Guideline

DOI: 10.4274/anajog.galenos.2026.06078

Anat J Obstet Gynecol Res 2026;3(1):1-20

Vaginal Natural Orifice Transluminal Endoscopic Surgery (vNOTES) Hysterectomy in Benign Gynecologic Indications: Evidence-Based Recommendations of the Pelvic Floor and Cosmetic Gynecology (PETKOZ) Association, Combined with Expert Consensus - A National Guideline

Murat Yassa[1], Ozan Karadeniz[2], Cihan Kaya[3], Ozan Doğan[4], Baki Şentürk[5], Eray Çalışkan[6], Yaşam Kemal Akpak[7], Pınar Birol İlter[8], Sinem Bostan[1], Eralp Bulutlar[9], Behzat Can[10], Hüseyin Cengiz[11], Murat Ekin[12], Mustafa Melih Erkan[13], Selçuk Erkılınç[14], Elif Eryılmaz[15], Mehmet Genco[16], Ahkam Göksel Kanmaz[7], Osman Samet Günkaya[17], İlkhan Keskin[18], Fatma Ketenci Gencer[19], Memiş Ali Mutlu[1], İsa Aykut Özdemir[12], Koray Görkem Saçıntı[20], Süleyman Salman[21], Mehmet Akif Sargın[22], Arzu Bilge Tekin[23], Mahmut Yassa[2]

[1]Acıbadem Kartal Hospital, Clinic of Obstetrics and Gynecology, İstanbul, Turkey
[2]University of Health Sciences Turkey, Basakşehir Çam and Sakura City Hospital, Clinic of Obstetrics and Gynecology, İstanbul, Turkey
[3]İstanbul Aydın University Faculty of Medicine, Department of Obstetrics and Gynecology, İstanbul, Turkey
[4]İstanbul Nişantaşı University Faculty of Medicine, Department of Obstetrics and Gynecology, İstanbul, Turkey
[5]Tekirdağ Namık Kemal University Faculty of Medicine, Department of Obstetrics and Gynecology, Tekirdağ, Turkey
[6]Private Clinic, Department of Obstetrics and Gynecology, Kocaeli, Turkey
[7]University of Health Sciences Turkey, İzmir City Hospital, Clinic of Obstetrics and Gynecology, İzmir, Turkey
[8]Kütahya City Hospital, Clinic of Obstetrics and Gynecology, Kütahya, Turkey
[9]Üsküdar University Faculty of Medicine, Department of Obstetrics and Gynecology, İstanbul, Turkey
[10]Bower Private Hospital, Clinic of Obstetrics and Gynecology, Diyarbakır, Turkey
[11]Private Clinic, Department of Obstetrics and Gynecology, İstanbul, Turkey
[12]Medipol Mega University Hospital, Department of Obstetrics and Gynecology, İstanbul, Turkey
[13]Medicana International İzmir Hospital, Clinic of Obstetrics and Gynecology, İzmir, Turkey
[14]İzmir Demokrasi University Faculty of Medicine, Department of Obstetrics and Gynecology, İzmir, Turkey
[15]Private Çallı Meydan Medical Center, Department of Obstetrics and Gynecology, Antalya, Turkey
[16]Kayseri City Hospital, Clinic of Obstetrics and Gynecology, Kayseri, Turkey
[17]Memorial Ataşehir Hospital, Clinic of Obstetrics and Gynecology, İstanbul, Turkey
[18]Bartın State Hospital, Clinic of Obstetrics and Gynecology, Bartın, Turkey
[19]University of Health Sciences Turkey, Gaziosmanpaşa Training and Research Hospital, Clinic of Obstetrics and Gynecology, İstanbul, Turkey
[20]Yale School of Medicine, Department of Obstetrics, Gynecology and Reproductive Sciences, New Haven, United States
[21]Medicalpark TEM Hospital, Clinic of Obstetrics and Gynecology, İstanbul, Turkey
[22]Okan University Faculty of Medicine, Department of Obstetrics and Gynecology, İstanbul, Turkey
[23]University of Health Sciences Turkey, Sancaktepe Şehit Prof.Dr. İlhan Varank Training and Research Hospital, Clinic of Obstetrics and Gynecology, İstanbul, Turkey
*Authors: (The names are listed alphabetically by surname after the first six names.)

Address for Correspondence: Assoc. Prof. Murat Yassa, Acıbadem Kartal Hospital, Clinic of Obstetrics and Gynecology, İstanbul, Turkey
E-mail: murat.yassa@gmail.com **ORCID ID:** orcid.org/0000-0001-8661-1192
Received: 14.04.2026 **Accepted:** 24.04.2026 **Epub:** 08.05.2026 **Publication Date:** 13.05.2026

Cite this article as: Yassa M, Karadeniz O, Kaya C. Vaginal natural orifice transluminal endoscopic surgery (vNOTES) hysterectomy in benign gynecologic indications: Evidence-Based Recommendations of the Pelvic Floor and Cosmetic Gynecology (PETKOZ) Association, combined with expert consensus - a national guideline. Anat J Obstet Gynecol Res. 2026;3(1):1-20

1. Contraindications

1.1. Prior Cesarean sections or benign gynecological pelvic surgery or small bowel surgery or colon surgery, nulliparity, postmenopausal status, absence of uterine prolapse (Grade 2 or higher), large uteri, long or narrow or atrophic vagina, history of pelvic inflammatory disease is not a contraindication for vNOTES hysterectomy [GPP].

1.2. Deep infiltrating endometriosis is a contraindication for vNOTES benign hysterectomy [GPP].

2. Preoperative Preparation and Assessment

2.1. Ultrasound assessment of the cul-de-sac using the sliding sign and bimanual vaginal examination should be routinely performed in the preoperative evaluation for vNOTES hysterectomy [GPP].

2.2. Routine preoperative laxative administration (oral or intravenous) is not recommended prior to vNOTES hysterectomy [GPP].

2.3. Preoperative vaginal culture, preoperative rectal mechanical bowel preparation, and a special preoperative dietary restriction is not required in asymptomatic patients scheduled for vNOTES hysterectomy [GPP].

2.4. The recommended preoperative antibiotic prophylaxis regimen for vNOTES hysterectomy is 2 g cefazolin sodium combined with 1 g metronidazole [GPP].

3. Perioperative Management

3.1. Compression stockings and early postoperative mobilization are recommended as part of venous thromboembolism prophylaxis for vNOTES hysterectomy. Pharmacological anticoagulant prophylaxis should not be administered routinely following vNOTES hysterectomy but should be individualized according to patient-specific risk factors and classification (e.g., Caprini score). When pharmacological anticoagulant prophylaxis is indicated, administration should commence between the 6th and 12th postoperative hour [GPP].

3.2. An indwelling urinary catheter should be routinely inserted and maintained throughout vNOTES hysterectomy. The urinary catheter should be retained upon transfer of the patient to the ward following vNOTES hysterectomy [GPP].

3.3. Anti-sliding shoulder braces should be applied to prevent cephalad patient displacement during vNOTES hysterectomy [GPP].

3.4. The primary and assistant surgeons should be seated during vNOTES hysterectomy. The scrub nurse should be positioned to the right of the primary surgeon during vNOTES hysterectomy. The professional designation of the second assistant (physician or nurse) does not affect intraoperative outcomes during vNOTES hysterectomy. The intraoperative presence of a second surgeon should be considered mandatory in technically demanding or anatomically complex hysterectomy cases [GPP].

3.5. vNOTES hysterectomy confers ergonomic advantages over laparoscopic hysterectomy with regard to operative posture, wrist loading, and musculoskeletal fatigue. During the colpotomy and vaginal closure phases, optimal ergonomics and visualization are achieved with the operating table raised (patient elevated) and the surgeon in a lowered position. During the endoscopic phase, optimal ergonomics and visualization are achieved with the operating table lowered (patient in a dependent position) and the surgeon in a raised position [GPP].

4. Intraoperative Technique

4.1. Vaginally assisted vNOTES hysterectomy (Va-vNOTES/VANH) is the preferred approach over total vNOTES hysterectomy (TVNH) for benign indications [GPP].

4.2. Posterior colpotomy should be performed as the initial step and a circumferential mucosal incision (cervical circumcision) should be performed in vNOTES hysterectomy for benign indications. Digital palpation of the pelvic cavity should be performed following posterior colpotomy during vNOTES hysterectomy [GPP].

4.3. Trendelenburg positioning should be applied during the laparoscopic (endoscopic) phase of vNOTES hysterectomy. A CO_2 insufflation pressure of 10-12 mmHg is recommended as the standard working pressure for vNOTES hysterectomy. CO_2 insufflation pressure should be modified in patients with obesity, significant cardiopulmonary comorbidity, or advanced age undergoing vNOTES hysterectomy [GPP].

4.4. In vNOTES hysterectomy for benign indications, the uterus and adnexa may be excised and removed separately; en-bloc removal is not mandatory [GPP].

4.5. Monopolar electrocautery is the preferred instrument for the initial vaginal mucosal incision during vNOTES hysterectomy. A combined approach using both blunt and sharp dissection is recommended following the initial vaginal mucosal incision in vNOTES hysterectomy [GPP].

4.6. An advanced bipolar vessel-sealing device is the preferred energy instrument for hemostatic pedicle control during vNOTES hysterectomy. Suction-irrigation should be deployed on demand during vNOTES hysterectomy; routine intraoperative setup at case initiation is not required [GPP].

4.7. Placement of a supplementary (fourth) port is indicated when hemorrhage, bowel, or bladder compromise adequate visualisation of the operative field during vNOTES hysterectomy [GPP].

4.8. No. 1 polyglactin 910 (Vicryl) is the preferred suture material for vaginal cuff closure following vNOTES hysterectomy [GPP].

4.9. Cystoscopy following vNOTES hysterectomy with high uterosacral ligament suspension should not be performed routinely but reserved for cases in which bladder or ureteral injury is clinically suspected [GPP].

4.10. Vaginal cuff closure should incorporate both the posterior and anterior peritoneum together with the vaginal mucosa, rather than approximating the vaginal mucosa alone [GPP].

4.11. Both the cardinal and uterosacral ligament origins should be routinely incorporated into the vaginal cuff closure following vNOTES hysterectomy [GPP].

5. Postoperative Care

5.1. The risk of vaginal or pelvic-abdominal infectious complications following vNOTES hysterectomy is not increased compared with laparoscopic or open hysterectomy [GPP].

5.2. Routine postoperative full blood count monitoring is not required following uncomplicated vNOTES hysterectomy; hematological assessment should be reserved for cases with clinical suspicion of hemorrhage [GPP].

5.3. The ideal discharge time following uncomplicated vNOTES hysterectomy is within 12-24 hours of the procedure [GPP].

5.4. Early postoperative mobilization should be initiated within 4-6 hours following vNOTES hysterectomy. Postoperative mobilization following vNOTES hysterectomy may be initiated earlier than recommended under standard enhanced recovery after surgery (ERAS) protocols [GPP].

5.5. The incidence of postoperative nausea and vomiting following vNOTES hysterectomy is lower compared with laparoscopic hysterectomy. Routine prophylactic antiemetic therapy is not recommended following vNOTES hysterectomy [GPP].

5.6. Postoperative antibiotic therapy should be routinely administered following vNOTES hysterectomy [GPP].

5.7. Patients should be advised to abstain from sexual intercourse for a period of six weeks following vNOTES hysterectomy [GPP].

6. Operative Time

6.1. All clinicians should be aware that vNOTES hysterectomy is associated with a significantly shorter operative time compared with TLH and may be considered in centres with appropriate surgical expertise [A].

7. Hospital Stay

7.1. Clinicians should be aware that vNOTES is associated with a modest reduction in length of hospital stay compared with TLH. Although the absolute decrease is small, this reduction may contribute to improved perioperative efficiency and facilitate early discharge, particularly when integrated within ERAS protocols [A].

8. Hemoglobin Decline

8.1. Patients should be counseled that perioperative hemoglobin decline following vNOTES hysterectomy is generally comparable to other minimally invasive approaches. However, variability may occur depending on surgical technique, surgeon experience, and patient-specific factors [C].

9. Estimated Blood Loss

9.1. Estimated blood loss (EBL) during vNOTES hysterectomy is comparable to other minimally invasive approaches, including laparoscopic and vaginal hysterectomy [B].

9.2. Hemostatic preparation and intraoperative management should follow standard protocols for minimally invasive hysterectomy, although consideration should be given to surgical expertise and patient-specific risk factors [B].

10. Blood Transfusion

10.1. There is insufficient evidence to recommend a specific practice. Clinicians should follow standard hemostatic protocols, with no additional precautions required solely for the vNOTES approach [B].

11. Postoperative Pain

11.1. Patients may experience lower early postoperative pain scores with vNOTES compared with laparoscopic hysterectomy [A].

11.2. vNOTES hysterectomy is associated with lower postoperative pain compared with laparoscopic hysterectomy and should be considered when selecting the surgical approach [A].

12. Postoperative Analgesic Usage

12.1. Perioperative analgesic protocols for vNOTES hysterectomy should be individualized, with consideration for potentially reduced systemic analgesic requirements compared to laparoscopic approaches [B].

12.2. Clinicians should consider minimizing opioid use in patients undergoing vNOTES hysterectomy, as postoperative analgesic needs are generally low and can often be managed with non-opioid regimens [B].

13. Re-admission

13.1. Women should be informed that the risk of unplanned re-admission following vNOTES hysterectomy is comparable to that of other minimally invasive approaches [B].

13.2. Standard postoperative discharge criteria and re-admission thresholds should be applied without modification based on surgical route [B].

14. Anal Exhaust Time (Time to first flatus)

14.1. Clinicians may consider vNOTES hysterectomy as an approach potentially associated with earlier recovery of gastrointestinal function, reflected by shorter time to first flatus, compared to other minimally invasive approaches. However, it should not be used as a sole determinant of clinical decisions [C].

14.2. Patients undergoing vNOTES hysterectomy may experience an earlier return of bowel function compared with other minimally invasive approaches but the magnitude of this benefit remains uncertain and may vary between individuals [C].

15. Mobilization/Return to Daily Activities

15.1. vNOTES hysterectomy is associated with earlier mobilization and faster return to daily activities compared with laparoscopic hysterectomy, and this potential recovery advantage may be a relevant factor when counselling patients regarding their surgical options. [C]

15.2. vNOTES may be integrated into ERAS programmes incorporating early mobilization protocols. [C]

15.3. Clinicians may consider vNOTES hysterectomy in patients for whom rapid postoperative recovery is a clinical priority, including obese patients and those with large uteri [C].

16. Postoperative Sexual Function

16.1. Women should be reassured that vNOTES hysterectomy does not adversely affect postoperative sexual function compared with laparoscopic hysterectomy [B].

16.2. Clinicians should inform women that vNOTES hysterectomy is not associated with deterioration of sexual function and can be performed without expected adverse effects on postoperative sexual health [B].

17. Intraoperative Complications

17.1. Clinicians should consider vNOTES hysterectomy as a safe alternative to conventional laparoscopic or vaginal hysterectomy for benign indications, as current evidence shows comparable intra-operative complication rates [A].

17.2. Women may be reassured that undergoing vNOTES does not appear to increase the risk of intra-operative complications compared with other minimally invasive approaches [A].

17.3. When intraoperative conversion is required during vNOTES hysterectomy, the appropriate conversion modality (laparoscopy or laparotomy) should be selected according to the underlying indication and clinical circumstances [GPP].

17.4. When an intraoperative bladder injury is identified during vNOTES hysterectomy, repair should be deferred until completion of the endoscopic phase and performed during the vaginal cuff closure phase [GPP].

18. Postoperative complications

18.1. Clinicians should consider vNOTES hysterectomy as having a similar post-operative complication profile compared with conventional laparoscopic or vaginal hysterectomy for benign indications [A].

18.2. Clinicians should counsel women that vNOTES does not appear to increase the risk of major or minor post-operative complications, including bleeding, infection, or need for reoperation [A].

18.3. Women may be reassured that recovery and safety outcomes with vNOTES are comparable to other minimally invasive hysterectomy techniques [A].

19. Indwelling Urinary Catheterization

19.1. Urinary catheter removal should be planned by clinicians for the earliest clinically appropriate time point following vNOTES hysterectomy and should be incorporated into ERAS protocols. Routine prolonged catheterisation is not indicated following uncomplicated vNOTES [D].

20. Conversion Rate

20.1. Clinicians should counsel patients that conversion rates with vNOTES hysterectomy are low and comparable to other minimally invasive approaches. The choice of surgical technique should therefore be based on patient factors, surgeon experience, and available expertise rather than concerns regarding conversion risk [B].

21. Cost Analysis

21.1. Institutions considering the adoption of vNOTES should undertake a prospective local economic evaluation accounting for equipment procurement, training costs, operative time savings, and bed day reductions. Formal health technology assessment is recommended prior to national-level commissioning decisions [D].

ABSTRACT

Purpose: Vaginal Natural Orifice Transluminal Endoscopic Surgery (vNOTES) hysterectomy is an increasingly adopted and most minimally invasive approach for benign gynecological indications. However, considerable heterogeneity exists in clinical practice regarding patient selection, perioperative management, surgical technique, and outcome reporting. This guideline aims to provide evidence-based and expert consensus-supported national recommendations for vNOTES hysterectomy in benign gynecology, developed on behalf of the Pelvic Floor and Cosmetic Gynecology (PETKOZ) Association.
Methods: A systematic search of Medline/PubMed, Cochrane, EMBASE, and Google Scholar was conducted for articles published between January 2015 and March 2026, yielding 1960 records. Fifty-seven studies met inclusion criteria, comprising eight systematic reviews/meta-analyses, six randomized controlled trials, six prospective and 37 retrospective cohort studies. Evidence quality and recommendation strength were graded using the SIGN classification system. For clinical questions insufficiently addressed by the literature, a three-round Delphi consensus process was conducted among 22 expert surgeons, each with a minimum of 50 vNOTES cases; ≥70% agreement defined consensus.
Results: Compared with total laparoscopic hysterectomy, vNOTES hysterectomy was associated with significantly shorter operative time (evidence level: 1+), reduced early postoperative pain (1+), a modest reduction in hospital stay (1+), and faster postoperative recovery. Intraoperative and postoperative complication rates, conversion rates, and readmission rates were comparable to other minimally invasive approaches. Comprehensive recommendations covering contraindications, preoperative preparation, intraoperative technique, and postoperative care were established through both evidence synthesis and the Delphi process.
Conclusion: This national guideline supports vNOTES hysterectomy as a safe and feasible approach for benign gynecological disease when performed in appropriately selected patients at centers with relevant surgical expertise. While findings are reinforced by structured evidence appraisal and formal consensus methodology, a substantial proportion of the evidence base remains observational. Future randomized trials, standardized outcome reporting, and prospective health-economic analyses are essential for refining recommendations in subsequent guideline updates.

Keywords: vNOTES scarless surgery, vnotes hysterectomy, national guidelines, vaginal laparoscopy

INTRODUCTION

Purpose and Scope

The purpose of this guideline is to provide advice to guide clinicians, based on the best available evidence, regarding the use of vaginal natural orifice transluminal endoscopic surgery (vNOTES) for non-malignant hysterectomy. This guideline reviews patient selection, perioperative assessment, surgical technique, and postoperative management. It aims to standardize practice, optimize surgical outcomes, and minimize complications for women undergoing hysterectomy for benign conditions.

This guideline excludes hysterectomy performed for suspected or confirmed malignancy, as the surgical approach and perioperative considerations differ significantly. Recommendations have been developed as a practical guide for gynecology surgeons, residents, and other healthcare professionals involved in the perioperative care of these patients. It is recognized that in individual cases, alternative approaches may be reasonable based on patient factors, surgical expertise, and available resources.

Population and Setting

Women undergoing hysterectomy for benign gynecological conditions, including fibroids, adenomyosis, abnormal uterine bleeding, or pelvic organ prolapse, in both hospital and outpatient surgical settings.

Interventions to be Studied

The guideline focuses on the application of vNOTES as a surgical approach for non-malignant hysterectomy, including preoperative assessment, intraoperative technique, and postoperative care, and compares its outcomes with conventional vaginal or laparoscopic hysterectomy where relevant evidence is available.

Background

vNOTES hysterectomy has emerged as a novel minimally invasive approach for the management of benign gynecological disease.[1,2] By integrating the advantages of conventional vaginal surgery with endoscopic visualization, this technique offers the potential to reduce surgical morbidity, enhance postoperative recovery, and improve patient-centered outcomes.[3] However, despite its growing adoption, considerable heterogeneity remains in clinical practice, particularly with respect to patient selection, perioperative management, surgical technique, and outcome reporting, reflecting the lack of standardized, evidence-based guidance. The aim of this guideline is to critically appraise the available evidence and provide comprehensive recommendations on the use of vNOTES for hysterectomy in benign gynecology, encompassing patient selection, preoperative evaluation, intraoperative considerations, and postoperative care. The overarching objective is to support safe implementation, optimize surgical outcomes, and minimize procedure-related complications. Given the variability in surgical expertise, institutional infrastructure, and resource availability across different healthcare settings, this guideline integrates both evidence-based recommendations and consensus-derived expert opinion. Where appropriate, recommendations have been contextualized to enhance their applicability across diverse clinical environments. Key recommendations and clinical pathways are summarized in structured tables and figures to facilitate translation into routine practice.

METHODS

This guideline was developed in accordance with standard methodology for producing national guideline on behalf of the Guidelines Committee of the Pelvic Floor and Cosmetic Gynecology (PETKOZ) (https://petkoz.org) Association. A comprehensive search was conducted in MEDLINE/PubMed, the Cochrane Database of Systematic Reviews and the Cochrane Methodology Register, EMBASE, and Google Scholar for articles published between January 2015 and March 2026. The following search string was applied: ("vNOTES" or "vaginal natural orifice transluminal endoscopic surgery" or "transvaginal notes") and ("hysterectomy") and ("benign" or "non-malignant" or "leiomyoma" or "fibroids" or "adenomyosis" or "abnormal uterine bleeding" or "pelvic organ prolapse"). No language restrictions were applied. Studies were eligible for inclusion if they: (1) enrolled adult women undergoing hysterectomy for benign indications; (2) reported vNOTES as a surgical approach; (3) included at least one comparator arm (laparoscopic or vaginal hysterectomy); and (4) reported at least one of the pre-specified participants, intervention, comparison, and outcome (PICO) criteria. Exclusion criteria comprised: case reports with fewer than five patients; studies focused exclusively on malignant indications; conference abstracts without full-text availability; and studies with no extractable outcome data.

The systematic review was undertaken using a PICO approach, resulting in the formulation of five key research questions focusing on the application of vNOTES in benign gynecology (Supplementary Material 1). The review specifically addressed standardized preoperative preparation protocols, comprehensive perioperative care management, and the identification of clinical contraindications for the vaginal approach. Furthermore, the analysis investigated specific intraoperative techniques and surgical nuances, alongside an evaluation of postoperative care and recovery outcomes.

An Assessment of Quality of Evidence and Grading of Strength of Recommendations

In evaluating the quality of evidence and grading the strength of recommendations, this guideline adopted the classification system proposed by the Scottish Intercollegiate Guidelines Network (SIGN), as outlined in Table 1. Evidence levels were assigned based on study design and methodological rigour, ranging from 1++ [high-quality meta-analyses or randomized controlled trials (RCTs) with very low risk of bias] to 4 (expert opinion), with intermediate categories reflecting case-control and cohort studies of varying quality (2++, 2+, 2−) as well as non-analytical studies such as case reports and case series (level 3). Grades of recommendations were subsequently assigned according to the highest level of evidence directly applicable to each clinical question: Grade A denotes recommendations supported by at least one meta-analysis, systematic review, or RCT rated 1++, or a body of evidence rated 1+ with overall consistency; Grade B reflects evidence rated 2++ or extrapolated from level 1 studies; Grade C corresponds to evidence rated 2+ or extrapolated from 2++; and Grade D is reserved for evidence of level 3 or 4, or extrapolated from 2+. Where no formal evidence was available but a clinical practice point could be identified, a good practice point (✓) was designated, reflecting the consensus-based clinical experience of the guideline development group.

Creating Expert Consensus Statements

For clinical questions that could not be adequately addressed by the available literature, a Delphi consensus process was conducted to formulate expert-based recommendations.[4,5]

Table 1. Scottish Intercollegiate Guidelines Network (SIGN) levels of evidence

Classification of evidence levels		Grades of recommendations	
1++	High-quality meta-analyses, systematic reviews of RCTs or RCTs with very low risk of bias	**A**	At least one meta-analysis, systematic review or RCT rated as 1++ and directly applicable; or systematic review of RCTs or body of evidence rated as 1+ with overall consistency
1+	Well-conducted meta-analyses, systematic reviews of RCTs or RCTs with low risk of bias	**B**	Body of evidence rated as 2++ directly applicable with overall consistency; or extrapolated from 1++ or 1+
1–	Meta-analyses, systematic reviews of RCTs or RCTs with high risk of bias	**C**	Body of evidence rated as 2+ directly applicable with consistency; or extrapolated from 2++
2++	High-quality case-control or cohort studies with very low risk of confounding and high probability of causal relationship	**D**	Evidence level 3 or 4; or extrapolated from 2+
2+	Well-conducted case-control or cohort studies with low risk of confounding and moderate probability of causal relationship		
2–	Case-control or cohort studies with high risk of confounding and significant risk relationship is not causal		
3	Non-analytical studies, e.g., case reports, case series		
4	Expert opinion	✓	**Good practice point recommended best practice based on the clinical experience of the guideline development group***

*On the occasion when the guideline development group finds there is an important practical point that they wish to emphasize but for which there is not, nor is there likely to be any research evidence. It must be emphasized that these are NOT an alternative to evidence-based recommendations, and should only be used where there is no alternative means of highlighting the issue
RCTs: Randomized controlled trials

A panel of specialists experienced in the vNOTES technique and affiliated with the PETKOZ association were invited to participate in a structured, iterative questionnaire focusing on five domains: contraindications, preoperative preparation, perioperative care, intraoperative surgical technique, and postoperative care. Eligible clinicians were identified from the PETKOZ association expert register and invited to participate if they had performed at least 50 vNOTES procedures; this threshold was applied to ensure that panel responses reflected meaningful procedural experience. The authors acknowledge that this inclusion criterion may limit generalizability to centres with less vNOTES experience, and this is noted as a limitation of the guideline. The 22 specialists participating in the Delphi panel were affiliated with a diverse range of healthcare institutions, including university hospitals, training and research hospitals, and private healthcare centers, thereby ensuring broad representation across different levels of clinical practice and healthcare delivery settings.

A three-round survey was conducted using a web-based platform (Google Forms), with each round administered via a unique, anonymized secure link. In each round, panellists were asked to rate their level of agreement with a series of proposed recommendation statements using a five-point Likert scale (1= strongly disagree; 2= disagree; 3= neutral; 4= agree; 5= strongly agree). Responses were collected anonymously, and the aggregated results from each round were fed back to participants before the subsequent round, allowing them to reassess their judgements in light of the group's overall responses. Statements were classified into three categories based on the proportion of panellists scoring 4 or 5 (agree or strongly agree): (1) consensus achieved (≥70% agreement)-statements were accepted and incorporated as recommendations; (2) neutral zone (50-69% agreement)-statements were revised based on qualitative feedback from the group and re-presented in the following round; and (3) no consensus (<50% agreement)-statements were excluded from the subsequent round and not carried forward. Before the third round, a virtual meeting was held to review the outcomes of the earlier rounds, concentrating particularly on statements in the neutral zone that had not yet achieved consensus. The PETKOZ expert group initially drafted the final manuscript, which was subsequently reviewed and endorsed by all participating clinicians. Recommendations derived through this process are clearly identified throughout the guideline as consensus-based expert recommendations, distinct from those grounded in the formal evidence hierarchy, as shown in Table 2.

Table 2. Responses by Delphi consensus of expert panel (third round results) — vNOTES hysterectomy for benign indications (n=22 experts; consensus threshold ≥70%)

#	Statement	Agreement (%)	Disagreement (%)
CONTRAINDICATIONS			
1	A previous Cesarean section is not a contraindication for vNOTES hysterectomy.	100.0	0.0
2	The number of prior Cesarean sections does not, in itself, constitute a contraindication for vNOTES hysterectomy.	95.5	4.5
3	Nulliparity is not a contraindication for vNOTES hysterectomy.	100.0	0.0
4	Postmenopausal status is not a contraindication for vNOTES hysterectomy.	100.0	0.0
5	The absence of uterine descent (Grade 0-1 prolapse) is not a contraindication for vNOTES hysterectomy.	100.0	0.0
6	Uterine size alone does not constitute a contraindication for vNOTES hysterectomy.	86.4	13.6
7	Deep infiltrating endometriosis (DIE) is a contraindication for vNOTES hysterectomy.	77.3	22.7
8	A history of benign gynecological pelvic surgery is not a contraindication for vNOTES hysterectomy.	90.9	9.1
9	A history of prior small bowel surgery is not a contraindication for vNOTES hysterectomy.	95.5	4.5
10	A long vagina is not a contraindication for vNOTES hysterectomy.	100.0	0.0
11	A narrow or atrophic vagina is not a contraindication for vNOTES hysterectomy.	90.9	9.1
12	A history of prior colon surgery is not a contraindication for vNOTES hysterectomy.	86.4	13.6
13	A history of pelvic inflammatory disease (PID) is not a contraindication for vNOTES hysterectomy.	81.8	18.2
PREOPERATIVE PREPARATION			
14	Routine preoperative laxative administration (oral or intravenous) is not recommended prior to vNOTES hysterectomy.	77.3	22.7
15	Ultrasound assessment of the cul-de-sac using the sliding sign should be routinely performed in the preoperative evaluation for vNOTES hysterectomy.	72.7	27.3
16	Bimanual vaginal examination should be routinely performed as part of the preoperative assessment prior to vNOTES hysterectomy.	95.5	4.5
17	Preoperative vaginal culture is not required in asymptomatic patients scheduled for vNOTES hysterectomy.	100.0	0.0

Table 2. Continued

#	Statement	Agreement (%)	Disagreement (%)
18	The recommended preoperative antibiotic prophylaxis regimen for vNOTES hysterectomy is 2 g cefazolin sodium combined with 1 g metronidazole.	77.3	22.7
19	Preoperative rectal mechanical bowel preparation is not required prior to vNOTES hysterectomy.	81.8	18.2
20	A special preoperative dietary restriction is not necessary for patients undergoing vNOTES hysterectomy.	77.3	22.7
PERIOPERATIVE MANAGEMENT			
21	An indwelling urinary catheter should be routinely inserted and maintained throughout vNOTES hysterectomy.	81.8	18.2
22	Compression stockings are recommended as part of venous thromboembolism prophylaxis for vNOTES hysterectomy.	100.0	0.0
23	Early postoperative mobilization is recommended as part of venous thromboembolism prophylaxis following vNOTES hysterectomy.	100.0	0.0
24	Anti-sliding shoulder braces should be applied to prevent cephalad patient displacement during vNOTES hysterectomy.	81.8	18.2
25	The primary surgeon should be seated during vNOTES hysterectomy.	90.9	9.1
26	The assistant surgeon should be seated during vNOTES hysterectomy.	90.9	9.1
27	The scrub nurse should be positioned to the right of the primary surgeon during vNOTES hysterectomy.	81.8	18.2
28	During the colpotomy and vaginal closure phases, optimal ergonomics and visualization are achieved with the operating table raised (patient elevated) and the surgeon in a lowered position.	86.4	13.6
29	During the endoscopic phase, optimal ergonomics and visualization are achieved with the operating table lowered (patient in a dependent position) and the surgeon in a raised position.	81.8	18.2
30	The professional designation of the second assistant (physician or nurse) does not affect intraoperative outcomes during vNOTES hysterectomy.	81.8	18.2
31	vNOTES hysterectomy confers ergonomic advantages over laparoscopic hysterectomy with regard to operative posture, wrist loading, and musculoskeletal fatigue.	72.7	27.3
32	The urinary catheter should be retained upon transfer of the patient to the ward following vNOTES hysterectomy.	77.3	22.7
33	Pharmacological anticoagulant prophylaxis should not be administered routinely following vNOTES hysterectomy but should be individualized according to patient-specific risk factors and classification.	77.3	22.7
34	When pharmacological anticoagulant prophylaxis is indicated, administration should commence between the 6th and 12th postoperative hour.	77.3	22.7
35	Routine pharmacological anticoagulant prophylaxis is not indicated for all patients undergoing vNOTES hysterectomy; the decision should be individualized based on patient-specific risk stratification (e.g., Caprini score).	90.9	9.1
INTRAOPERATIVE TECHNIQUE			
36	Posterior colpotomy should be performed as the initial step in vNOTES hysterectomy for benign indications.	90.9	9.1
37	A circumferential mucosal incision (cervical circumcision) should be performed in vNOTES hysterectomy for benign indications.	72.7	27.3
38	Digital palpation of the pelvic cavity should be performed following posterior colpotomy during vNOTES hysterectomy.	77.3	22.7
39	In vNOTES hysterectomy for benign indications, the uterus and adnexa may be excised and removed separately; en-bloc removal is not mandatory.	81.8	18.2
40	Trendelenburg positioning should be applied during the laparoscopic (endoscopic) phase of vNOTES hysterectomy.	72.7	27.3
41	An advanced bipolar vessel-sealing device is the preferred energy instrument for hemostatic pedicle control during vNOTES hysterectomy.	100.0	0.0
42	Placement of a supplementary (fourth) port is indicated when hemorrhage, bowel, or bladder has compromized adequate visualization of the operative field during vNOTES hysterectomy.	72.7	27.3

Table 2. Continued

#	Statement	Agreement (%)	Disagreement (%)
43	Suction-irrigation should be deployed on demand during vNOTES hysterectomy; routine intraoperative setup at case initiation is not required.	77.3	22.7
44	Monopolar electrocautery is the preferred instrument for the initial vaginal mucosal incision during vNOTES hysterectomy.	77.3	22.7
45	A combined approach using both blunt and sharp dissection is recommended following the initial vaginal mucosal incision in vNOTES hysterectomy.	81.8	18.2
46	A CO_2 insufflation pressure of 10-12 mmHg is recommended as the standard working pressure for vNOTES hysterectomy.	86.4	13.6
47	When intraoperative conversion is required during vNOTES hysterectomy, the appropriate conversion modality (laparoscopy or laparotomy) should be selected according to the underlying indication and clinical circumstances.	72.7	27.3
48	When an intraoperative bladder injury is identified during vNOTES hysterectomy, repair should be deferred until completion of the endoscopic phase and performed during the vaginal cuff closure phase.	81.8	18.2
VAGINAL CUFF CLOSURE AND APICAL SUPPORT			
49	No. 1 polyglactin 910 (Vicryl) is the preferred suture material for vaginal cuff closure following vNOTES hysterectomy.	72.7	27.3
50	Cystoscopy following vNOTES hysterectomy with high uterosacral ligament suspension (HUSLS) should not be performed routinely but reserved for cases in which bladder or ureteral injury is clinically suspected.	95.5	4.5
51	Vaginal cuff closure should incorporate both the posterior and anterior peritoneum together with the vaginal mucosa, rather than approximating the vaginal mucosa alone.	77.3	22.7
52	Both the cardinal and uterosacral ligament (USL) origins should be routinely incorporated into the vaginal cuff closure following vNOTES hysterectomy.	81.8	18.2
POSTOPERATIVE CARE			
53	The risk of vaginal or pelvic-abdominal infectious complications following vNOTES hysterectomy is not increased compared with laparoscopic or open hysterectomy.	95.5	4.5
54	Routine postoperative full blood count monitoring is not required following uncomplicated vNOTES hysterectomy; hematological assessment should be reserved for cases with clinical suspicion of hemorrhage.	81.8	18.2
55	The ideal discharge time following uncomplicated vNOTES hysterectomy is within 12–24 hours of the procedure.	90.9	9.1
56	Early postoperative mobilization should be initiated within 4–6 hours following vNOTES hysterectomy.	86.4	13.6
57	Postoperative mobilization following vNOTES hysterectomy may be initiated earlier than recommended under standard Enhanced Recovery After Surgery (ERAS) protocols.	86.4	13.6
58	Routine prophylactic antiemetic therapy is not recommended following vNOTES hysterectomy.	72.7	27.3
59	Postoperative antibiotic therapy should be routinely administered following vNOTES hysterectomy.	77.3	22.7
60	The incidence of postoperative nausea and vomiting (PONV) following vNOTES hysterectomy is lower compared with laparoscopic hysterectomy.	81.8	18.2
61	Patients should be advised to abstain from sexual intercourse for a period of six weeks following vNOTES hysterectomy.	95.5	4.5
ADDITIONAL CONSIDERATIONS			
62	Vaginally assisted vNOTES hysterectomy (Va-vNOTES / VANH) is the preferred approach over total vNOTES hysterectomy (TVNH) for benign indications.	86.4	13.6
63	The intraoperative presence of a second surgeon should be considered mandatory in technically demanding or anatomically complex hysterectomy cases.	77.3	22.7
64	CO_2 insufflation pressure should be modified in patients with obesity, significant cardiopulmonary comorbidity, or advanced age undergoing vNOTES hysterectomy.	100.0	0.0

Agreement (%) = proportion of panel selecting the highest-ranked response option. Disagreement (%) = 100% − Agreement (%). DIE = deep infiltrating DIE: Deep infiltrating endometriosis, ERAS: Enhanced recovery after surgery, HUSLS: High uterosacral ligament suspension, PID: Pelvic inflammatory disease, PONV: Postoperative nausea and vomiting, USL: Oterosacral ligament, Va-vNOTES: Vaginally assisted vNOTES, VANH: Vaginally assisted NOTES hysterectomy, TVNH: Total vaginal NOTES hysterectomy

Quality and Risk of Bias Assessment

Two independent authors assessed the methodological quality of articles independently of each other. This encompassed an evaluation of potential bias related to participant selection, outcome measurement, and data reporting, as well as bias associated with study funding sources. Discrepancies in quality assessment were resolved through discussion between reviewers. In instances where consensus could not be achieved, adjudication was provided by a third independent researcher. Cohort or observational studies were analyzed using the risk of bias in non-randomized studies of interventions (ROBINS-I) tool.[6] Studies judged to be at critical risk of bias under the ROBINS-I framework were excluded from the quantitative synthesis, as such studies are considered incapable of providing credible effect estimates. For randomized studies, the Cochrane risk-of-bias tool was used for randomized trials (RoB 2) which scores studies as having a high, low, or unclear risk of bias in five domains: selection, performance, detection, attrition, and reporting biases.[7] Systematic reviews and meta-analyses were critically appraised using the AMSTAR 2 framework to verify methodological integrity.[8] AMSTAR-2 acts as a 16-item framework for assessing the methodological quality and transparency of systematic reviews. It classifies evidence into four confidence levels: high (accurate and comprehensive), moderate (minor weaknesses only), low (contains a critical flaw), and critically low (multiple critical flaws). Ultimately, reviews with low or critically low ratings are considered unreliable for providing an accurate summary of the evidence.

The results of the risk-of-bias assessments directly informed the evidence grading process. Studies rated as critical risk of bias under ROBINS-I were excluded from the evidence synthesis and did not contribute to formal recommendations. Systematic reviews rated as critically low confidence by AMSTAR 2 were excluded from primary evidence grading; their findings are reported descriptively where contextually relevant but are not cited as the evidentiary basis for any formal recommendation. For RCTs, the RoB 2 assessment was used to differentiate between evidence level 1++ (low risk across all domains) and level 1+ (some concerns in one or more domains); in the context of surgical trials, the inherent inability to blind operating surgeons was a consistent source of "some concerns" in Domain 2 (deviation from intended interventions) and was acknowledged as a domain-specific but unavoidable limitation. The overall confidence in each body of evidence, as determined through these assessments, was the primary determinant of the SIGN evidence level assigned and, subsequently, the grade of the corresponding recommendation.

Ethical approval was not required for the development of this guideline, as it was based solely on a review of the literature and expert consensus.

RESULTS

A total of 1960 records were identified through database searching, of which 57 studies met the inclusion criteria and were incorporated into the final analysis (Figure 1). The included evidence comprised eight systematic reviews and meta-analyses,[9,11-17] six RCTs,[10,18-20] six prospective cohort studies,[21-25] and 37 retrospective cohort studies.[26-65]

The methodological quality of the eight included systematic reviews was appraised using the AMSTAR 2 tool across 16 items and seven critical domains (Supplementary Material 2). Only one review[9] achieved a "high" confidence rating with full adherence across all critical domains, while five reviews were rated "low",[11,12,14,15] one "Low-to-Moderate",[16] and one "Critically Low".[13] At the item level, full compliance (100%) was achieved for PICO formulation, comprehensive search strategy, duplicate study selection and data extraction, risk-of-bias tool application, interpretation of findings, and conflict-of-interest disclosure. Conversely, publication bias assessment (Item 15), a critical domain, was adequately reported in only two reviews (25%), and funding source disclosure (Item 10) was addressed in a single review (12.5%). Overall, while most reviews satisfied core methodological criteria, persistent deficiencies in publication bias assessment and funding transparency substantially limit confidence in the available evidence.

The risk of bias of the six included RCTs was evaluated using RoB 2 across five domains (Supplementary Material 3). No study was rated as high risk in any domain. Five trials[18,19,20,65] raised some concerns primarily due to the inherent impossibility of blinding surgeons in surgical trials (D2) and unblinded outcome assessment for subjective endpoints (D4). Prekatsounaki et al.[65] was a pre-planned secondary analysis of the HALON and NOTABLE trials. Both parent trials employed sham abdominal incisions to blind participants and outcome assessors, resulting in low risk of bias for D1, D2, and D4. Some concerns were noted for D3 due to exclusion of sexually inactive women, and for D5 due to the post-hoc pooled design without a pre-specified combined analysis protocol. The HALON trial[10] was the only study rated as low risk across all domains, owing to participant and assessor blinding achieved through sham abdominal incisions.

The methodological quality of the 37 included retrospective studies was assessed using ROBINS-I, with full domain-level results reported in Supplementary Material 4. Under ROBINS-I, studies were rated across seven domains including bias due to confounding, participant selection, classification of interventions, deviations from intended interventions, missing data, outcome measurement, and selection of the reported result, yielding an overall judgement of low, moderate, serious, or critical risk of bias. The predominant rating across the retrospective evidence base was moderate risk of bias (n=21), most commonly driven by residual confounding inherent to non-randomized designs and incomplete adjustment for baseline differences between surgical groups. Sixteen studies were judged to carry a serious risk of bias, primarily due to substantial selection bias, absence of propensity-score adjustment, or inadequate control of confounding variables. No study was rated as critical.

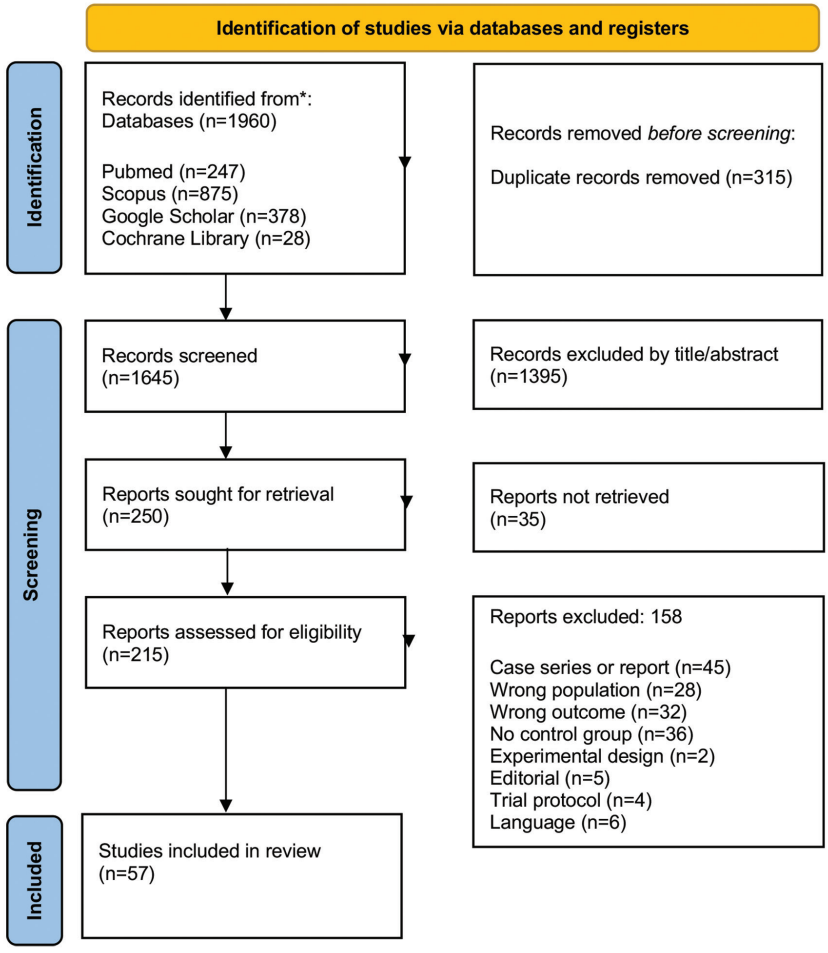

Figure 1. Flow diagram of study selection process according to PRISMA 2020 guidelines for the national guideline comparing vNOTES and minimally invasive hysterectomy techniques in benign gynecology

vNOTES: Vaginal Natural Orifice Transluminal Endoscopic Surgery, PRISMA: Preferred Reporting Items for Systematic reviews and Meta-Analyses

Operative Time

1. Recommendation (Grade A)

vNOTES hysterectomy is associated with a significantly shorter operative time compared with TLH and should be considered in centers with appropriate surgical expertise.

Evidence Level: 1+

Among all perioperative metrics evaluated in this guideline, operative time is the most consistently reported and arguably the most reproducible advantage of vNOTES over TLH. The Cochrane systematic review by Pickett et al.[9] provides the highest level of evidence, incorporating an RCT[10] that demonstrated a mean operative time reduction of 34 minutes in favor of vNOTES compared to TLH [95% confidence interval (CI) -45.54 to -22.46], representing a clinically meaningful decrease in operative duration. This finding has been corroborated by multiple meta-analyses comparing vNOTES with laparoscopic approaches,[11-15] and the network meta-analysis by Guan et al.[16] ranked vNOTES as having a shorter operative time than TLH among minimally invasive techniques. Furthermore, a systematic review evaluating robotic vNOTES hysterectomy versus robotic-assisted laparoscopic hysterectomy (RALH) for benign gynecological disease similarly favored vNOTES in operative time.[17]

Three high-quality RCTs comparing vNOTES with conventional laparoscopy, LESS, and vaginal approaches consequently reported shorter operative times for vNOTES.[10,18,19] In contrast, a single RCT comparing vNOTES with vaginal hysterectomy for benign indications found no difference in operative time.[20] Prospective cohort studies of moderate-level evidence generally favored vNOTES over TLH,[21-24] although Fang et al.[25] reported shorter operative times with TLH. Studies in special populations, including obese patients[26-28] and those with enlarged uteri,[29-31] also demonstrated reduced operative times with vNOTES.

Conflicting results were predominantly observed in retrospective studies, which were generally of lower quality. A total of 33 retrospective studies compared vNOTES with alternative surgical approaches for hysterectomy:

11 reported no significant differences,[32-41] 17 demonstrated clear advantages for vNOTES,[41-57] and five favored conventional approaches, including vaginal hysterectomy,[58-60] TLH,[61] and LESS.[62] Collectively, these findings suggest a trend toward improved outcomes with vNOTES, although heterogeneity in study design and endpoints necessitates cautious interpretation.

Hospital Stay

1. Recommendation (Grade A)

vNOTES is associated with a modest reduction in length of hospital stay compared with TLH. Although the absolute decrease is small, this reduction may contribute to improved perioperative efficiency and facilitate early discharge, particularly when integrated within ERAS protocols.

Evidence Level: 1+

Hospital length of stay is an important indicator of patient recovery and a major contributor to healthcare expenditures. Evidence from the Cochrane review by Pickett et al.[9] demonstrates that vNOTES is associated with a modest but statistically significant reduction in hospitalisation compared with TLH (mean difference -0.50 days; 95% CI 0.97 to -0.03). While the absolute decrease is small, it may lead to meaningful efficiency gains at the system level when implemented across a hysterectomy service, especially within ERAS protocols. These findings are supported by several systematic reviews[11,12,15] and reinforced by the network meta-analysis of Guan et al.,[16] which positions vNOTES favorably relative to TLH, LESS, and RALH techniques.

RCTs comparing vNOTES with other minimally invasive hysterectomy approaches have consistently reported hospital stay outcomes either in favor of vNOTES or showing no significant difference. Park et al.[19] found no significant difference when comparing LESS and vNOTES hysterectomy, while Yıldız et al.[20] reported similar findings in a comparison between vaginal hysterectomy and vNOTES. In two RCTs evaluating hysterectomy combined with apical prolapse repair to prevent post-hysterectomy vaginal cuff descent, Lowenstein et al.[18] reported a shorter operative time in favor of vNOTES, whereas Bacak et al.[63] found no significant difference between approaches.

The perioperative advantage of vNOTES has been consistently demonstrated in prospective cohort studies[21,22] and corroborated across multiple retrospective series from diverse surgical centers.[26-30,33,35,37,39,40,42,45-49,51,54,56,57,60,61] Notably, this benefit appears to be preserved in technically challenging patient populations, including those with non-descended uteri,[30] individuals with a history of prior pelvic surgery,[54] patients with obesity,[26-28] and those presenting with markedly enlarged uteri.[29-31]

Hemoglobin Decline

1. Recommendation (Grade C)

Patients should be counseled that perioperative hemoglobin (Hb) decline following vNOTES hysterectomy is generally comparable to other minimally invasive approaches; however, variability may occur depending on surgical technique, surgeon experience, and patient-specific factors.

Evidence level: 1-

Perioperative Hb decline is a surrogate for intraoperative blood loss and is relevant to the risk of transfusion and postoperative anemia. Unlike operative time and hospital stay, the evidence for this outcome is heterogeneous and difficult to interpret. The majority of systematic reviews and meta-analyses that have addressed Hb decline, including Housmans et al.,[11] Marchand et al.,[12] and Chaccour et al.,[15] have reported no significant difference between vNOTES and laparoscopic comparators. This finding of equivalence is supported in an RCT comparing vNOTES and LESS, also moderate-level evidence with prospective series.[23,64] Retrospective cohort studies of low-level evidence[25,26,32,38,45,54,56] demonstrated comparable reductions in Hb levels in vNOTES cases relative to other surgical approaches.

However, the literature demonstrates some heterogeneity in findings. Several prospective and retrospective comparative studies have reported a greater decline in Hb levels following vNOTES compared to TLH,[21,33,47,62] which may be attributable to technical factors related to vaginal cuff hemostasis, the surgical learning curve, or differences in patient selection.

Estimated Blood Loss

4. Recommendation (Grade B)

1- Estimated blood loss during vNOTES hysterectomy is comparable to other minimally invasive approaches, including laparoscopic and vaginal hysterectomy.

2- Hemostatic preparation and intraoperative management should follow standard protocols for minimally invasive hysterectomy, although consideration should be given to surgical expertise and patient-specific risk factors.

Evidence level: 1-

Intraoperative blood loss estimation serves as a more dynamic clinical indicator than postoperative Hb reduction, primarily because it provides a real-time assessment of surgical hemorrhage. This immediate feedback is essential for guiding timely intraoperative interventions and fluid management strategies.

Multiple systematic reviews have assessed this outcome. Housmans et al.[11] observed lower EBL with vNOTES compared to laparoscopic hysterectomy, a result further supported by Marchand et al.,[17] who evaluated robotic vNOTES against other surgical approaches for benign gynecological conditions. Conversely, studies by Sarkar et al.,[13] Marchand et al.[12,14] and Chaccour et al.[15] found no significant differences in EBL between vNOTES and laparoscopic, vaginal, or LESS approaches. In the network meta-analysis by Guan et al.,[16] which included the widest range of comparators, vNOTES was positioned intermediately: EBL was higher than with TLH or RALH, yet lower than with vaginal hysterectomy in the network comparisons.

Across the currently available RCTs, in a moderate-level RCT, Park et al.[19] found no difference in EBL when comparing vNOTES with LESS hysterectomy, while Lowenstein et al.[18] demonstrated higher EBL with conventional vaginal hysterectomy compared to vNOTES; notably, no RCT has demonstrated a statistically significant increase in EBL in favor of any comparator over vNOTES.

In six prospective cohort studies[21-25,64] with moderate-to-high level evidence, four reported no significant difference in EBL between vNOTES and other hysterectomy approaches, while two demonstrated higher EBL with vNOTES compared to TLH. In the prospective cohort by Fang et al.,[25] vNOTES had a median EBL of 100 mL versus 30 mL for TLH; the authors attributed this difference to lack of prior vNOTES experience at their center, suggesting a learning curve effect rather than an intrinsic disadvantage of the technique. Moreover, in the study of Takahashi et al.,[23] vNOTES demonstrated significantly higher EBL compared to TLH (150 mL vs 70 mL, $p<0.001$), despite similar Hb decline. The study included surgeons with varying experience levels; while EBL was higher, the authors did not explicitly attribute this to surgical experience, although it remains a possible contributing factor given the real-world multicenter setting and the inherent learning curve associated with vNOTES procedures.

The majority of moderate-low quality retrospective series report no clinically significant difference in EBL between vNOTES and its comparators.[27,29,35-39,42,54,55,59,62]

Blood Transfusion

5. Recommendation (Grade B)

There is insufficient evidence to recommend a specific practice. Clinicians should follow standard hemostatic protocols, with no additional precautions required solely for the vNOTES approach.

Evidence level: 2+

Blood transfusion is a clinically meaningful outcome reflecting the hemorrhagic risk of surgical procedures. Evidence comes from systematic reviews with low to critically low AMSTAR ratings,[12,15] a moderate-strength RCT,[19] and several prospective and retrospective cohort studies of low to moderate quality. Marchand et al.[12] conducted a systematic review and meta-analysis including both randomized and observational studies, suggesting vNOTES may be associated with lower transfusion rates compared to conventional approaches; however, the review was rated critically low by AMSTAR due to limitations in study selection and risk-of-bias assessment. Similarly, Chaccour et al.[15] performed a low-quality systematic review and reported no significant differences in transfusion rates between vNOTES and laparoscopic hysterectomy. At the study level, the moderate-strength RCT,[19] a prospective cohort study,[25] and multiple retrospective cohort studies[26,27,30,32,34,35,40-43,47,50,56] consistently found no statistically significant difference in transfusion requirements.

Overall, these data suggest that vNOTES does not increase the risk of perioperative blood transfusion. However, the evidence is limited by the predominance of retrospective studies and the low methodological quality of available systematic reviews. The primary limitation of evidence in this outcome domain is due to the rarity of the event and the consequent lack of adequately powered studies. Most reviews and individual studies are not powered to detect meaningful differences in transfusion rates.

Postoperative Pain

6. Recommendation (Grade A)

1- Patients may experience lower early postoperative pain scores with vNOTES compared with laparoscopic hysterectomy.

2- vNOTES hysterectomy is associated with lower postoperative pain compared with laparoscopic hysterectomy and should be considered when selecting the surgical approach.

Evidence level: 1+

Two RCTs[10,18] and four meta-analyses[12-15] consistently demonstrate that vNOTES hysterectomy results in lower early postoperative pain scores compared with conventional laparoscopic hysterectomy. The network meta-analysis by Guan et al.[16] ranked approaches as LESS-LAVH > LAVH > vNOTES > TLH > LESS-TLH > VH for pain outcomes.

Prospective cohort[23,24,64] and retrospective analyses from multiple institutions[27,28,30,31,33-35,37,38,40,42-48,53,56,60-62] demonstrate that vNOTES is associated with lower postoperative pain compared with laparoscopic hysterectomy, even when controlling for uterine size, body mass index (BMI), and prior surgery.

In the RCT by Park et al.,[19] postoperative abdominal pain did not differ significantly between vNOTES and LESS hysterectomy, which may reflect the widespread use of patient-controlled analgesia (PCA) potentially masking subtle differences in visceral discomfort. Vaginal pain was marginally higher in the vNOTES group, likely related to additional suturing required for cuff closure and hemostasis. Despite this, pain scores at 16 and 24 hours remained low, with no need for additional analgesics. The use of vessel-sealing devices in vNOTES, as opposed to conventional suture ligation, is proposed to further mitigate postoperative pain relative to standard laparoscopic hysterectomy.

Postoperative Analgesic Usage

7. Recommendation (Grade B)

1- Perioperative analgesic protocols for vNOTES hysterectomy should be individualized, with consideration for potentially reduced systemic analgesic requirements compared to laparoscopic approaches.

2- Clinicians should consider minimizing opioid use in patients undergoing vNOTES hysterectomy, as postoperative analgesic needs are generally low and can often be managed with non-opioid regimens.

Evidence level: 1+

Reduction in postoperative analgesic consumption is a clinically relevant surrogate for pain and patient comfort, and has direct implications for opioid-sparing recovery protocols.

A review of the available literature suggests that the current evidence is broadly consistent with this hypothesis. When the data are synthesized, postoperative analgesic requirements appear largely comparable between vNOTES and other minimally invasive techniques; however, several studies demonstrate a tendency toward lower analgesic consumption in the vNOTES cohort. In particular, the RCT by Baekelandt et al.[10] reported significantly reduced analgesic requirements following vNOTES compared with TLH. Similar findings were observed in the randomized studies by Lowenstein et al.,[18] who documented decreased analgesic use in vNOTES for apical prolapse relative to the conventional vaginal approach, and by Yıldız et al.,[20] who likewise demonstrated lower analgesic demand in patients undergoing vNOTES compared with vaginal hysterectomy.

Among prospective cohort studies comparing vNOTES with TLH, Takahashi et al.[23] and Sarikaya et al.[33] both reported reduced postoperative analgesic consumption in the vNOTES group. Jiamset et al.[57] corroborated these findings in a retrospective interrupted time-series analysis at a single centre, and Matak et al.[26] similarly documented lower analgesic use following vNOTES in obese patients undergoing laparoscopic versus vNOTES hysterectomy. Yıldız et al.[24] additionally reported lower analgesia requirements alongside improved quality-of-life scores in the vNOTES cohort.

Conversely, a number of studies across differing methodological designs and comparator groups found no statistically significant difference in postoperative analgesic consumption.[12,27,30,32,48,49]

Taken together, the body of evidence does not support a definitive superiority of vNOTES over other minimally invasive hysterectomy approaches with respect to postoperative analgesic consumption.

Re-Admission

8. Recommendation (Grade B)

1- Women should be informed that the risk of unplanned re-admission following vNOTES hysterectomy is comparable to that of other minimally invasive approaches.

2- Standard postoperative discharge criteria and re-admission thresholds should be applied without modification based on surgical route.

Evidence level: 1+

Unplanned hospital readmission is a composite safety outcome reflecting the severity of postoperative complications, adequacy of discharge planning, and patient resilience, and is routinely used as a quality indicator in surgical care. Reported readmission rates following vNOTES hysterectomy, across eleven studies including two RCTs, one systematic review and meta-analysis, two prospective cohort studies, and six retrospective studies, demonstrate no statistically significant differences compared with other minimally invasive hysterectomy approaches. Both the systematic review by Housmans et al.[11] and the randomized trial by Baekelandt et al.[10] reported equivalent readmission rates between vNOTES and laparoscopic hysterectomy. These findings are further supported by a randomized trial comparing vNOTES with vaginal hysterectomy[20] as well as by prospective[25] and retrospective cohort studies from multiple centers.[22,36,38,44,46-48] No published study has identified a significantly increased risk of readmission with vNOTES compared with any surgical comparator.

Anal Exhaust Time (Time to First Flatus)

9. Recommendation (Grade C)

1- Clinicians may consider vNOTES hysterectomy as an approach potentially associated with earlier recovery of gastrointestinal function, reflected by shorter time to first flatus, compared to other minimally invasive approaches. However, it should not be used as a sole determinant of clinical decisions.

2- Patients undergoing vNOTES hysterectomy may experience an earlier return of bowel function compared with other minimally invasive approaches; however, the magnitude of this benefit remains uncertain and may vary between individuals.

Evidence level: 2+

Time to first flatus (anal exhaust time) is used as a proxy for gastrointestinal recovery following surgery and reflects avoidance of postoperative ileus. There are no systematic reviews or RCTs addressing this specific outcome; the evidence derives entirely from prospective cohort and retrospective studies.

In a prospective cohort study, Wu et al.[21] performed multivariate regression analysis to identify independent predictors of time to first flatus, demonstrating that vNOTES was associated with a 2.528-hour reduction compared to LESS (β=-2.528; 95% CI: -6.61 to 1.56; p=0.224), although this difference did not reach statistical significance, indicating that the observed trend in favour of vNOTES warrants further evaluation in adequately powered studies. Additionally, Tang et al.,[22] in a prospective cohort study, performed linear regression analysis to identify independent predictors of postoperative recovery outcomes, confirming that surgical approach was a significant determinant of time to first anal exhaust; the median time to first flatus was significantly shorter in the vNOTES group compared to the laparoscopic hysterectomy group (48.0 h vs. 69.0 h; p<0.001), and this earlier restoration of bowel function was further associated with a favourable effect on return to work. These results are further supported by evidence from retrospective cohort studies.[39,43,47]

The limitation of this evidence base is the complete absence of RCT data addressing bowel recovery as a primary endpoint. Measurement methodology is also heterogeneous, time to first flatus is subject to patient recall bias and ward documentation variability. These caveats notwithstanding, the consistency of the directional signal across studies from different institutions and countries lends biological plausibility to the finding.

Prospective randomised data are needed to confirm the clinical magnitude and duration of this advantage.

Mobilization/Return to Daily Activities

10. Recommendation (Grade C)

1- vNOTES hysterectomy is associated with earlier mobilization and faster return to daily activities compared with laparoscopic hysterectomy, and this potential recovery advantage may be a relevant factor when counselling patients regarding their surgical options.

2- vNOTES may be integrated into ERAS programmes incorporating early mobilization protocols

3- Clinicians may consider vNOTES hysterectomy in patients for whom rapid postoperative recovery is a clinical priority, including obese patients and those with large uteri.

Evidence level: 2+

Earlier return to functional independence is the clinical endpoint that most directly reflects the patient experience of recovery, and available moderate-low quality evidence consistently favours vNOTES hysterectomy in this regard.

Fang et al.,[25] in a prospective cohort study conducted in primary hospitals, reported significantly shorter time to ambulation in the vNOTES group. Tang et al.,[22] in a prospective cohort study specifically designed to evaluate rapid recovery outcomes, demonstrated earlier mobilization and faster return to daily activities following vNOTES hysterectomy. Among retrospective studies in general populations, Sarikaya et al.[33] and Uluutku Bulutlar et al.[45] similarly reported faster postoperative recovery in favour of vNOTES.

In specific patient populations, Albayrak Denizli et al.[28] reported earlier return to daily activities following vNOTES hysterectomy in obese patients, and Kheirbek et al.[29] demonstrated a similar recovery advantage in patients with large uteri.

Evidence regarding this outcome is limited by the absence of prospective randomized data and systematic analyses. Retrospective studies are inherently susceptible to ascertainment bias, as functional recovery outcomes are frequently extracted from routine clinical records rather than assessed through standardized, validated instruments. Future studies should incorporate validated patient-reported outcome measures at predefined postoperative time points and should distinguish between in-hospital mobilization and community-level return to activities.

Postoperative Sexual Function

11. Recommendation (Grade B)

1- Women should be reassured that vNOTES hysterectomy does not adversely affect postoperative sexual function compared with laparoscopic hysterectomy.

2- Clinicians should inform women that vNOTES hysterectomy is not associated with deterioration of sexual function and can be performed without expected adverse effects on postoperative sexual health.

Evidence level: 1+

Post-hysterectomy sexual function constitutes a key patient-reported outcome and is commonly a central focus during preoperative counseling. From a theoretical standpoint, the vNOTES approach could differentially impact sexual health compared with conventional laparoscopy, primarily due to the requirement for transvaginal cuff closure involving direct suturing of the vaginal vault and its adjacent supportive structures. This technical aspect has raised concerns regarding potential anatomical and functional sequelae, including vaginal vault shortening or altered sensory perception, which could negatively influence long-term sexual function.

However, the available clinical evidence does not substantiate these concerns. Randomized data from Baekelandt et al.,[10] and more importantly, pooled analyses of two RCTs by Prekatsounaki et al.,[65] demonstrate no statistically significant differences in postoperative sexual function between vNOTES and laparoscopic hysterectomy when assessed using validated psychometric tools. These findings are further supported by one prospective cohort[22] and three retrospective cohort studies[32,49,54] in which sexual quality of life was typically evaluated as a secondary endpoint, consistently demonstrating comparable outcomes between surgical approaches.

Intraoperative Complications

12. Recommendation (Grade A)

1- Clinicians should consider vNOTES hysterectomy as a safe alternative to conventional laparoscopic or vaginal hysterectomy for benign indications, as current evidence shows comparable intra-operative complication rates.

2- Women may be reassured that undergoing vNOTES does not appear to increase the risk of intra-operative complications compared with other minimally invasive approaches.

Evidence level: 1+

The current body of literature consistently demonstrates no significant difference in intra-operative complication rates between vNOTES and other minimally invasive hysterectomy techniques, including TLH, VH, and single-port approaches.

Most systematic reviews and meta-analyses[11,12,14,15] report no significant differences when vNOTES is compared with laparoscopic or vaginal hysterectomy, although their methodological quality is often limited. A network meta-analysis suggested a relative advantage for conventional approaches, such as TLH and VH, but this finding was not consistently supported by direct comparative studies.[16]

Evidence from RCTs and prospective cohort series supports these findings, comparing vNOTES with both laparoscopic and vaginal approaches[10,18,20,22,24,64] reported similar intra-operative complication rates, with no clear advantage for either technique.

This consistency is further reinforced by a large number of retrospective cohort studies,[26,28,29,31,32,34-36,38,39,40,41,43-50,53,59,60,62] including diverse patient populations (e.g., obese patients, large uteri, prior pelvic surgery). Across these studies, intra-operative complications, such as bleeding, organ injury,

vascular injury or bladder/bowel injury, were comparable between vNOTES and alternative surgical approaches, with no reproducible increase in risk associated with vNOTES.

Postoperative Complications

13. Recommendation (Grade A)

1- Clinicians should consider vNOTES hysterectomy as having a similar post-operative complication profile compared with conventional laparoscopic or vaginal hysterectomy for benign indications.

2- Clinicians should counsel women that vNOTES does not appear to increase the risk of major or minor post-operative complications, including bleeding, infection, or need for reoperation.

3- Women may be reassured that recovery and safety outcomes with vNOTES are comparable to other minimally invasive hysterectomy techniques.

Evidence level: 1+

The systematic review by Housmans et al.[11] showed no significant difference in postoperative complication rates between vNOTES and laparoscopic hysterectomy.[11] Few meta-analyses have suggested a lower complication rate with vNOTES compared to laparoscopy,[9,12] while others comparing vNOTES with vaginal hysterectomy and robotic-assisted vNOTES found no meaningful differences between techniques.[14,17] Chaccour et al.[15] reported fewer postoperative complications with vNOTES compared to classic laparoscopic hysterectomy. The network meta-analysis by Guan et al.[16] ranked approaches as LESS-LAVH > LAVH > vNOTES > TLH > LESSLH > LH > VH > RALH > LESS-TLH for postoperative events, placing vNOTES among the more favourable approaches.

Well-designed RCTs[10,19,20,63] and multiple prospective cohort studies reported comparable safety profiles.[22-25] Notably, Basol et al.[35] and Qian et al.[62] reported fewer postoperative complications with vNOTES. Zhang et al.[47] also reported fewer complications with vNOTES.

The majority of prospective cohort and retrospective studies found no significant difference between vNOTES and comparator approaches.[26,28,29,31,35-40,42,43,45,46,50,51,54,56,57,59,60]

Indwelling Urinary Catheterization

14. Recommendation (Grade D)

Urinary catheter removal should be planned by clinicians for the earliest clinically appropriate time point following vNOTES hysterectomy and should be incorporated into ERAS protocols. Routine prolonged catheterisation is not indicated following uncomplicated vNOTES.

Evidence level: 2-

No systematic review or RCT has addressed catheterization duration as a primary endpoint in the context of vNOTES hysterectomy; the available evidence is therefore derived exclusively from observational data.

The prospective cohort study by Fang et al.,[25] which carries the highest methodological weight among the available non-randomized evidence, demonstrated significantly shorter indwelling urinary catheterization time in the vNOTES group compared to conventional laparoscopic hysterectomy (31.1±17.3 hours vs 45.6±22.7 hours, $p=0.012$). Consistent results have been reported across multiple moderate- to low-quality retrospective cohort studies, which also show shorter catheterization duration with vNOTES relative to laparoscopic or single-port approaches.[26,37,39,42,48] However, the absence of randomized data and variability in catheter removal protocols across institutions limit the strength of conclusions.

Conversion Rate

15. Recommendation (Grade B)

Clinicians should counsel patients that conversion rates with vNOTES hysterectomy are low and comparable to other minimally invasive approaches. The choice of surgical technique should therefore be based on patient factors, surgeon experience, and available expertise rather than concerns regarding conversion risk.

Evidence level: 1+

Conversion from the planned surgical approach to a different modality (laparotomy or laparoscopy) represents an important safety indicator reflecting the feasibility and safety of vNOTES at institutional and individual surgeon levels. Low conversion rates are essential for any surgical technique to be incorporated into mainstream practice with confidence.

Three recent systematic reviews and meta-analyses, including two low-quality and one critically low-quality AMSTAR-rated study, reported no significant differences in surgical outcomes between vNOTES and laparoscopic hysterectomy for benign gynecological indications.[12,14,15]

In an RCT by Baekelandt et al.,[10] no conversions from vNOTES to an alternative surgical approach were reported among 70 women undergoing hysterectomy. Similarly, two additional RCTs[18,19] comparing vNOTES with laparoendoscopic single-site hysterectomy and conventional vaginal surgery for apical prolapse reported zero conversions in either group

Consistently, moderate-to-low-quality prospective and retrospective cohort studies indicate comparable conversion rates between vNOTES and other hysterectomy techniques,[22,25,26,29,31,35,36,38,41,40,43,46,48-51,56-60,64] with none demonstrating a statistically significant increase in conversions for vNOTES in benign gynecological surgery.

The notable exception is in the comparison with LESS, where Wu et al.[21] reported a higher conversion rate with vNOTES (4.29%); in all three converted cases, the indication was severe adhesion at the posterior fornix, which precluded safe transvaginal access and created an unacceptable risk of injury to adjacent pelvic organs, rather than representing a limitation intrinsic to the vNOTES approach itself.

Cost Analysis

16. Recommendation (Grade D)

Institutions considering the adoption of vNOTES should undertake a prospective local economic evaluation accounting for equipment procurement, training costs, operative time savings, and bed day reductions. Formal health technology assessment is recommended prior to national-level commissioning decisions.

Evidence level: 2+

No RCT has included cost-effectiveness analysis as a primary endpoint for vNOTES, and no systematic review has addressed this outcome as a primary objective. Available evidence is limited to institutional cost analyses and observational comparisons. Potential cost drivers include equipment procurement, training requirements, and learning curve duration.

The strongest available evidence comes from the RCT by Baekelandt et al.,[10] in which direct healthcare costs were assessed using the total hospital bill, encompassing all expenses incurred up to six weeks postoperatively. Although mean total costs were lower in the vNOTES group compared with TLH (USD 3.599±914 vs. USD 4.103±1.348), corresponding to a mean difference of -504 USD (95% CI -1,044 to +36), this difference did not reach statistical significance.

However, the broader literature does not consistently support a cost advantage for vNOTES. While the highest-quality evidence suggests cost neutrality, lower-quality retrospective studies[52,60] report conflicting findings, with some indicating lower costs for LAVH compared with vNOTES.

Overall, the economic impact of vNOTES remains highly context-dependent and is influenced by institutional case volume, existing laparoscopic infrastructure, and reimbursement models. In the absence of formal health technology assessment or prospective cost-effectiveness analyses, current evidence does not allow definitive conclusions regarding cost superiority.

DISCUSSION

The present national guideline suggests that vNOTES hysterectomy is a feasible and safe, minimally invasive approach for benign gynecological indications when performed in appropriately selected women and in centres with relevant surgical expertise.[66-68] The most consistent benefits identified across the available literature were shorter operative time, reduced early postoperative pain, a modest but noticeable reduction in hospital stay, and faster postoperative recovery compared with conventional laparoscopic hysterectomy. Importantly, these advantages were not accompanied by a clear increase in intraoperative or postoperative morbidity, as complication, readmission, and conversion rates were generally comparable with those reported for other minimally invasive hysterectomy techniques.

The main strength of this guideline is that it combines a structured appraisal of the available evidence with a formal Delphi-based expert consensus process, thereby allowing clinically relevant recommendations to be formulated even in areas where direct comparative data remain limited. This is particularly important in the context of vNOTES hysterectomy, where rapid clinical adoption has outpaced the development of standardized guidance in several domains of perioperative care and surgical technique. In addition, the guideline addresses both comparative surgical outcomes and practical aspects of implementation that are directly relevant to routine clinical practice.

These findings should, however, be interpreted in light of important limitations. Although some recommendations were supported by RCTs and systematic reviews, a substantial proportion of the evidence base consisted of observational studies with moderate to serious risk of bias. Methodological heterogeneity was also considerable, particularly with respect to patient selection, surgeon experience, perioperative protocols, comparator groups, and outcome definitions. Furthermore, several clinically important questions could not be answered from the published literature alone and therefore required consensus-based recommendations. As with other evolving surgical techniques, learning-curve effects and institutional variation are also likely to have influenced reported outcomes.

Within the Turkish healthcare system, the economic impact of vNOTES is further influenced by the cost of disposable access platforms and instruments, which are procured through institutional tender systems and may vary between centers. Current Social Security Institution (SGK) reimbursement policies do not always specifically cover these vNOTES-specific disposable materials, potentially increasing institutional cost burden. In comparison, although laparoscopic surgery also relies on disposable instruments, these are more standardized and better integrated into existing reimbursement frameworks. It should be noted that vPORT™, a novel Turkish disposable access device developed by Biomicro Medikal (Istanbul, Turkiye), has recently emerged as a cost-effective and efficient port system for use in vNOTES procedures. Surgeons in Turkiye are reducing costs by reusing disposable ports, using the cost-effective Turkish-branded vPORT™, and finally, using glove ports in exchange for surgical discomfort.[69] Despite potentially higher upfront costs, shorter hospital stay, reduced recovery time and the absence of additional uterine manipulator and trocar costs may partially offset overall expenses, making the net economic effect of vNOTES largely dependent on institutional volume and local procurement conditions.

Taken together, the evidence makes a credible case for vNOTES hysterectomy as a meaningful addition to the surgical armamentarium for benign gynecological disease. To truly establish its place, however, the field needs larger more rigorous RCTs, more consistent reporting of perioperative and patient-reported outcomes, and prospective health-economic analyses, all of which will be essential for refining patient selection and informing future iterations of this guideline.

Study Limitations

Most of the guideline recommendations have low certainty of evidence and serious to moderate risk of bias, highlighting the need for higher quality data to aid in refining future recommendations. In addition, the expert panel was restricted to surgeons with experience of at least 50 vNOTES cases. While this criterion was applied to ensure adequate procedural expertise, it may limit the generalizability of the recommendations to centres with lower case volumes or surgeons earlier in their learning curve.

Recommendations for Future Research

Despite recent advances, there remain several unanswered questions and priorities for future research. These areas include the following: (1) Optimal anesthesia regimen specifically for vNOTES hysterectomy; (2) the role of strategies to reduce postoperative pain such as intraperitoneal irrigation or rectus sheath block; (3) predictors for conversion to laparoscopy; (4) the role of outpatient management of benign vNOTES hysterectomy; (5) optimal technique for prophylactic apical suspension following vNOTES hysterectomy; (6) optimal technique for transvaginal surgical drain following a vNOTES hysterectomy; (7) the effects of vNOTES training courses using hands-on models and their outcomes; and (8) outcomes for repeat vNOTES following a vNOTES hysterectomy or repeat vNOTES hysterectomy following another vNOTES procedure. Further studies and research in these priority areas are needed to improve the outcomes of the vNOTES technique for hysterectomy performed for benign conditions and to better define optimal management.

Plans for Updating

The topics listed above that were not covered in this guideline will be addressed in future guideline documents and expert practice opinion papers. Given the expectation of new national data results and RCTs, this guideline is planned to be updated within two years, following a literature review of newly published works on the first anniversary of its publication.

Footnotes

Authorship Contributions

Surgical and Medical Practices: M.Y., O.K., C.K., O.D., B.Ş., E.Ç., Y.K.A., P.B.İ., S.B., E.B., B.C., H.C., M.E., M.M.E., S.E., E.E., M.G., A.G.K., O.S.G., İ.K., F.K.G., M.A.M., K.G.S., İ.A.Ö., M.A.S., A.B.T., M.Y., Concept: M.Y., O.K., C.K., O.D., Design: M.Y., O.K., C.K., O.D., B.Ş., E.Ç., Y.K.A., P.B.İ.,S.B., E.B., B.C., H.C., M.E., M.M.E., S.E., E.E., M.G., A.G.K., O.S.G., İ.K., F.K.G., M.A.M., K.G.S., İ.A.Ö., M.A.S., A.B.T., M.Y., Data Collection or Processing: M.Y., O.K., C.K., Analysis or Interpretation: M.Y., C.K., O.D., O.K., Literature Search: M.Y., O.K., C.K, Writing: M.Y., O.K.,C.K.,O.D.

Conflict of Interest: Akpak Y.K. and Kanmaz A.G. declares that they are instructor/trainer for Applied Medical. Three author of this article, Murat Yassa, Ozan Doğan, Eray Çalışkan, is a member of the Editorial Board of the Anatolian Journal of Obstetrics and Gynecology Research. However, they did not involved in any stage of the editorial decision of the manuscript. The editors who evaluated this manuscript are from different institutions. All other authors declare that they have no conflict of interest.

Financial Disclosure: All those involved in the development of this guideline were unpaid volunteers and receive no direct funding for their work in producing the guideline.

Supplementary Materials 1-4: https://d2v96fxpocvxx.cloudfront.net/d363ec1e-9e5e-4591-a00a-d656bfcabb80/content-images/5607d5bc-83b3-463b-bb80-28993b0952c5.pdf

REFERENCES

1. Kaya C, AlAli H, Saka T. The effect of posterior colpotomy on type of delivery after natural orifice specimen extraction: a systematic review. Asian J Endosc Surg. 2025;18(1):e70160.
2. Bulutlar E, Uluutku Bulutlar GB, Şahin S. Optimizing V-NOTES hysterectomy: a comparative analysis of GelPoint and Glove techniques. Ginekol Pol. 2025;96(8):624-629.
3. Michener CM, Lampert E, Yao M, Harnegie MP, Chalif J, Chambers LM. Meta-analysis of laparoendoscopic single-site and vaginal natural orifice transluminal endoscopic hysterectomy compared with multiport hysterectomy: real benefits or diminishing returns? J Minim Invasive Gynecol. 2021;28(3):698-709.e1.
4. Jones J, Hunter D. Consensus methods for medical and health services research. BMJ. 1995;311(7001):376-380.
5. Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. J Adv Nurs. 2000;32(4):1008-1015.
6. Sterne JA, Hernán MA, Reeves BC, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. BMJ. 2016;355:i4919.
7. Higgins JP, Altman DG, Gøtzsche PC, et al; Cochrane Bias Methods Group; Cochrane Statistical Methods Group. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. BMJ. 2011;343:d5928.
8. Shea BJ, Reeves BC, Wells G, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ. 2017;358:j4008.
9. Pickett CM, Seeratan DD, Mol BWJ, et al. Surgical approach to hysterectomy for benign gynaecological disease. Cochrane Database Syst Rev. 2023;8(8):CD003677.
10. Baekelandt JF, De Mulder PA, Le Roy I, et al. Hysterectomy by transvaginal natural orifice transluminal endoscopic surgery versus laparoscopy as a day-care procedure: a randomised controlled trial. BJOG. 2019;126(1):105-113.
11. Housmans S, Noori N, Kapurubandara S, et al. Systematic review and meta-analysis on hysterectomy by vaginal natural orifice transluminal endoscopic surgery (vNOTES) compared to laparoscopic hysterectomy for benign indications. J Clin Med. 2020;9(12):3959.
12. Marchand GJ, Masoud AT, Ulibarri H, et al. Systematic review and meta-analysis of vaginal natural orifice transluminal endoscopic surgery vs laparoscopic hysterectomy. AJOG Glob Rep. 2024;4(1):100320.
13. Sarkar A, Sivaranjani P, Zangmo R, et al. Comparison of outcomes following vaginal natural orifice transluminal endoscopic surgery and laparoendoscopic single-site surgery in benign hysterectomy: a systematic review and meta-analysis. Gynecol Minim Invasive Ther. 2023;12(4):195-202.
14. Marchand GJ, Ulibarri H, Arroyo A, et al. Systematic review and meta-analysis of vaginal natural orifice transluminal endoscopic surgery hysterectomy versus vaginal hysterectomy for benign indications. AJOG Glob Rep. 2024;4(2):100355.

15. Chaccour C, Giannini A, Golia D'Augè T, et al. Hysterectomy using vaginal natural orifice transluminal endoscopic surgery compared with classic laparoscopic hysterectomy: a new advantageous approach? A systematic review on surgical outcomes. Gynecol Obstet Invest. 2023;88(4):187-196.
16. Guan M, Li H, Tian T, Peng J, Huang Y, He L. Different minimally invasive surgical methods to hysterectomy for benign gynecological disease: a systematic review and network meta-analysis. Health Sci Rep. 2024;7(11):e70137.
17. Marchand G, Ulibarri H, Arroyo A, et al. The feasibility and surgical outcomes of robotic vaginal natural orifice transluminal endoscopic single port hysterectomy for benign gynecologic diseases: a systematic review and meta-analysis. AJOG Glob Rep. 2025;5(3):100512.
18. Lowenstein L, Mor O, Matanes E, Justman N, Stuart A, Baekelandt J. Conventional vaginal approach vs. transvaginal natural orifice transluminal endoscopic surgery for treating apical prolapse, a randomized controlled study. Eur J Obstet Gynecol Reprod Biol. 2024;303:180-185.
19. Park SJ, Kim HS, Yim GW. Comparison of vaginal natural orifice transluminal endoscopic surgery (vNOTES) and Laparoendoscopic single-site (LESS) hysterectomy on postoperative pain reduction: a randomized pilot study. Pain Ther. 2021;10(2):1401-1411.
20. Yıldız G, Keles E, Yıldız P, et al. Comparison of vaginal natural orifice transluminal endoscopic surgery and vaginal hysterectomy for benign indications: a prospective randomized controlled study. Rev Assoc Med Bras (1992). 2025;71(11):e20250948.
21. Wu X, Li X, Xie A, et al. Transvaginal natural orifice endoscopic surgery for hysterectomy: a prospective cohort study. BMC Womens Health. 2024;24(1):631.
22. Tang Y, Fang CL, Huang JR, et al. Comparison of rapid recovery outcomes between vNOTES hysterectomy and laparoscopic hysterectomy: a prospective study. BMC Surg. 2025;25(1):189.
23. Takahashi A, Kitazawa J, Hirata K, Koikawa Y, Koikawa A, Nakata M. Feasibility and perioperative outcomes of vaginal natural orifice transluminal endoscopic hysterectomy regardless of surgeon experience: a comparison with total laparoscopic hysterectomy. Eur J Obstet Gynecol Reprod Biol. 2026;317:114864.
24. Yıldız P, Keles E, Yıldız G, et al. Health-related quality of life following hysterectomy by vNOTES versus conventional laparoscopy. Minim Invasive Ther Allied Technol. 2024;33(4):232-236.
25. Fang S, Xia Y, Jin J, Zhang J, Lu L. Comparison of surgical outcomes between vaginally assisted NOTES hysterectomy and laparoscopic hysterectomy in primary hospitals: a prospective cohort study. J Invest Surg. 2025;38(1):2515054.
26. Matak L, Medić F, Sonicki Z, Matak M, Šimičević M, Baekelandt J. Retrospective analysis between total laparoscopic and vNOTES hysterectomy in obese patients: single-center study. Arch Gynecol Obstet. 2024;309(6):2735-2740.
27. Kaya C, Yıldız Ş, Alay İ, Aslan Ö, Aydıner İE, Yaşar L. The comparison of surgical outcomes following laparoscopic hysterectomy and vNOTES hysterectomy in obese patients. J Invest Surg. 2022;35(4):862-867.
28. Albayrak Denizli AB, Bulutlar E, Boz İzceyhan G, et al. Evaluating the safety and recovery benefits of vNOTES compared to laparoscopy in obese patients. Asian J Endosc Surg. 2025;18(1):e70165.
29. Kheirbek N, Delporte V, El Hajj H, et al. Comparing vNOTES hysterectomy with laparoscopic hysterectomy for large uteri. J Minim Invasive Gynecol. 2023;30(11):877-883.
30. Kaya C, Yıldız Ş, Alay İ, et al. Comparison of surgical outcomes of total laparoscopic hysterectomy and vNOTES Hysterectomy for undescended-enlarged uteri. J Invest Surg. 2022;35(4):918-923.
31. Güngördük K, Gülseren V, Uyar BŞ, et al. Can vaginal natural orifice transluminal endoscopic surgery hysterectomy be performed in patients with an enlarged uterus? J Obstet Gynaecol Res. 2025;51(6):e16345.
32. Timmermans M, Hovsepyan H, Tanos P, Nisolle M, Karampelas S. Sexual quality of life after hysterectomy performed by conventional laparoscopy versus Vaginal natural orifice transluminal endoscopic surgery (vNOTES) in benign gynaecology. Facts Views Vis Obgyn. 2025;17(1):68-74.
33. Sarikaya S, Taskin MI, Bozhuyuk Sahin T, et al. Comparison of perioperative outcomes between V-NOTES and total laparoscopic hysterectomy: a retrospective analysis. J Invest Surg. 2025;38(1):2488131.
34. Kurçaloğlu M, Önal M, Yaşar C, Yilmazlar F, Uslu PU, Yoleri Y. Comparison of postoperative pain rates with different hysterectomy techniques: a retrospective study. Medicine (Baltimore). 2025;104(36):e44374.
35. Basol G, Cora AO, Gundogdu EC, et al. Hysterectomy via transvaginal natural orifice transluminal endoscopic surgery versus single-port laparoscopy: comparison of early outcomes. J Obstet Gynaecol Res. 2021;47(9):3288-3296.
36. Merlier M, Collinet P, Pierache A, et al. Is V-NOTES hysterectomy as safe and feasible as outpatient surgery compared with vaginal hysterectomy? J Minim Invasive Gynecol. 2022;29(5):665-672.
37. Xie C, Cao H. Clinical application of vaginal natural orifice transluminal endoscopic surgery in hysterectomy. Afr J Reprod Health. 2025;29(6):49-57.
38. Yang CY, Shen TC, Lin CL, Chang YY, Huang CC, Lin WC. Surgical outcomes of hysterectomy by transvaginal natural orifice transluminal endoscopic surgery (vNOTES) compared with laparoscopic total hysterectomy (LTH) in women with non-prolapsed and benign uterine diseases. Taiwan J Obstet Gynecol. 2020;59(4):565-569.
39. Chen L, Zheng Y, Min L, Dong SM. [Clinical cohort study of total hysterectomy via transvaginal natural orifice transluminal endoscopic surgery and transumbilical laparoendoscopic single site surgery]. Zhonghua Fu Chan Ke Za Zhi. 2020;55(12):843-847.
40. Puisungnoen N, Yantapant A, Yanaranop M. Natural orifice transluminal endoscopic surgery-assisted vaginal hysterectomy versus total laparoscopic hysterectomy: a single-center retrospective study using propensity score analysis. Gynecol Minim Invasive Ther. 2020;9(4):227-230.
41. Badiglian-Filho L, Chaves Faloppa C, Narciso de Oliveira Menezes A, Mantoan H, Kumagai LY, Baiocchi G. Vaginally assisted NOTES hysterectomy with adnexectomy (vNOTES) compared with conventional laparoscopy. A retrospective observational cohort study. Int J Gynaecol Obstet. 2021;153(2):351-356.
42. Yuan W, Yang F, Zheng Y. Perioperative outcomes of transvaginal natural orifice transluminal endoscopic surgery and transumbilical laparoendoscopic single-site surgery in hysterectomy: a comparative study. Int J Gynaecol Obstet. 2024;165(3):1151-1157.
43. Aiob A, Francis YN, Hebi H, et al. Transvaginal natural orifice transluminal endoscopic hysterectomy vs. abdominal laparoscopic approach in real-life practices: a retrospective cohort study. Arch Gynecol Obstet. 2025;312(5):1805-1812.
44. Bulutlar E, Uluutku Bulutlar GB, Cilli LA, Kılıççı Ç, Şahin S. vNOTES hysterectomy versus laparoscopic hysterectomy: experiences and outcomes in a tertiary center. Minim Invasive Ther Allied Technol. 2025;34(4):297-302.
45. Uluutku Bulutlar GB, Bulutlar E, Albayrak Denizli AB, Kılıççı Ç. Advancing apical POP treatment: a comparative analysis of vNOTES lateral suspension and laparoscopic lateral suspension. Minim Invasive Ther Allied Technol. 2025;34(5):416-423.
46. Ozceltik G, Hortu I, Itil IM, Yeniel AO. Vaginal approach versus laparoscopy for hysterectomy in transgender men. J Gynecol Obstet Hum Reprod. 2022;51(2):102286.
47. Zhang LL, Wang YS, Bai LP, Zheng A. Comparison of hysterectomy cases performed by transvaginal natural orifice transluminal endoscopic surgery: a paired sample cross-sectional study. Medicine (Baltimore). 2024;103(13):e37551.

48. Güngördük K, Şahin Uyar B, Gülseren V. Comparative outcomes of hysterectomy using single-port umbilical laparoscopy versus vaginal natural orifice transluminal endoscopic surgery. Minim Invasive Ther Allied Technol. 2025;34(4):318-323.
49. Yang YS, Kim SY, Hur MH, Oh KY. Natural orifice transluminal endoscopic surgery-assisted versus single-port laparoscopic-assisted vaginal hysterectomy: a case-matched study. J Minim Invasive Gynecol. 2014;21(4):624-631.
50. Baron C, Netter A, Tourette C, Pivano A, Agostini A, Crochet P. Initial experience with vNOTES hysterectomy for benign conditions in a French university hospital. Facts Views Vis Obgyn. 2022;14(2):147-153.
51. Lim JC, Yang LY, Lin WL, et al. Redefining hysterectomy: robotic versus conventional approaches in transvaginal natural orifice transluminal endoscopic surgery and laparoscopically-assisted vaginal hysterectomy. J Formos Med Assoc. 2025:S0929-6646(25)00341-9.
52. Wang CJ, Huang HY, Huang CY, Su H. Hysterectomy via transvaginal natural orifice transluminal endoscopic surgery for nonprolapsed uteri. Surg Endosc. 2015;29(1):100-107.
53. Halisçelik MA, Şanlı C, Bala M, et al. Comparison of pelvic organ prolapse and sexual function after vaginal natural orifice transluminal endoscopic surgery and conventional laparoscopic hysterectomy. J Clin Med. 2025;14(8):2590.
54. Imai K, Suzuki Y, Hiiragi K, Hotta Y, Shigeta H. Comparison of quality of life after robotic-transvaginal natural orifice transluminal endoscopic surgery and robot-assisted laparoscopic hysterectomy. Eur J Obstet Gynecol Reprod Biol. 2023;288:211-215.
55. Isono W, Tsuchiya H, Tsuchiya A, Nishii O, Fujimoto A. Obvious advantage of vaginal natural orifice transluminal endoscopic surgery hysterectomy against total laparoscopic hysterectomy in small uterus patients and the future prospects at a regional core institution: a retrospective study. Eur J Obstet Gynecol Reprod Biol X. 2023;19:100206.
56. Kaya C, Alay I, Cengiz H, Yıldız GO, Baghaki HS, Yasar L. Comparison of hysterectomy cases performed via conventional laparoscopy or vaginally assisted natural orifice transluminal endoscopic surgery: a paired sample cross-sectional study. J Obstet Gynaecol. 2021;41(3):434-438.
57. Jiamset I, Uttraporn P, Suphasynth Y. Comparative outcomes between transvaginal endoscopic hysterectomy and total laparoscopic hysterectomy in patients with benign uterine disease: a single-center, retrospective, cohort, interrupted time-series study. Int J Gynaecol Obstet. 2024;164(3):1080-1085.
58. Kim SH, Jin CH, Hwang IT, et al. Postoperative outcomes of natural orifice transluminal endoscopic surgery-assisted vaginal hysterectomy and conventional laparoscopic-assisted vaginal hysterectomy: a comparative study. Obstet Gynecol Sci. 2018;61(2):261-266.
59. Dujardin C, Cosson M, Behal H, Vandendriessche D, Merlier M, Giraudet G. Success of outpatient hysterectomy: V-Notes versus Vaginal hysterectomy. J Gynecol Obstet Hum Reprod. 2025;54(4):102916.
60. Mollahüseyinoğlu Küllaç F, Özdemir AZ, Yildiz Ç. A single center retrospective study of vNOTES hysterectomy, laparoscopic hysterectomy and vaginal hysterectomy operations. Medicine (Baltimore). 2024;103(50):e40881.
61. Donmez EE, Elci E, Elci G. Total vNOTES hysterectomy versus conventional total laparoscopic hysterectomy in virgin transgender men. Minim Invasive Ther Allied Technol. 2024;33(3):163-170.
62. Qian P, Chen W, Su B, et al. Feasibility and safety of transvaginal natural orifice transluminal endoscopic surgery (V-NOTES) panhysterectomy: a polycentric retrospective study. Eur J Med Res. 2024;29(1):605.
63. Bacak HB, Salman S, Coskun et al. Anatomic and functional outcomes after vaginal hysterectomy with mesh-based v-NOTES lateral suspension versus sacrospinous ligament fixation: a randomized controlled trial.
64. Noh JJ, Kim MS, Kang JH, et al. Comparison of surgical outcomes of hysterectomy by vaginal natural orifice transluminal endoscopic surgery (vNOTES) versus single-port access (SPA) surgery. J Pers Med. 2022;12(6):875.
65. Prekatsounaki S, Bosteels JJA, Baekelandt JF, Mol BWJ, Enzlin P. Sexual functioning after vaginal natural orifice transluminal endoscopic surgery: combined results of two randomized controlled trials. J Sex Med. 2025;22(8):1440-1446.
66. Tekin AB, Yassa M, Kaya C, et al. Implementing the transvaginal natural orifice transluminal endoscopic surgery (vNOTES) "first" strategy in benign gynecological surgeries. Arch Gynecol Obstet. 2023;307(4):1007-1013.
67. Tekin AB, Yassa M, Kaya C, et al. Vaginal birth following diagnostic vNOTES and appendectomy in a pregnant woman: a case report. J Obstet Gynaecol. 2022;42(7):3387-3389.
68. Kaya C, Yassa M. A Bladder-saving technique in vNOTES: uterine twisting maneuver for patients with previous cesarean sections. Asian J Endosc Surg. 2025;18(1):e70076.
69. Yassa M, Kaya C, Kalafat E, et al. The comparison of transvaginal natural orifice transluminal endoscopic surgery and conventional laparoscopy in opportunistic bilateral salpingectomy for permanent female sterilization. J Minim Invasive Gynecol. 2022;29(2):257-264. e1.