Review

Comparison of Vaginal Hysterectomy Techniques and Interventions for Benign Indications

A Systematic Review

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OBJECTIVE: To create evidence-based clinical practice guidelines based on a systematic review of published literature regarding the risks and benefits of available preoperative, intraoperative, and postoperative technical steps and interventions at the time of vaginal hysterectomy for benign indications.

DATA SOURCES: We systematically searched the literature to identify studies that compared technical steps or interventions during the preoperative, intraoperative, and postoperative periods surrounding vaginal hysterectomy. We searched MEDLINE, Cochrane Central Register of Controlled Trials, Health Technology Assessments, and ClinicalTrials.gov from their inception until April 10, 2016, using the MeSH term "Hysterectomy, Vaginal" and associated text words. We included comparative studies, single-group studies, and systematic reviews published in English.

METHODS OF STUDY SELECTION: We double-screened 4,250 abstracts, identifying 60 eligible studies. Discrepancies were adjudicated by a third reviewer. We followed standard systematic review methodology and the Grades for Recommendation, Assessment, Development and Evaluation approach to evaluate the evidence and generate guideline recommendations.

TABULATION, INTEGRATION, AND RESULTS: Because of limited literature, only 16 perioperative risks, technical steps, and interventions were identified: obesity, large uteri, prior surgery, gonadotropin-releasing hormone agonists, vaginal antisepsis, bilateral salpingo-oophorectomy, morcellation, apical closure, uterine sealers, hemostatic injectants, hot cone, retractor, cystoscopy, vaginal packing, bladder management, and accustimulation. We organized and reported these as four domains: patient selection, preoperative, intraoperative, and postoperative. We did not identify any patient characteristics precluding a vaginal approach; chlorhexidine or povidone is appropriate for vaginal antisepsis; vasopressin decreases blood loss by 130 cc; tissue-sealing devices decrease blood loss by 44 cc and operative time by 15 minutes with uncertain complication implications; vertical cuff closure results in 1-cm increased vaginal length; either peritoneum or epithelium can be used for colpotomy closure; and routine vaginal packing is not advised.

CONCLUSION: Minimal data exist to guide surgeons with respect to planning and performing a vaginal hysterectomy. This study identifies available information and future areas for investigation.

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Hysterectomy is one of the most frequently performed surgeries in the United States, with more than 400,000 hysterectomies performed annually.[1,2] A systematic review of 47 randomized controlled trials (RCTs) including 5,102 hysterectomies concluded that a vaginal approach is the safest and most cost-effective route of hysterectomy.[3] Congruent with these findings, the American College of Obstetricians and Gynecologists recommends a vaginal approach as the preferred route of hysterectomy.[4] Despite this recommendation, the proportion of hysterectomies performed vaginally has steadily decreased from 25% in 1998 to 17% in 2010.[2]

Gynecologists have cited potential complications, technical difficulties, lack of experience, and low-volume caseload as barriers to performing a vaginal hysterectomy.[5] These barriers, in part, may be addressed with increased knowledge about the factors associated with success and failure of a vaginal approach. In addition, our systematic review of the literature (described in the next paragraph) did not identify any published clinical practice guidelines to direct surgeons on how to perform a vaginal hysterectomy. With these barriers in mind, the Society of Gynecologic Surgeons Systematic Review Group performed a systematic review to create an evidence-based clinical practice guideline that addresses the relative risks and benefits of available preoperative, intraoperative, and postoperative technical steps and interventions at the time of vaginal hysterectomy for benign indications.

SOURCES

The Society of Gynecologic Surgeons Systematic Review Group includes members with clinical and surgical expertise on performing vaginal hysterectomy and in the conduct of systematic review and guideline development. We systematically searched the literature to identify studies comparing technical step options and interventions during the preoperative, intraoperative, and postoperative periods surrounding a vaginal hysterectomy. We followed standard systematic review methodology and the Grades for Recommendation, Assessment, Development and Evaluation approach to evaluate the evidence for guideline recommendations.[6,7] We searched MEDLINE, Cochrane Central Register of Controlled Trials, Health Technology Assessments, and ClinicalTrials.gov from their inception until April 10, 2016. We used a broad search strategy to identify all technical steps and interventions that had been assessed. Our search included all studies related to the MeSH term "Hysterectomy, Vaginal" and associated text words. The search was limited to English language and comparative studies, single-group studies, and systematic reviews.

STUDY SELECTION

We included studies reporting on vaginal hysterectomy for benign indications. We excluded studies that did not separately report data for vaginal hysterectomy alone and studies that compared vaginal hysterectomy with another route of hysterectomy.

Interventions of interest included any technical step, intervention, or decision related to the performance of a vaginal hysterectomy, including technical surgical aspects or management in the preoperative and postoperative period, or patient characteristics that may be considered traditional barriers to performing a vaginal hysterectomy. Comparators of interest included any alternate treatment methods. Included studies had to report intraoperative outcomes (eg, surgical time, estimated blood loss) or postoperative outcomes (eg, vaginal length, pain, nausea, and length of hospital stay).

Citations from the search were screened for eligibility by 11 reviewers using Abstrackr (http://abstrackr.cebm.brown.edu/).[8] To establish relevance and consensus among reviewers, all 11 reviewers screened 150 abstracts. Once consensus was assured, all remaining abstracts were independently screened in duplicate with discrepancies adjudicated by a third reviewer. Potentially relevant full-text articles were then independently reviewed and double-screened by 10 reviewers, who extracted data from all included studies.

We extracted data on study characteristics, participant characteristics, funding source, intervention details, length of follow-up, outcomes of interest, and how the outcomes were assessed. After data extraction, we categorized all interventions into the following four domains: 1) preoperative, 2) intraoperative, 3) postoperative, and 4) patient selection factors. These interventions are listed in Table 1.

The methodologic quality (or risk of bias) of each study was assessed with the Cochrane risk of bias tool for RCTs and selected questions from the Newcastle-Ottawa Scale for observational studies.[9,10] The overall quality of each study was then categorized as good (A), fair (B), or poor (C). Each study outcome was also assessed for possible downgrading of quality because of outcome-specific concerns.[6] An evidence profile was generated for each intervention category (eg, vaginal preparation, hemostatic injection) by grading the quality of evidence for each outcome (eg, estimated blood loss, length of hospital stay) across studies.[6,11]

Table 1. Evidence for Comparative Outcomes

Domain	Intervention or Factor	Strength of Evidence	No. of Studies	Total No. of Participants
Patient selection*	Obesity	Low	3	1,131
	Obese patients have longer operative times, higher EBL and transfusion rates; no increase in risk of complications or hospital stay			
	Traditional contraindications*	Low	2	920
	No differences in hospital stay, operative time, time to regular diet, hematocrit, transfusion rate, febrile morbidity, cystitis, urinary tract injury, or overall complication rates			
Preoperative	Gonadotropin-releasing hormone	Insufficient	1	50
	Gonadotropin-releasing hormone agonists increased the number of hysterectomies completed vaginally without differences in uterine weight or transfusion rates			
	Vaginal antisepsis	Low	2	83
	No difference in incidence of postoperative vaginal infections			
Intraoperative	Bilateral salpingo-oophorectomy	Low	3	1,216
	No increase in estimated blood loss, complications, or length of stay; oophorectomy is likely associated with longer operative time			
	Morcellation	Low	3	2,432
	There are no substantial harms associated with morcellation, but operative time is increased			
	Apical closure technique	Low	3	202
	Vertical cuff closure results in slight increase in vaginal length			
	Peritoneal closure	Low	5	363
	There are no benefits or harms to closing the peritoneum			
	Tissue sealer vs conventional ligation	Moderate	15	1,389
	Tissue sealer devices may decrease operative time and blood loss compared with traditional suture ligation with unknown complication risks			
	Hemostatic injectants	Low	5	345
	Vasopressin appears to decrease blood loss with no difference in infections, operative time, or hospital stay			
	Hormone (estrogen)	Insufficient	1	269
	Estrogen may improve wound healing			
	Hot cone	Insufficient	1	402
	Cervical cautery may decrease infection rates if preoperative antibiotics are not available			
	Retractor	Insufficient	1	213
	Self-retaining retractors may work as well as a surgical assistant			
	Cystoscopy	Insufficient	1	593
	Cystoscopy does not demonstrate a difference in ureteral injury identification or costs			
Postoperative	Vaginal packing	Moderate	3	395
	There are no apparent net benefits to vaginal packing			
	Bladder management	Insufficient	5	369
	Various interventions and outcomes were evaluated resulting in insufficient data and inability to provide useful recommendations.			
	Vaginal Drain	Insufficient	1	272
	There are no net benefits to placing a vaginal drain.			
	Postoperative recovery	Insufficient	2	300
	Standardized protocols improve postoperative recovery; accustimulation may decrease nausea and vomiting			

EBL, estimated blood loss.

* Patient selection: characteristics that may be considered barriers to performing a vaginal hysterectomy such as prior laparotomy or cesarean delivery, nulliparity, or large uterus.

We considered methodologic quality, consistency of results across studies, directness of evidence, and other factors such as imprecision or sparseness of evidence to determine an overall quality of evidence in accordance with the Grades for Recommendation, Assessment, Development and Evaluation system. The overall strength of evidence for each outcome was categorized as high, moderate, low, or insufficient.[6,11] For outcomes with two or less studies or if we were unable to find an association or effect (generally because of imprecision or inconsistency across studies), we determined that the evidence was "insufficient."

We developed recommendation statements incorporating the balance between benefits and harms of the compared interventions when there was sufficient

evidence (of high, moderate, or low strength) to support these statements. Each recommendation statement was assigned a strength of recommendation (1–"strong" or 2–"weak") based on the quality of the supporting evidence and the magnitude of the net medical benefit (benefits compared with harms) to indicate the confidence that adherence to the recommendation will do more good than harm. We presented our findings at the Society of Gynecologic Surgeons Annual Scientific Meeting in April 2016. The draft guideline was made available to the entire Society of Gynecologic Surgeons membership for review for 10 days after public presentation and to the Society's executive committee for final approval. Feedback from Society of Gynecologic Surgeons members and leadership was incorporated into the final recommendations.

RESULTS

The literature search identified 4,250 abstracts; 264 full-text papers were retrieved and assessed in detail (Fig. 1). In total, 60 studies were eligible and included in this review. We categorized the studies into 18 interventions, as outlined in Table 1 and Appendices 1–15 (appendices available online at http://links.lww.com/AOG/A944).

The Society of Gynecologic Surgeons Systematic Review Group developed an evidence-based clinical practice guideline for performing vaginal hysterectomy with specific recommendations (Box 1) when there is sufficient evidence to warrant recommendations. To reiterate, each recommendation received a strength of recommendation (1=strong, "we recommend" or 2=weak, "we suggest") and overall strength of evidence (high [A] to low [C]). Most of the recommendations were graded as 2B or 2C, indicating that existing evidence supports suggestions that the majority of patients and clinicians would want to follow but many would not. Clinical judgment is needed for these suggestions because physicians must evaluate the particular needs of each patient to arrive at the best management decision for that patient. From a policymaking standpoint, additional evidence is needed for most aspects of a vaginal hysterectomy before a policy statement could be made on "best" performance of a vaginal hysterectomy.

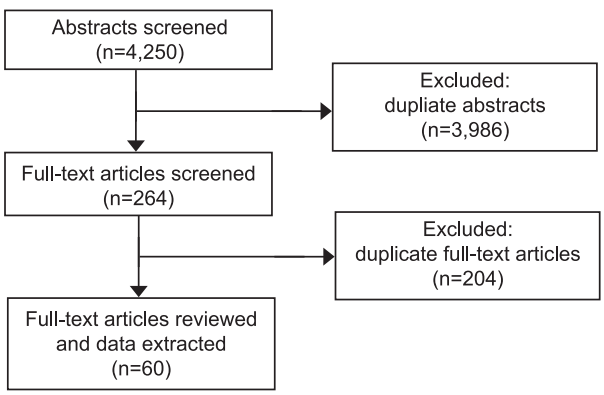

Fig. 1. Flow diagram showing study selection.

Jeppson. Vaginal Hysterectomy Systematic Review. Obstet Gynecol 2017.

Box 1. Vaginal Hysterectomy Clinical Practice Guidelines

Patient selection

- We suggest the following factors need not be deterrents to attempting a transvaginal approach (grade 2C):
  - Obesity
  - Prior cesarean delivery or other laparotomy
  - Nulliparity
  - Planned concomitant bilateral salpingo-oophorectomy
  - Enlarged uterus

Preoperative

- We suggest either 4% chlorhexidine or povidone for vaginal surgical site antisepsis (grade 2B).

Intraoperative

- We suggest injecting vasopressin intracervically at the start of vaginal hysterectomy to decrease blood loss (grade 2B).
- We suggest using tissue sealing devices to limit blood loss and shorten operative time, but these benefits should be balanced against the potential risk of thermal complications and uncertain cost implications (grade 2B).
- If postoperative vaginal length is a concern, we suggest vertical cuff closure at the time of vaginal hysterectomy (grade 2B).
- We suggest that either peritoneum or vaginal epithelium can be used for colpotomy closure (grade 2C).

Postoperative

- We recommend against the routine use of vaginal packing for improvement in postoperative pain, bleeding, or infections (grade 1B).

Seven studies examined patient characteristics that may be considered barriers to performing a vaginal hysterectomy (n=3,259) consisting of poor (five studies[12–16]) or fair (two studies[17,18]) quality. Comparing subpopulations of women undergoing vaginal hysterectomy with characteristics that may be considered barriers to vaginal hysterectomy (ie, prior laparotomy, cesarean delivery, nulliparity, or uterus greater than 180 g) with women without these

characteristics, no difference was observed in length of hospital stay (low strength of evidence).[13,16]

Three studies compared intraoperative and postoperative outcomes in nonobese and obese patients undergoing vaginal hysterectomy; nonobese patients had shorter operative times (moderate strength of evidence) and less intraoperative estimated blood loss and perioperative transfusions (low strength of evidence).[14,15,17] However, obesity was not associated with increased duration of hospital stay or increased risk of complications (ie, reoperation, viscus injury, venous thromboembolism, or urinary retention; low strength of evidence). There was insufficient evidence regarding febrile morbidity and postoperative cystitis. No absolute contraindications to vaginal hysterectomy were identified.

Only one study, of good quality, compared preoperative gonadotropin-releasing hormone therapy with no therapy (n=50).[19] Women with symptomatic 14–18 weeks-sized fibroid uteri planning hysterectomy received 8 weeks of preoperative therapy compared with no therapy. A greater proportion of women who received therapy had their hysterectomies completed vaginally (low strength of evidence). There were no differences in final uterine weight, transfusion rates, or postoperative hematocrit levels (low strength of evidence). Data are lacking on complications associated with 8 weeks of agonist therapy. There is not enough data to recommend for or against gonadotropin-releasing hormone therapy before vaginal hysterectomy.

Three studies compared uterine morcellation with intact uterine extirpation at the time of vaginal hysterectomy (n=2,432) of poor (two studies[20,21]) or fair (one study[22]) quality. There was no difference in bladder injury or postoperative febrile morbidity (both moderate strength of evidence), postoperative transfusion or other bleeding-related outcomes, conversion to laparotomy, or length of hospital stay (all low strength of evidence); however, operative time increased with morcellation (low strength of evidence). We did not identify any articles commenting on the risk of leiomyosarcoma at the time of vaginal hysterectomy and cannot comment on that risk. Based on the studies included, there were no significant risks identified for uterine morcellation at the time of vaginal hysterectomy.

Two studies compared vaginal cleaning solutions before vaginal hysterectomy (n=83) with good[23] and poor[24] study quality. One study (n=50) compared povidone–iodine with chlorhexidine[23] and the other (n=33) compared povidone–iodine with a saline solution.[24] There was no difference in postoperative vaginal infection rates among chlorhexidine, povidone, and saline. The study that compared povidone–iodine with chlorhexidine used a surrogate of bacterial load after vaginal cleaning with a significantly lower number of bacteria present in the chlorhexidine group (high strength of evidence). The results of povidone compared with saline should be interpreted with caution because all patients in that study received 24 hours of postoperative prophylactic antibiotics (low strength of evidence).[24] There were no adverse events reported, including mucosal irritation or contact dermatitis, for the women who received chlorhexidine. There were no identified risks for the routine use of vaginal antisepsis at the time of vaginal hysterectomy.

Three studies compared surgical outcomes for bilateral salpingo-oophorectomy (BSO) compared with no BSO at the time of vaginal hysterectomy (n=1,216) with poor study quality.[25–27] They found no difference in hospital length of stay or perioperative complications, including transfusion (low-quality evidence). Concurrent BSO increases surgical time by 2–23 minutes (low strength of evidence). Concurrent BSO does not seem to appreciably increase surgical risk at the time of vaginal hysterectomy.

Three studies compared vertical with horizontal cuff closure (n=202) in vaginal hysterectomy without concomitant apical suspension with good[28,29] and poor[30] study quality. Vertical cuff closure (ie, ending with a vertical repair line of the epithelial scar) demonstrated 1-cm longer vaginal length 6 weeks after surgery compared with horizontal closure, but the clinical significance of this difference is unclear and patient-centered outcomes (ie, dyspareunia, prolapse) were not reported.[28,29] Closure technique did not demonstrate any difference in operative time, blood transfusion, or cuff cellulitis (moderate strength of evidence).

Five studies compared intracervical injection of vasopressin with normal saline or no injection at the beginning of vaginal hysterectomy (n=345) with good,[31,32] fair,[33,34] and poor[35] study quality. Compared with women in a control group, vasopressin decreased estimated blood loss by approximately 130 cc with higher postoperative hematocrit (1–2%; moderate-quality evidence); there was no difference in incidence of vaginal cuff infection (moderate-quality evidence), operative time (low-quality evidence), or hospital length of stay (high-quality evidence). Vasopressin may cause temporary elevations in blood pressure and increased postoperative narcotic use (low-strength evidence). Overall, the benefits of intracervical injections of vasopressin at the start of vaginal hysterectomy may outweigh the potential harms (moderate strength of evidence), but a 2% difference in postoperative hematocrit is probably not clinically significant under most circumstances.

Fifteen studies examined the use of a tissue sealing, stapling, or suturing device compared with traditional clamping and suture ligation during vaginal hysterectomy (n=1,389). The number of study participants per trial ranged from 10[36] to 200,[37] and study qualities were good,[38–43] fair,[44,45] and

Table 2. Vaginal Hysterectomy Interventions With Insufficient Evidence

Intervention	No. of Studies	Study Details
Patient selection	1	Numerous outcomes were assessed by only one study each; insufficient evidence regarding operative time, time to resumption of regular diet, change in hematocrit, transfusion rate, febrile morbidity, postoperative cystitis, injury to lower urinary tract, or overall complication rates[12,13,16,18]
Bilateral salpingo-oophorectomy	1	Insufficient evidence is available to comment on factors associated with successful completion of BSO[59]
Peritoneal closure	5	Five studies evaluated peritoneal closure (n=363) with fair[60–63] and poor[64] study quality; three studies compared only closing peritoneum with only closing vaginal epithelium (n=207) [60,62,64]; overall, no difference was seen in complications between groups with the exception of one study that intentionally left a small portion of the peritoneum open to drain, which reported one fallopian tube prolapse and one bowel evisceration[62]; all of these studies were underpowered for both their primary and secondary outcomes; there is insufficient evidence to recommend for or against adding peritoneal closure when closing the vaginal cuff
Tissue sealers	2	One study evaluated the Multifire Endo-GIA stapler compared with traditional suture ligation (n=10)[46]; another study compared an aneurysm needle suture technique with traditional suturing (n=46)[37]; based on the limited data regarding these techniques, reliable conclusions cannot be made
Bladder function	3	Three studies evaluated pharmacologic agents on postoperative voiding dysfunction[65–67]; prostaglandin E2 may decrease febrile morbidity, duration of catheter use, and length of hospital stay (insufficient evidence); prostaglandin F2á did not demonstrate any benefit (insufficient evidence); oral α-adrenergic blockers may decrease postoperative urinary retention (insufficient evidence); there is insufficient evidence to recommend the routine use of medical management to facilitate Foley catheter removal
Hormone	1	Compared transdermal systemic estrogen with local vaginal estrogen on wound healing and infection[68]; possible improved wound healing in both estrogen groups
Hot cone	1	"Hot cone" refers to removing the central portion of the cervix with cautery to help with antisepsis, not dysplasia; three-armed study evaluated the effect of cervical conization with cautery on postoperative infection; the cautery group demonstrated similar infection rates with the antibiotic group and much lower infection rates than the no antibiotic group[69]
Retractor	1	Compared a self-retaining retractor with standard assistant retraction without any between-group differences in surgical time or estimated blood loss[70]
Cystoscopy	1	Compared routine cystoscopy with no cystoscopy at the time of vaginal hysterectomy with similar ureteral injuries and costs between groups[71]
Vaginal drain	1	Compared placement of a vaginal vault drain with no drain; no difference noted with respect to febrile morbidity, hospital readmission, blood transfusion, postoperative hematocrit change, or length of hospital stay[72]
Postoperative recovery: recovery protocol	1	Compared a standardized recovery protocol with routine care in a population of women undergoing vaginal hysterectomy[73]; the standardized protocol decreased use of vaginal packing, duration of catheter, and overall length of hospital stay
Postoperative recovery: accustimulation	1	Accustimulation is a practice of applying mild electrical stimulation to acupuncture sites; compared the inclusion of accustimulation with routine care with decreased nausea and vomiting in the accustimulation group[74]

BSO, bilateral salpingo-oophorectomy.

poor.[36,37,46–50] Eight studies evaluated the Ligasure,[36,38–40,43,44,48,50] and four examined other similar bipolar clamps.[42,45,47,49] One study evaluated ultrasonic shears compared with traditional suture ligation (n=43).[41] Narcotic analgesia use, length of hospital stay, hysterectomy time, and total operative time were similar in both groups (high strength of evidence). Estimated blood loss was less in the ultrasonic shears group without a difference in postoperative hemoglobin change (moderate strength of evidence). Two additional studies that reported on different surgical products are included in Table 2.

Bipolar tissue sealer instruments resulted in 15 minute shorter operative times (high strength of evidence) and 44 mL less intraoperative estimated blood loss (moderate strength of evidence) than conventional suturing with no other significant differences between groups (moderate strength of evidence). Subsequently, there do not appear to be any net benefits for one method (moderate strength of evidence) with the exception of surgical time favoring tissue sealers (high strength of evidence). However, this benefit should be weighed against device cost and unclear complication risks because none of the studies was adequately powered to evaluate for rare adverse events.

Three RCTs compared vaginal packing with no packing in a population of women undergoing vaginal hysterectomy (n=395) with good study quality.[51–53] There were no apparent net benefits to vaginal packing for postoperative pain, satisfaction, bleeding, or infections (moderate strength of evidence). In addition, vaginal packing did not have an effect on the presence of a cuff hematoma 6 weeks after surgery (low strength of evidence). There were no identified benefits for the use of routine vaginal packing at the time of vaginal hysterectomy.

Two studies compared catheter management after vaginal hysterectomy.[54,55] Early removal of a bladder catheter decreases febrile morbidity and length of stay but may result in catheter replacement (low-quality evidence). All remaining interventions have insufficient evidence and are reported in Table 2.

DISCUSSION

This systematic review provides evidence to support several vaginal hysterectomy clinical practice guidelines. We have listed these in Box 1. This study also highlights the areas of limited data and may facilitate hypothesis generation by identifying additional areas where future investigation may be helpful (Table 3).

We developed an a priori list of interventions and patient factors to consider when planning a vaginal hysterectomy and included additional interventions that were identified in eligible studies. However, we found comparative evidence for only a subset of these interventions and adequate ("sufficient") evidence for a small subset of those comparisons. To improve evidence-based decision-making, future studies are needed for a wide range of interventions and are listed in Table 3. Only the recommendation against routine postoperative vaginal packing rose to level 1 (specifically 1B), indicating that the risks of postoperative vaginal packing generally outweigh the benefits for most patients.

Table 3. Areas Lacking for Guidance of Vaginal Hysterectomy

Timing	Interventions*
Preoperative	Preoperative bowel preparation, prophylactic antibiotics,treatment of bacterial vaginosis, thromboprophylaxis
Intraoperative	Patient positioning, surgeon positioning, general vs spinal anesthesia
Surgical techniques	Blunt vs sharp dissection, colpotomy techniques, retractor use, vaginal morcellation techniques
Immediate postoperative	Routine hemoglobin and hematocrit or chemistry laboratory panels
Long-term postoperative	Sexual function, chronic pain, vaginal prolapse, urinary incontinence, quality of life, patient satisfaction

* Various study types (including comparative cohorts, randomized controlled trials, and case–control studies) could be used to provide additional information on these interventions.

We identified two prior systematic reviews that evaluated electrosurgical vessel sealing for vaginal hysterectomy.[56,57] Similar to our findings, Kroft et al[56] found shorter operative times and lower estimated blood loss with the use of vessel sealing devices compared with conventional suturing. In contrast to our study, however, these authors found improved postoperative hematocrit levels, reduced patient-reported pain, and shorter hospital stay. A second systematic review by Pergialiotis et al[57] reported lower estimated blood loss but no difference in operative time with electrosurgical bipolar instruments. The discrepancies between the prior systematic reviews and our systematic review are likely attributable to our inclusion of a broader range of studies. The prior systematic reviews were restricted to seven and eight RCTs, respectively.[56,57] In contrast, we also included nonrandomized comparative studies for a total of 15 studies (of electrosurgical vessel sealing),

10 of which were RCTs. We also included other vessel sealing technologies including bipolar, ultrasonic, and stapling, whereas the prior reviews only included bipolar devices.

This review has several strengths including robust methodology and utilization of clear, reproducible practice guideline development based on evidence-based clinical data. This review was performed by experienced reviewers using an updated systematic review methodology, allowing us to combine and grade evidence from different study types.[6] This methodology allows surgeons and patients to interpret and make personal decisions about risks and benefits of technical steps and interventions at the time of vaginal hysterectomy.[6] This systematic review is limited by the available evidence in the medical literature on interventions to facilitate optimal outcomes after vaginal hysterectomy. We have presented all available studies in this area and highlighted gaps in the evidence (Table 3) that may help researchers formulate future research studies on this important topic.

One limitation of this practice guideline is that we restricted our search to studies specifically related to vaginal hysterectomy. For example, the Centers for Disease Control and Prevention published a systematic review with very robust data, which essentially recommends minimizing urinary catheter use and duration for all patients. The results of our study support those findings but are based on very sparse data because only two studies were included in this systematic review specific to the use of an indwelling catheter at the time of a vaginal hysterectomy.[58] Standard medical management and surgical techniques from broad medical literature and surgeon experience should be used for decision-making in areas that are not well addressed by this review such as minimizing urinary catheter use and decisions about vaginal hysterectomy with concomitant pelvic reconstruction.

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