 2006 to 2008 inclusive. Data were stratified by year, type of service and, in the case of radiation therapy, site of service. Treatment trends were calculated by indexing the total number of Medicare beneficiaries receiving a service against needle biopsies of the prostate. Results: The percentage of Medicare beneficiaries receiving therapy indexed to needle biopsies of the prostate increased from 43.8% in 2006 to 49.0% in 2008. Trends in radiation and surgery were similar with 11.5% and 13% increases in each modality, respectively. Total Medicare beneficiaries receiving intensity modulated radiation therapy and laparoscopic radical prostatectomy increased by 25.4% and 22.1%, respectively, while Medicare beneficiaries treated with open radical prostatectomy and 3-dimensional conformal radiation therapy decreased by
27.9% and 37.6%, respectively. The pattern of use for intensity modulated radiation therapy was similar in physician office and hospital facility settings, increasing from 7.3% to 11.1% and 8.3% to 11.3% of Medicare beneficiaries indexed to needle biopsies of the prostate receiving intensity modulated radiation therapy at these sites in 2008, respectively. Conclusions: Treatment trends in surgery and radiation strongly favor newer technologies, and in the case of intensity modulated radiation therapy, utilization trends for treatment of adenocarcinoma of the prostate are similar across all sites of service. © 2011 American Urological Association Education and Research, Inc.


Background: Although the use of minimally invasive radical prostatectomy (MIRP) has increased, there are few comprehensive population-based studies assessing temporal trends and outcomes relative to retropubic radical prostatectomy (RRP). Objective: Assess temporal trends in the utilization and outcomes of MIRP and RRP among US Medicare beneficiaries from 2003 to 2007. Design, setting, and participants: A population-based retrospective study of 19,594 MIRP and 58,638 RRP procedures was performed from 2003 to 2007 from the 100% Medicare sample, composed of almost all US men ≥65 yr of age. Intervention: MIRP and RRP. Measurements: We measured 30-d outcomes (cardiac, respiratory, vascular, genitourinary, miscellaneous medical, miscellaneous surgical, wound complications, blood transfusions, and death), cystography utilization within 6 wk of surgery, and late complications (anastomotic stricture, ureteral complications, rectourethral fistulae, lymphocele, and corrective incontinence surgery). Results and limitations: From 2003 to 2007, MIRP increased from 4.9% to 44.5% of radical prostatectomies while RRP decreased from 89.4% to 52.9%. MIRP versus RRP subjects were younger (p < 0.001) and had fewer comorbidities (p < 0.001). Decreased MIRP genitourinary complications (6.2-4.1%; p = 0.002), miscellaneous surgical complications (4.7-3.7%; p = 0.030), transfusions (3.5-2.2%; p = 0.005), and postoperative cystography utilization (40.3-34.1%; p < 0.001) were observed over time. Conversely, overall RRP perioperative complications increased (27.4-32.0%; p < 0.001), including an increase in perioperative mortality (0.5-0.8%, p = 0.009). Late RRP complications increased, with the exception of fewer anastomotic strictures (10.2-8.8%; p = 0.002). In adjusted analyses, RRP versus MIRP was associated with increased 30-d mortality (odds ratio [OR]: 2.67; 95% confidence interval [CI], 1.55-4.59; p < 0.001) and more perioperative (OR: 1.60; 95% CI, 1.45-1.76; p < 0.001) and late complications (OR: 2.52; 95% CI, 2.20-2.89; p < 0.001). Limitations include the inability to distinguish MIRP with versus without robotic assistance and also the lack of pathologic information. Conclusions: From 2003 to 2007, there were fewer MIRP transfusions, genitourinary complications, and miscellaneous surgical complications, whereas most RRP perioperative and late complications increased. RRP versus MIRP was associated with more postoperative mortality and complications. © 2011.


Purpose: Studies comparing pain after minimally invasive vs retropubic and perineal radical prostatectomy are conflicting. We characterized population based outpatient
narcotic prescribing patterns after minimally invasive, retropubic and perineal radical prostatectomy. Materials and Methods: We evaluated outpatient prescription data after minimally invasive, retropubic and perineal radical prostatectomy from 2003 to 2006 using MarketScan®. Baseline and postoperative narcotic prescriptions were identified using the National Drug Code. Total prescribed narcotic strength in morphine sulfate equivalents, the number of prescriptions filled and costs were compared. We performed multivariate analysis adjusted for surgical approach, age, comorbidity, baseline narcotic use, health plan and geographic region. Results: We identified 2,206 minimally invasive, 8,037 retropubic and 463 perineal radical prostatectomies with no differences in baseline narcotic prescription use. Perineal and retropubic operations were associated with greater total morphine sulfate equivalent use than the minimally invasive operation. Perineal prostatectomy was associated with more narcotic refills than minimally invasive and retropubic prostatectomy (42.3% vs 20.2% and 28.9%, respectively, p <0.001). Median narcotic costs were lower for minimally invasive than for perineal and retropubic prostatectomy. On adjusted analysis perineal radical prostatectomy, younger age, baseline narcotic use and preferred provider organization health plan were associated with greater morphine sulfate equivalents and narcotic refills while minimally invasive surgery was associated with fewer refills and lower costs but not with total morphine sulfate equivalents. There was significant geographic variation in narcotic use and costs. Conclusions: Postoperatively minimally invasive radical prostatectomy required fewer narcotic refills and had lower narcotic costs while perineal radical prostatectomy required the greatest amount of narcotics. However, minimally invasive vs retropubic radical prostatectomy morphine sulfate equivalent requirements did not differ on adjusted analysis. While our findings support the purported advantage of minimally invasive radical prostatectomy of less postoperative pain, confirmatory prospective studies with objective outcomes are needed. © 2011 American Urological Association Education and Research, Inc.


OBJECTIVE: To examine contemporary outcomes of minimally invasive radical prostatectomy (MIRP) compared with open prostatectomy, using a national, prospective perioperative database reflecting diverse practice settings. METHODS: The National Surgical Quality Improvement Program database was queried from 2005 to 2010 for laparoscopic or robotic prostatectomy (Current Procedural Terminology code 55866) and open retropubic prostatectomy (Current Procedural Terminology codes 55840, 55842, 55845). Perioperative outcomes examined were surgical and total operation duration, transfusion rates, length of stay, major morbidity (cardiovascular, pulmonary, renal, and infectious), and mortality. RESULTS: The study identified 5319 radical prostatectomies: 4036 MIRP and 1283 open. Although operative time was significantly longer in the MIRP group, there were significantly fewer perioperative blood transfusions and shorter mean length of stay. Major postoperative morbidity and mortality were 5% in the MIRP group and 9% in the open group (P <.001). Age, body mass index, presence of medical comorbidities, and open surgical technique were all independently predictive of major complications and mortality on multivariate analysis. CONCLUSION: In a nationwide database of diverse medical centers, MIRP was associated with longer operative time, but a significantly decreased rate of blood transfusions, length of stay, perioperative
complication rate, and mortality compared with open prostatectomy. The minimally invasive surgical approach was independently associated with significantly fewer complications and deaths on multivariate analysis. Compared with other administrative databases that capture only inpatient events, the National Surgical Quality Improvement Program identifies complications up to 30 days postoperatively, providing more detailed characterization of complications after prostatectomy. These data reflect contemporary practice patterns and suggest that MIRP can be performed with low perioperative morbidity.


PURPOSE: Enthusiasm for laparoscopic surgical approaches to prostate cancer treatment has grown despite limited evidence of improved outcomes compared with open radical prostatectomy. We compared laparoscopic prostatectomy with or without robotic assistance vs open radical prostatectomy in terms of postoperative outcomes and subsequent cancer directed therapy. MATERIALS AND METHODS: Using a population based cancer registry linked with Medicare claims we identified men 66 years old or older with localized prostate cancer who underwent radical prostatectomy from 2003 to 2005. Outcome measures were general medical/surgical complications and mortality within 90 days after surgery, genitourinary/bowel complications within 365 days, radiation therapy and/or androgen deprivation therapy within 365 days and length of hospital stay. RESULTS: Of the 5,923 men 18% underwent laparoscopic radical prostatectomy. Adjusting for patient and tumor characteristics, there were no differences in the rate of general medical/surgical complications (OR 0.93 95% CI 0.77-1.14) or genitourinary/bowel complications (OR 0.96 95% CI 0.76-1.22), or in postoperative radiation and/or androgen deprivation (OR 0.80 95% CI 0.60-1.08). Laparoscopic prostatectomy was associated with a 35% shorter hospital stay (p <0.0001) and a lower bladder neck/urethral obstruction rate (OR 0.74, 95% CI 0.58-0.94). In laparoscopic cases surgeon volume was inversely associated with hospital stay and the odds of any genitourinary/bowel complication. CONCLUSIONS: Laparoscopic prostatectomy and open radical prostatectomy have similar rates of postoperative morbidity and additional treatment. Men considering prostate cancer surgery should understand the expected benefits and risks of each technique to facilitate decision making and set realistic expectations.


BACKGROUND: Race represents an established barrier to health care access in the United States and elsewhere. We examined whether race affects the utilization rate of minimally invasive radical prostatectomy (MIRP) in a populationbased sample of individuals from the United States. METHODS: Within the Healthcare Cost and Utilization Project Nationwide Inpatient Sample (NIS), we focused on patients in whom MIRP and open radical prostatectomy (ORP) were performed between 2001 and 2007. We assessed the proportions and temporal trends in race distributions between MIRP and
ORP. Multivariable logistic regression analyses further adjusted for age, year of surgery, baseline Charlson Comorbidity Index, annual hospital caseload tertiles, hospital region, insurance status, and median zip code income. RESULTS: Of 65,148 radical prostatectomies, 3581 (5.5%) were MIRPs. African Americans accounted for 11.4% of patients versus 78.8% for Caucasians versus 9.9% for others. Between 2001 and 2007, the annual proportions of Caucasian patients treated with MIRP were 2.2%, 0.9%, 2.6%, 7.2%, 4.7%, 9.3%, and 11.6%, respectively (chi-square trend p<0.001). For the same years in African American patients, the proportions were 0.8, 0.3, 1.4, 4.4, 3.5, 9.0 and 8.4% (chi-square trend P < .001). In multivariable analyses relative to Caucasian patients, African American patients were 14% less likely to undergo MIRP (P = .01). After period stratification between years 2001-2005 versus 2006-2007, African Americans were 22% less likely to undergo a MIRP in the early period (P = .007) versus 11% less likely to have a MIRP in the contemporary period (P = .1). CONCLUSIONS: The racial discrepancies in MIRP utilization rates are gradually improving. © 2011 American Cancer Society.


Purpose: Minimally invasive radical prostatectomy has supplanted radical retropubic prostatectomy in popularity despite the absence of strong comparative effectiveness data demonstrating its superiority. We examined the influence of patient, surgeon and hospital characteristics on the use of minimally invasive radical prostatectomy vs radical retropubic prostatectomy. Materials and Methods: Using SEER (Surveillance, Epidemiology and End Results)-Medicare linked data we identified 11,732 men who underwent radical prostatectomy from 2003 to 2007. We assessed the contribution of patient, surgeon and hospital characteristics to the likelihood of undergoing minimally invasive radical prostatectomy vs radical retropubic prostatectomy using multilevel logistic regression mixed models. Results: Patient factors (36.7%) contributed most to the use of minimally invasive radical prostatectomy vs radical retropubic prostatectomy, followed by surgeon (19.1%) and hospital (11.8%) factors. Among patient specific factors Asian race (OR 1.86, 95% CI 1.27-2.72, p = 0.001), clinically organ confined tumors (OR 2.71, 95% CI 1.60-4.57, p <0.001) and obtaining a second opinion from a urologist (OR 3.41, 95% CI 2.67-4.37, p <0.001) were associated with the highest use of minimally invasive radical prostatectomy while lower income was associated with decreased use of minimally invasive radical prostatectomy. Among surgeon and hospital specific factors, higher surgeon volume (OR 1.022, 95% CI 1.015-1.028, p <0.001), surgeon age younger than 50 years (OR 2.68, 95% CI 1.69-4.24, p <0.001) and greater hospital bed size (OR 1.001, 95% CI 1.001-1.002, p <0.001) were associated with increased use of minimally invasive radical prostatectomy, while solo or 2 urologist practices were associated with decreased use of minimally invasive radical prostatectomy. Among surgeon and hospital specific factors, higher surgeon volume (OR 1.022, 95% CI 1.015-1.028, p <0.001), surgeon age younger than 50 years (OR 2.68, 95% CI 1.69-4.24, p <0.001) and greater hospital bed size (OR 1.001, 95% CI 1.001-1.002, p <0.001) were associated with increased use of minimally invasive radical prostatectomy, while solo or 2 urologist practices were associated with decreased use of minimally invasive radical prostatectomy (OR 0.48, 95% CI 0.27-0.86, p = 0.013). Conclusions: The adoption of minimally invasive radical prostatectomy vs radical retropubic prostatectomy is multifactorial, and associated with specific patient, surgeon and hospital related factors. Obtaining a second opinion from another urologist was the strongest factor associated with opting for minimally invasive radical prostatectomy. © 2012 American Urological Association Education and Research, Inc.
Objective To characterize factors associated with positive surgical margins (PSMs) and derive population-based PSM cutoffs to evaluate surgeon performance in radical prostatectomy (RP). Patients and Methods SEER-Medicare data were used to identify 4247 men diagnosed with prostate cancer during 2004-2005 who underwent RP up to 2006. We performed logistic regression to assess the impact of tumour characteristics, surgeon volume and surgical approach on the likelihood of PSMs for pT2 and PT3a disease. Moreover, we derived 25th and 10th percentile cutoffs from binomial distribution equations. Results Overall, 19.4% of men experienced PSMs with a pT2 vs pT3a PSM rate of 14.9% vs 42% (P < 0.001). Extrapolating from our population-based results, a surgeon incurring more than three PSMs in 10 cases of pT2 disease performed below the 25th percentile. There was a trend for fewer PSMs with minimally invasive vs open RP (17.4% vs 20.1%, P= 0.086), and the PSM rate also decreased over the study period from 21.3% in 2004 to 16.6% in 2006 (P= 0.028) with significant geographic variation (P < 0.001). In adjusted analyses, temporal and geographic variation in PSM persisted, and men with high (odds ratio 3.68, 95% CI 2.82-4.81) and intermediate (odds ratio 2.52, 95% CI 2.03-3.13) vs low-risk disease were at greater odds to experience PSMs. Notably, neither surgical approach nor surgeon volume was significantly associated with PSMs. Conclusion Our population-based PSM benchmarks allow identification of under-performing outliers who may seek courses or video self-study to improve outcomes. There was significant temporal and geographic variation in PSMs but neither surgeon volume nor surgical approach was associated with PSMs. © 2010 BJU INTERNATIONAL.


There is an increasing trend of minimally invasive treatments for prostate cancer with increased utilization of robotic technology contributing largely to this trend. Our study found that increased utilization of MIRP corresponded with a decreasing trend for complications, blood transfusions, lengths of stay and need for reoperation. Additionally, MIRP was found to have fewer associated complications compared with men undergoing open procedures. OBJECTIVE • To determine differences in surgical outcomes by surgical approach during a period of rapid adoption of minimally invasive surgical approaches in radical prostatectomy. PATIENTS AND METHODS • We identified 19 542 men undergoing minimally invasive (MIRP), perineal (PRP), and retropubic (RRP) radical prostatectomy from 2003 to 2006 from the MarketScan® Medstat database, a national employer-based administrative database. • We assessed for temporal trends in perioperative complications, use of postoperative cystography and anastomotic strictures by surgical approach. RESULTS • Between 2003 and 2006, MIRP use increased 33.6% vs 31.8% and 1.7% decreases in RRP and PRP, respectively. During the 4-year study, median length of stay for MIRP decreased from 2.0 to 1.0 day (P= 0.004) and overall perioperative complications decreased from 13.8 to 10.7%, (P= 0.023). • These findings were driven by reductions in genitourinary complications (3.3 to 2.5%, P= 0.049), miscellaneous surgical complications (3.6 to 2.3%, P= 0.006) and intestinal injury (1.5 to 0.1%, P= 0.009). • Median length of stay for RRP decreased from 3.2 to 2.9 days, (P < 0.001), overall perioperative complications decreased from 18.1 to 14.6%, (P= 0.007),
because of reductions in both wound/bleeding complications (2.0 to 1.1%, P= 0.002) and heterologous blood transfusions. • Men undergoing MIRP vs RRP were less likely to have perioperative complications (12.5 vs 17.1%, P < 0.001), blood transfusions (1.5 vs 8.9%, P < 0.001) and anastomotic strictures (6.3 vs 12.8%, P < 0.001), and they had shorter mean lengths of stay (1.8 vs 3.1 days, P < 0.001) during the study period.

CONCLUSION • The increased use of MIRP corresponds with a decreasing trend for complications, blood transfusions, lengths of stay and need for reoperation. Additionally, MIRP was found to have fewer associated complications compared with men undergoing open procedures. Further study is needed to assess the impact of tumour characteristics and surgeon volume on these perioperative outcomes as well as effects on long-term cancer control. © 2010 BJU International.