Authors

Maritza Harvey
MCN(Perioperative Nursing), RN, MACORN

Dr Paula Foran
PhD, RN, FACORN, FACPAN, MACN

Procedural considerations of hysterectomy by vNOTES (vaginal natural orifice transluminal endoscopic surgery): A literature review

Abstract

Problem identification: Transvaginal natural orifice transluminal endoscopic surgery (vNOTES) may be the next evolution in minimally invasive gynaecological surgery. vNOTES is a modernised vaginal approach to accessing the peritoneal cavity that combines the benefits of laparoscopic and traditional vaginal surgery techniques. While much has been written about the technicalities of this procedure, the aim of this review is to look at vNOTES through a perioperative nursing lens, focusing on providing greater understanding and knowledge for perioperative nurses.

Literature search: An electronic database search of EBSCO, CINAHL, Medline, PubMed and Scopus was undertaken. The search delivered 16 articles for inclusion in this literature review. The papers included were eight retrospective observational studies, five randomised control trials and three systematic reviews and meta-analyses that compared 1961 vNOTES hysterectomy procedures with 2161 conventional laparoscopic hysterectomy procedures.

Data evaluation synthesis: The vNOTES hysterectomy approach has three phases: phases one and three are vaginal entry and phase two is via laparoscopic entry. Four procedural considerations for vNOTES are anaesthesia and pre-operative preparation, surgical skin preparation and draping, equipment and furniture, and instrumentation and consumables. Some benefits of the vNOTES hysterectomy approach are lower levels of post-operative pain, shorter hospitalisation and reduced incidence of intra-operative and post-operative complications. However, it is also important to acknowledge some drawbacks in terms of restricted access, reduced manoeuvrability and limited visualisation when evaluatingthe suitability of vNOTES hysterectomy as an alternative to conventional laparoscopic hysterectomy.

Implications for perioperative nursing practice or research: The vNOTES hysterectomy procedure holds promise for enhanced patient care. Perioperative nurses' involvement in new, innovative, minimally invasive procedures like vNOTES hysterectomy will require understanding and knowledge. Perioperative nurses' familiarity with and knowledge of patient positioning, patient monitoring, surgical technique and intra-operative support, makes them valuable team members during the introduction of the vNOTES approach. This review will allow perioperative nurses to gain knowledge prior to the possible introduction of the vNOTES approach in their theatres, thus empowering them to contribute effectively to patient safety, comfort and positive outcomes.

Keywords: transvaginal NOTES, vNOTES, hysterectomy, transvaginal endoscopic surgery, transvaginal natural orifice transluminal endoscopic surgery

Introduction

Perioperative nurses play a crucial role in patient care and support during surgical procedures; therefore, it is essential for them to understand the evolving techniques in gynaecological surgeries. Hysterectomy is a common gynaecological procedure[1] performed throughout the world. The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) states that a hysterectomy is the surgical removal of the uterus and, in some cases, other organs – commonly one or both of the ovaries and/or fallopian tubes.[1] RANZCOG describes a total hysterectomy as the surgical removal of the uterus as well as the cervix and a subtotal hysterectomy as the removal of the uterus only.[1]

The most common surgical approaches are abdominal hysterectomy (AH), total laparoscopic hysterectomy (TLH), vaginal hysterectomy (VH) and laparoscopic assisted vaginal hysterectomy (LAVH).[1–3] Several studies recommend the VH approach due to decreased risk of surgical complications and reduced post-operative pain and length of hospital stay for patients.[2–4] However, other studies suggest that the VH approach is limited by patient factors such as large boggy uterus and narrow vaginal access which result in poor visualisation and limited space for surgical manipulation.[2–4]

Transvaginal natural orifice transluminal endoscopic surgery (vNOTES) is a minimally invasive approach that combines the benefit of laparoscopic and vaginal surgery using the vagina as the surgical access route to the abdominal cavity.[2,5–8] Once in the abdominal cavity, the vNOTES technique provides minimally invasive access to the uterus, fallopian tubes and ovaries for hysterectomy procedures.[8,9] This access via the vagina also reduces the possibility of scarring as seen with abdominal access.[2–4,8]

The vNOTES technique was first performed in humans in 2015 by Dr Baekelandt in Belgium and has evolved to include several other gynaecological procedures such as hysterectomy, salpingectomy, salpingostomy, oophorectomy and ovarian cystectomy.[2,4–7,10,11] This literature review aims to provide perioperative nurses with insights into the vNOTES hysterectomy approach, including its surgical technique, procedural considerations and possible benefits compared to conventional laparoscopic hysterectomy.

Problem identification

The vNOTES hysterectomy technique has garnered growing global attention among gynaecologists, owing to their adeptness with pelvic anatomy, proficiency in vaginal surgeries and skill in transvaginal peritoneal access.[2,5,8] This approach's surgical methodology holds the potential to revitalise the popularity of VH, addressing the limitations of conventional VH by affording magnified visualisation and an expanded operative field within the perineal cavity.[2,8]

Nonetheless, the imperative for comparative investigations and a comprehensive exploration of perioperative nursing considerations with vNOTES procedures has been duly acknowledged. This review seeks to meticulously investigate the existing literature from a perioperative nursing standpoint. The aim is to bridge the existing knowledge gap by equipping perioperative nurses with an enhanced comprehension of vNOTES. This, in turn, empowers them to play a pivotal role in delivering optimal perioperative care for patients undergoing this specific procedure.

Literature search

Design

This literature review followed Whittemore and Knafl's[12] five stages of an integrative review: problem identification, literature search, data evaluation, data integration and results. Following these five stages ensured a comprehensive review of qualitative, quantitative and mixed methods studies to include a broad understanding of the explored phenomena that will result in evidence-based practice initiatives.

Literature search methods

A systematic exploration of electronic databases including EBSCO, CINAHL, Medline, PubMed, and Scopus was undertaken. The search used specific keywords encompassing 'transvaginal NOTES', 'vNOTES', 'hysterectomy', 'transvaginal endoscopic surgery' and 'transvaginal natural orifice transluminal endoscopic surgery'. To refine the search, a blend of these keywords and corresponding medical subject headings (MeSH) terms, enclosed in parentheses and combined with truncation and Boolean operators, was meticulously applied.

Studies that were peer-reviewed, composed in English, centered on gynaecology and published within the temporal domain of 2017 to 2022 were included. Studies that concentrated exclusively on the indications for vNOTES surgery, devoid of insights pertinent to perioperative nursing, were deliberately excluded. A detailed search strategy is illustrated in figure 1.

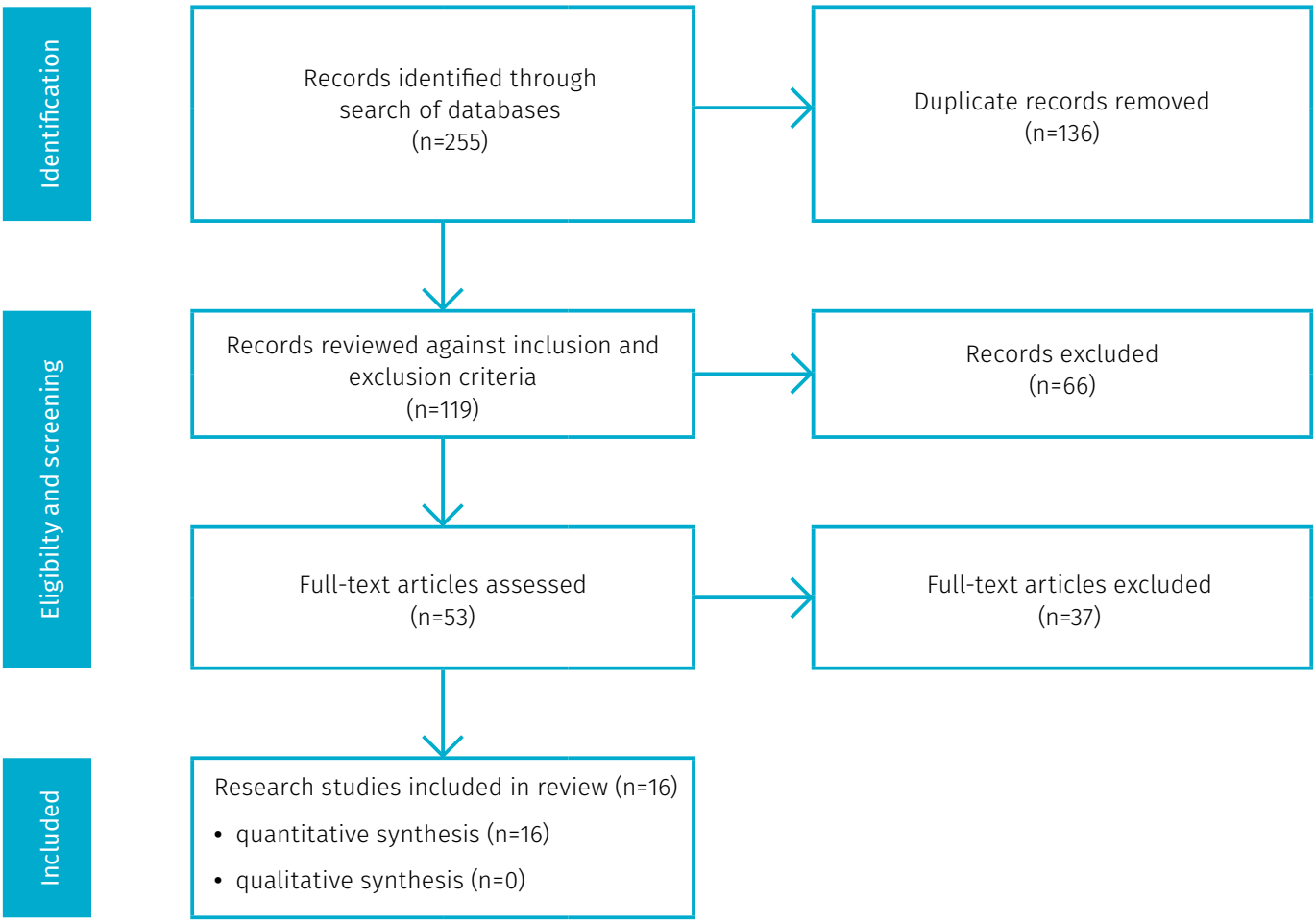

Figure 1: Flow diagram of search strategy

Data analysis

The author repeatedly and critically re-read the articles to identify, group, synthesise and code all the included literature. The subsequent thematic analysis identified four major themes when comparing vNOTES hysterectomy with conventional laparoscopic hysterectomy. Further implications of the major themes were identified and grouped into subthemes.

Data evaluation synthesis

A critical appraisal of 17 studies[2–7,13–23] using the reporting guidelines and checklists from the Equator Network, were conducted to analyse their methodological robustness, credibility, limitations, strengths and weaknesses. One study was deemed to be of suboptimal quality and was deliberately excluded from this review to ensure only scholarly works of merit were included.

Within the selected corpus, there were eight retrospective studies,[2–4,15,18,21–23] five randomised controlled trials,[7,14,17,19,20] and three systematic reviews and meta-analyses.[6,13,16] In addition, other published literature was used to provide definitions, relevant standards and step-by-step guidance for the procedure. Together this literature afforded comprehensive insights into the comparative efficacy of the vNOTES hysterectomy approach compared to the conventional laparoscopic approach.

While vNOTES hysterectomy procedures have been undertaken in Australia, the current dearth of research aimed at guiding perioperative nursing practices is evident. Among the examined studies, five originated from China, four from Turkey, two from Belgium and one each from Brazil, Israel, Korea, Taiwan and the United States of America (USA). Despite their international origins, these studies were found to have contextual resonances with the Australian setting, rendering their inclusion appropriate.

Discussion

Thematic analysis identified four main themes: 'procedural overview', 'procedural considerations' 'possible advantages' and 'possible disadvantages'.

Procedural overview

According to Housmans et al.[5] and Baekelandt et al.[6,7] the vNOTES hysterectomy approach has three phases: phases one and three are vaginal while phase two is laparoscopic. Eight studies[4–8,18,19,21] recommend the surgical steps below as a foundational approach for novice surgeons during their initial exposure to the vNOTES technique. It is worth acknowledging that surgical techniques may vary among individual surgeons, and the steps outlined serve as a guide for training purposes and to increase understanding for perioperative nurses. As with any surgical procedure, flexibility is essential to adapt to patient anatomy, specific clinical scenarios and the surgeon's expertise.

Phase 1: Vaginal entry and consumable set-up

Housmans et al.[5] and Baekelandt et al.[6,7] recommend the operating table is set at a 0° Trendelenburg position with the patient placed in lithotomy position during the setup of the colpotomy and insertion of devices. The patient's legs are abducted and flexed 90° at the hips with the buttocks placed at the edge of the operating table to provide optimal exposure of the perineal region and space for instrument manipulation.[5-7,23] The patient's arms are positioned alongside the body to avoid brachial injuries.[5,23]

One medium and one short Doyen's retractor are placed in the vagina

Table 1: GelPOINT® V-Path medium components

Quantity	Components Included in the Models
1	GelSeal cap
1	Alexis retractor
3	Tomm sleeves
1	12mm sleeve
1	Obturator
1	Instrument shield (C2A11/C2A12 only)
1	Introducer

Figure 2: GelPOINT® V-Path medium components
(Image source: Applied Medical)

and the cervix is grasped with two Pozzi tenacula's.[5–7] Baekelandt et al.[6,7] recommend cervical and paracervical hydrodissection at the start of the procedure to help maintain haemostasis and identify the correct planes. Housmans et al.[5] and Badiglian-Filho et al.[4] recommend a mixture of 40 ml ropivacaine (2mg/ml) with 0.2 ml of adrenaline (1mg/ml) for local anaesthetic infiltration. Local infiltration according to Housmans et al.[5] reduces blood loss and overall operating time. Scalpel circumcision of the cervix will open the pouch of Douglas and vesico-uterine pouch.[4-7]

The surgeon's fingers and a sponge are used as blunt dissection to create the posterior and anterior colpotomy.[5–7] The uterosacral ligaments are clamped, cut and tied with a 1.0 Vicryl absorbable suture.[5–7] Baekelandt et al.[6,7] also advise keeping the sutures at long length and attaching them with mosquito forceps to the drapes until uterosacral ligaments are reapproximated.

Five studies[4–7,24] recommend the GelPOINT® V-Path system by Applied Medical (see Figure 2) as the preferred transvaginal access system for vNOTES procedures.

Various studies[4–7,21] refer to the use of a self-constructed surgical glove port as replacement for the GelPOINT® V-Path system, but this practice may not be compliant with Australian regulations.

Four studies[4–7,21] recommend the 10 mm trocars of the Gelpoint® V-Path system are placed at least 1.5 cm away from the plastic ring at the 2.00, 6.00 and 10.00 o'clock positions as illustrated in Figure 3. Housmans et al.[5] and Baekelandt et al.[6,7] recommend a 10 mm 30° scope as the preferred endoscope as it minimises collisions with other laparoscopic instruments. Housmans et al.[5] and Baekelandt et al.[6,7] also recommend the 2.00 and 10.00 o'clock trocars be used for advancement of laparoscopic instruments and the 6.00 o'clock trocar for the laparoscope advancement during the endoscopic phase.

The Alexis retractor inner ring (see Figure 2) is inserted around the cervix and into the peritoneal cavity with the advancement from the introducer.[4–7,21] The tether attached to the Alexis ring must remain outside the vagina during insertion of the inner ring.[4–7,21] The Alexis outer ring is rolled inwards with a maximum of two rolls to avoid dislodgment of the inner ring.[4–7,21] A finger sweep of the area is performed to ensure tissue is not trapped between the inner ring and the peritoneum.[4–7,21] The GelSeal cap is secured to the Alexis retractor by closing the lever, and insufflation and smoke evacuation tubing is attached (see Figure 3).[4–7,21]

Phase 2: Laparoscopic/ endoscopic approach

The patient is placed in the 20° Trendelenburg position after the insertion of the transvaginal platform to clear the bowel from the pelvis.[4,8,10] It is important that the patients' legs are secured in the stirrups to avoid the patient sliding down toward the cranium.[5–7,23] Pneumoperitoneum commences with the insufflation pressure set at 8–10 mmHGg at a high flow setting and under laparoscopic guidance to visualise safe insufflation of the abdominal cavity.[5–7,23] Dissection of the uterus is performed caudally to cranially until the specimen is freed and mobilised.[5–7] An advanced bipolar energy device is recommended to seal and divide the uterine vessels, broad ligaments, ovarian ligament and mesosalpinx.[5–7]

According to Housmans et al.[5] and Lee et al.[17] the use of advanced bipolar instruments reduces blood loss and overall operating time. Housmans et al.[5] found the visibility and safety during excision of fallopian tubes and adnexa in the vNOTES approach superior to the VH approach. The stopcock valve is opened and closed intermittently during the procedure to evacuate the surgical smoke.[5–7] Haemostasis of the pelvic side walls are confirmed under laparoscopic view once the uterus is completely freed and grasped with laparoscopic forceps.[5] Pneumoperitoneum is released, and the specimen is retracted into the vagina.[5]

Phase 3 Vaginal approach

The patient is repositioned into the 10° Trendelenburg position to ensure the intestines and omentum are out of the way during the closure of the colpotomy.[4,8,10,11,16] The GelSeal cap lever is released, and the specimen is delivered transvaginally.[4–7,21] Large uteri might need manual morcellation in

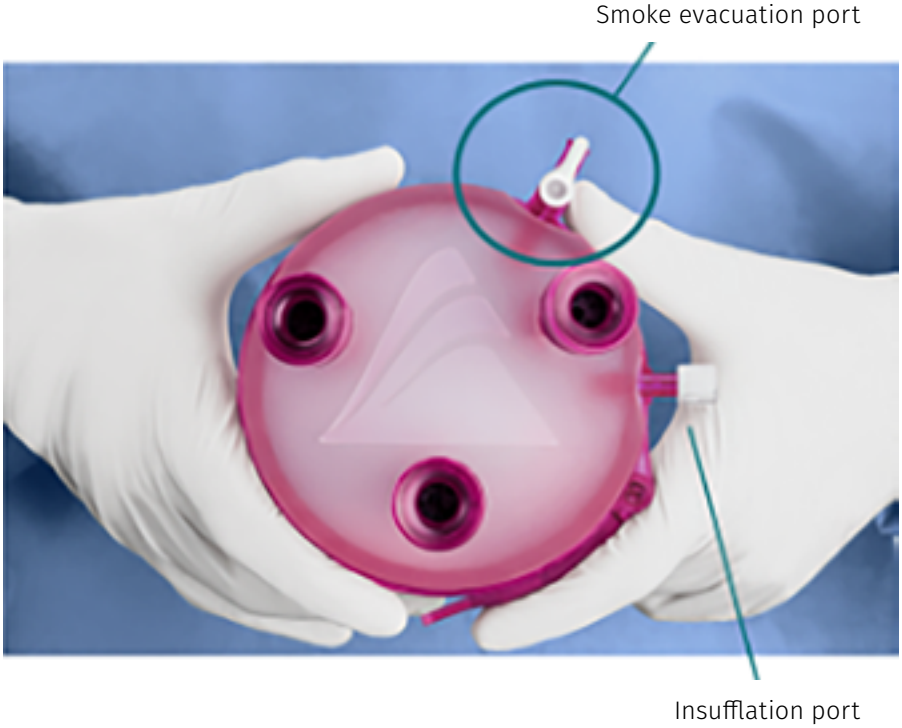

Figure 3: GelSeal cap *(Image source: Applied Medical)*

an endoscopic bag prior to being removed transvaginally.[4,10,15,25] The Alexis ring is removed by unrolling the outer ring and gently pulling the tether (see Figure 2).[4–7,21] The colpotomy is closed using an absorbable running suture.[4–7,21] Four studies[4–7] recommend a size 1.0 Vicryl absorbable suture to close the colpotomy. Vaginal gauze packing is used as tamponade at the conclusion of the surgery.[5]

Procedural considerations

Perioperative nurses' role in vNOTES surgeries extends beyond patient care to the orchestration of various procedural considerations. This includes ensuring proper anaesthesia and pre-operative preparation; maintaining sterile surgical skin preparation, patient positioning and draping; arranging necessary equipment and furniture, and organising instrumentation and consumables. Attention to ergonomic factors and surgical setup can contribute to smoother procedures and greater theatre efficiency.

Anaesthesia and pre-operative preparation

Six studies[4-7,18,22] highlight the importance of prophylactic antibiotic administration in alignment with established protocols for both vaginal and laparoscopic surgeries. This practice is in accordance with the World Health Organization's (WHO) surgical safety checklist (SSC) criteria for antibiotic administration. By adhering to the WHO's criteria for antibiotic administration, perioperative nurses play a pivotal role in minimising the potential for surgical site infections. This practice underscores the commitment of perioperative nurses to patient safety, as they contribute to the reduction of post-operative complications and the enhancement of overall surgical outcomes during vNOTES procedures.

vNOTES hysterectomy procedures require the elevation of the patient's legs into lithotomy positioning causing the redistribution of blood from the legs to the central circulation, resulting in reduced blood perfusion in the legs and an elevation in both cardiac output and venous return.[26,27] When the legs are elevated, as during vNOTES hysterectomy procedures, abdominal organs shift upward, exerting pressure on the diaphragm.[26,27] This can potentially compromise respiratory mechanics and contribute to respiratory difficulties.[26,27] The anaesthetist will ensure the ongoing security of the patient's airway device once the patient has been positioned in Trendelenburg during the vNOTES procedure.[26,27] The anaesthetist may also insert a nasogastric tube if necessary to manage and monitor gastric content during the case.[5–7]

In the context of minimally invasive gynaecological surgery, such as vNOTES hysterectomy, the administration of deep muscle relaxants serves a significant purpose.[26,27] Specifically, it effectively reduces abdominal wall muscle tension, thereby augmenting the quality of the surgical view when using low pneumoperitoneum pressures, as evidenced by studies by Housmans et al.[5] and Baekelandt et al.[6,7] This research consensus also highlights that, when compared to conventional laparoscopic surgery, the enhanced visualisation and surgical access offered by the vNOTES approach can enhance surgical efficiency and contribute to reduced operating time.[5-7]

Furthermore, the advantages of the vNOTES hysterectomy extend to its anaesthetic benefits.[20,21] Reports from Cui et al.[20] and Yildiz et al.[21] demonstrate that vNOTES procedures lead to increased respiratory function due to decreased intra-abdominal pressures. This reduction in intra-abdominal pressure results in a decreased requirement for anaesthetic agents, which contributes to a reduction in both the volume of administered agents and the duration of the operative procedure.[20,21] This beneficial aspect, as substantiated by the faster recovery times reported by Yaldiz et al.,[21] underscores the improved post-operative outcomes for vNOTES hysterectomy patients within the Post Anaesthesia Care Unit (PACU).

Patient positioning

Perioperative nurses need to determine the patient's suitability to tolerate the positioning requirements of a vNOTES hysterectomy procedure.[26,27] Perioperative nurses play a crucial role in ensuring patient safety during surgical procedures such as vNOTES hysterectomy. As part of the pre-operative phase and in line with the WHO SSC, specific measures should be taken to prevent pressure injuries and optimise patient positioning.

To execute proper patient positioning for vNOTES hysterectomy, perioperative nurses should follow a set of guidelines. These include aligning the patient's buttocks with the lower break of the operating room bed, to allow placement of vaginal instrumentation.[26,27] By placing a positioning device beneath the patient's sacrum, perioperative nurses can offer additional support to maintain the necessary exaggerated lithotomy position.[26,27] Attention should be given to avoid excessive flexion, rotation or abduction of the hips, particularly when using specialised leg holders.[26,27]

Consistency is crucial in maintaining proper positioning, and perioperative nurses should ensure that the leg holders are set at an even height.[26,27] By using appropriate padding, perioperative nurses can distribute

pressure more evenly across the patient's legs, reducing the risk of pressure injuries.[26,27] Placing the patient's heels in the lowest position possible helps optimise positioning while preventing pressure injuries to the common peroneal nerve.[26,27] The perioperative nursing team maintain vigilant observation of the sterile field to avoid misalignment caused by scrubbed team members leaning on the patient's legs or against the leg holder posts.[26,27]

Surgeons may employ the Trendelenburg position for vNOTES hysterectomy, as it causes the abdominal contents to shift towards the head when the patient's feet are elevated by around 15 to 30 degrees.[26,27] While the Trendelenburg position can have certain benefits, such as improved surgical access, it results in the redistribution of blood from the lower body to the patient's upper torso and head and can have negative effects on pulmonary circulation and venous blood return from the head.[26,27] Notably, venous pooling can lead to increased intraocular pressure and the possibility of venous stasis which, in turn, can trigger facial oedema (in areas like the tongue, eyes, lips and larynx) and potentially contribute to respiratory distress.[26,27] Therefore, it is essential for perioperative nurses to manage this position cautiously. Although more significant bed angles might be necessary at times, it is advised to minimise the duration of this position and reduce the angle when feasible.[26,27]

In addition, perioperative nurses should ensure a draw sheet is used to secure the patient's arms comfortably at their sides to prevent brachial injury.[26,27] Despite the shorter operating times associated with vNOTES hysterectomy, perioperative nurses should remain attentive to the possible necessity of transitioning patients into alternative positions during the course of the procedure.[4,7,21,22,26,27]

The 'time out' section of the WHO SSC serves as a valuable opportunity for the perioperative nurse to thoroughly initiate, evaluate, discuss and address various positioning factors. These include the alignment of the patient's head, adequate measures for eye protection and padding, appropriate positioning and padding for both upper and lower extremities, prevention of solution pooling on the patient's back and buttocks, monitoring the appearance of extremities including any signs of mottling, identification of potential pressure points and provision of appropriate padding, and correct placement of safety straps.[26,27]

Incorporating these positioning measures into the pre-operative time out process, as part of the WHO SSC, adds an extra layer of patient safety. By adhering to these guidelines, perioperative nurses contribute to minimising the risk of pressure injuries and ensuring optimal patient positioning during vNOTES hysterectomy procedures.

Surgical skin preparation and draping

Housmans et al.[5] and Baekelandt et al.[6,7] highly recommend that surgical skin preparation and sterile draping of the perineal and abdominal area are performed according to standard vaginal and laparoscopic surgery protocols to save time in the event of an intra-operative conversion. The perioperative nurse will prevent pooling of surgical skin solution as prolonged contact with patient skin can cause skin irritation, maceration and potential chemical burns. Pooled solutions can also contaminate the sterile field, increasing the risk of surgical site infection and other post-operative complications.

Equipment and furniture

Figure 4 is a schematic diagram of a suggested operating room set up for a vNOTES procedure.[6,7,22] The minimum equipment needed includes a video tower, monitor on a flexible arm with a sterile drape, advanced bipolar (Thunderbeat) and standard bipolar and monopolar energy sources (diathermy machine) and IV pole. A second monitor and suction equipment are optional.[4–7] Ergonomic challenges of the surgeon and assistant, location of screens and the height of the operating table need to be considered intra-operatively.[10]

The surgically draped primary monitor is centrally placed above the patient's abdomen to ensure ergonomic positioning for the surgeon and first assistant, with the second screen being used for the scrub nurse when possible.[5] The minimum furniture required is an instrument table, Mayo stand, a peri-gynae table, bowl stand and three rolling stools.[4–7]

Instrumentation and consumables

Badiglian-Filho et al.,[4] Housmans et al.[5] and Baekelandt et al.[6,7] recommend the instrumentation and standard equipment as listed in Table 1 for a vaginally assisted vNOTES procedure. A 14 French Foley indwelling catheter is inserted at the start of the procedure.[5–7]

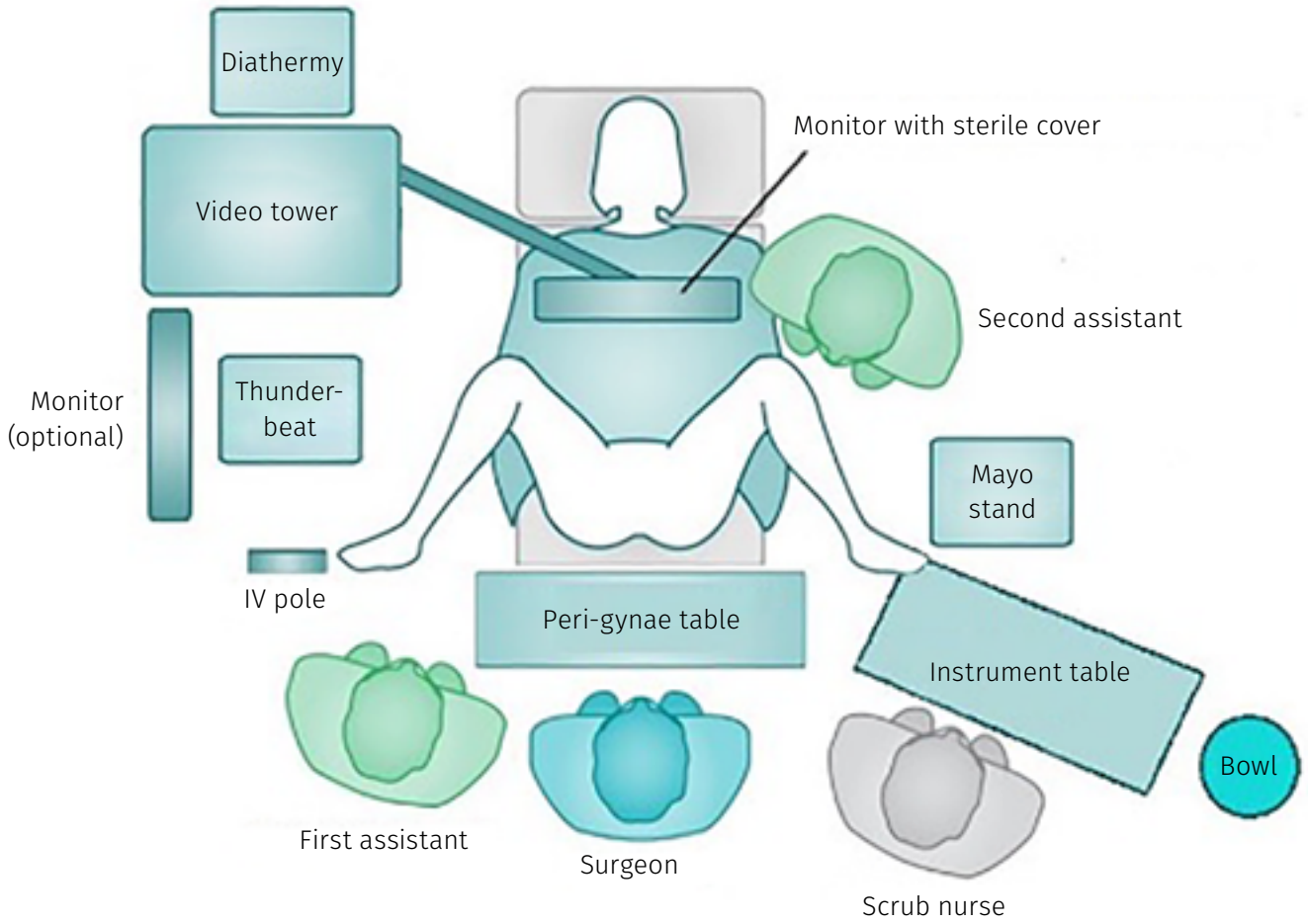

Figure 4: Suggested operating room set up for vNOTES procedure *(Image: adapted from Applied Medical)*

Possible advantages of the vNOTES hysterectomy approach

From a perioperative nursing standpoint, understanding the possible advantages of vNOTES is essential for delivering optimal care. The literature highlighted several advantages including shorter operating time, reduced post-operative pain, shorter hospitalisation and decreased intra- and post-operative complications. These outcomes can positively impact patient recovery, making vNOTES an appealing option for both patients and health care professionals.

Shorter operating time

A randomised controlled trial conducted by Baekelandt et al.[7] found operating times were shorter (41 versus 75 minutes; P<.001) for vNOTES hysterectomy (n = 35) compared to TLH (n = 35). Yildiz et al.[21] reported mean operative times of 90 minutes (45–110 minutes) in the vNOTES patient cohort and 150 minutes (120–200 minutes) in the conventional laparoscopic cohort (P<0.001). These statistically significant findings confirm that the enhanced visualisation and surgical access in vNOTES compared to conventional laparoscopic surgery allows for surgical efficiency and reduced operating time.[8,10]

Badiglian-Filho et al.[4] reported mean range operative times of 111.90 minutes (80–180 minutes) in the vNOTES patient cohort (n = 21) and 113.98 minutes (64–350 minutes) in the conventional laparoscopic group (n = 65) (P = 0.904). A limitation of the Badiglian-Filho et al. study was that two surgeons performed the conventional laparoscopic hysterectomies in the study and only one surgeon performed the vNOTES hysterectomies and this may have affected the mean operating times of the two patient cohorts.

Table 2: Standard Instrumentation and equipment for vaginally assisted vNOTES procedures[4–7]

conventional vaginal instruments	2 pairs of scissors (Mayo and Metz) 1 long scalpel handle with #23 blade 2 pickup forceps (toothed and non-toothed) 2 needle holders 3 VICRYL sutures, size 1 2 mosquito forceps 1 Kocher clamp 1 Roberts forceps, curved 1 cystoscope extra Mosquito forceps
conventional laparoscopic instruments	0° 5 mm and 30° 10 mm laparoscope laparoscopic Allis forceps 1 5 mm vessel sealing instrument (monopolar) 1 laparoscopic bipolar forceps 2 atraumatic laparoscopic graspers 1 laparoscopic scissors (optional)
forceps	2 Pozzi tenaculum forceps 2 mosquito clamps 2 Heaney clamps (curved and angled) 2 ring forceps 2 Pean clamps 1 Roberts forceps 1 Kocher clamp
retractors	Doyen vaginal retractors (1 small, 1 medium and 1 large)
consumables	1 GelPOINT® V-Path 1 laparoscopic suction irrigation 1 insufflation tubing 1 smoke evacuator 1 14 French Foley indwelling urinary catheter and catheter bag scabbards (2 long and 1 short) single cystoscopy giving set Yankeur sucker dissection swabs (optional) vaginal packing
extra	laparoscopic hysterectomy set up ready outside theatre for conversions

A study by Kaya et al.[22] included only obese women and reported mean operating times of 67.5 minutes (35–170 minutes) in the vNOTES group (n = 48) and 135 minutes (105–220 minutes) in the TLH group (n = 35). This statistically significant result (p<0.001) highlights the benefits of a vNOTES hysterectomy approach for the bariatric female population in overcoming current ergonomic and procedural difficulties experienced due to increased body mass.

Increased body mass can have an impact on surgical view, procedure time, intra-operative positioning and post-operative outcomes.[8,22,28] The amplified weight on the chest and heightened abdominal pressure seen in bariatric individuals with a body mass index over 40 kg/m² increases vulnerability to aspiration and diminishes lung capacity.[26] This situation might mandate mechanical intervention such as using positive-pressure ventilation through an endotracheal tube.[26] Perioperative nursing staff should prioritise minimising the duration of lithotomy and Trendelenburg positioning for bariatric patients, aiming to use this position as briefly as is feasible despite the shorter operating time associated with vNOTES hysterectomies.[26]

Decreased post-operative pain

Baekelandt et al.[7] found that vNOTES hysterectomy patients required less post-operative analgaesia (8 versus 14 units; P = .006) and had a lower self-reported and visual analogue pain score (P=0.003) compared to the TLH group. Yildiz et al.[21] also reported a lower pain score in the vNOTES group (P=0.002). Eight of the studies[3,5,6,15.17,18,22,23] found women in the vNOTES hysterectomy group reported lower pain scores, less post-operative pain and decreased analgaesia administration in the PACU compared to multiport conventional laparoscopic surgery.

Seven studies[5,6,7,18,21–23] found that the lower pneumoperitoneum settings of the vNOTES approach decreased post-operative discomfort compared to conventional laparoscopic surgery. These are significant findings confirming that vNOTES hysterectomy is superior to conventional laparoscopic hysterectomy in minimising the post-operative pain and discomfort associated with high abdominal pressures and skin incisions found in conventional laparoscopic surgery.[8] The study by Park et al.[14] was the only study to report post-operative vaginal pain separately to abdominal pain and found the median total vaginal pain score in the vNOTES group was higher compared to the conventional laparoscopy group (3 versus 1 (P=0.007) at 16 hours, and 2 versus 0 (P=0.010) at 24 hours). However, a limitation of the Park et al. study is the use of patient-controlled analgesia in the PACU as this intervention may have hindered the accuracy of the data.

Shorter hospitalisation

Baekelandt et al.[7] found shorter length of hospital stays in the vNOTES hysterectomy group compared to TLH (0.8 versus 1.3 days; mean difference -0.50; 95% CI -0.98 to 0.02 days; P = .004) and more discharges within twelve hours of surgery (77% versus 43%; difference 34%; 95 CI 13–56%; P=0.007). Yildiz et al.[21] also reported a reduced mean length of hospital stay of 54.5 hours (42–63 hours) in the vNOTES hysterectomy group compared to 67 hours (51–80) in the TLH group (P=0.001). Kaya et al.[22] reported that the vNOTES group (n = 48) had a statistically significant shorter median length of hospital stay than the TLH group (n = 35). The vNOTES hysterectomy group in Yang et al.[16] reported shorter recovery times after surgery (mean difference -1.36, 95% CI -1.84 to -0.87; P<0.001). These statistically significant findings indicate that all women, including the obese population, undergoing a vNOTES hysterectomy in future can be treated in a day care setting allowing them to return to work and other activities of daily living more quickly.[3,8,28]

Intra-operative and post-operative complications

All the studies reviewed reported no statistically significant differences between vNOTES and TLH in terms of intra-operative and post-operative complications. Three studies[7,15,19] reported bladder trauma in one of the vNOTES cases but did not require conversion. The bladder trauma was associated with larger uteri and pelvic adhesions from previous abdominal surgeries in all three studies.[7,15,19]

Possible disadvantages of the vNOTES hysterectomy approach

While it is true that the vNOTES hysterectomy approach offers possible advantages, it also has drawbacks in terms of restricted access, reduced manoeuvrability and limited visualisation. It is imperative to consider these possible disadvantages and limitations when evaluating the suitability of the vNOTES approach as an alternative to conventional laparoscopic hysterectomy.

Restricted access and reduced manoeuvrability

The need to navigate through the narrow vaginal canal, which is inherent in the vNOTES approach, results in restricted surgical access. In turn, this constrained pathway can impede the surgeon's ability to

manipulate surgical instruments with the same degree of dexterity and precision that is achievable through conventional laparoscopy.

Limited visualisation

The limited visual field provided by the vNOTES approach might hinder comprehensive assessment of the surgical site, potentially leading to oversight of important anatomical details or complications. In contrast, the conventional laparoscopic approach allows for a wider scope of vision and enhanced manipulation that enables surgeons to address complex tissue interactions and perform thorough procedural execution more effectively.

Conclusion

This literature review underscores the significance of perioperative nurses' understanding of the vNOTES hysterectomy approach. With thorough knowledge of the surgical technique, procedural considerations and benefits of vNOTES hysterectomy, perioperative nurses can play a pivotal role in patient care, contribute to efficient surgical procedures and facilitate positive patient outcomes. As the vNOTES approach continues to gain traction, perioperative nurses are poised to have substantial impact on gynaecological surgical practices.

The vNOTES hysterectomy approach may be the next advancement in minimally invasive surgery, improving not only patient outcomes and cosmesis but also patient satisfaction. This literature review reported significant advantages of vNOTES hysterectomy for patients – reductions in surgical procedural time, post-operative pain, analgaesic administration and hospital stay; faster recovery time and fewer post-operative infections. The combined benefits of laparoscopic and vaginal surgery in the vNOTES approach broadens the indications for vaginal hysterectomy and may help overcome the potential drawbacks of reduced access to and limited visualisation of the anatomy.

Perioperative nurses' involvement in innovative procedures like vNOTES hysterectomy needs further exploration. Perioperative nurses play a vital role in planning, implementing and delivering high quality intra-operative patient care. This review of the vNOTES hysterectomy approach will increase perioperative nurses' knowledge and can lead to clinical practice skills advancement.

To date, there has been no Australian research conducted into the vNOTES approach. Therefore, it is recommended that research into the outcomes of this procedure be undertaken in the Australian context to determine the role of vNOTES hysterectomy within the landscape of hysterectomy procedures in Australia.

Declaration of conflicting interests

The authors have declared no competing interests with respect to the research, authorship and publication of this article.

Acknowledgement

This paper was submitted to the University of Tasmania as part fulfilment of subject CNA803, Advanced Clinical Nursing Practice, for the Master of Clinical Nursing (Perioperative Nursing). The author sincerely wishes to thank Dr Paula Foran, unit coordinator, for her guidance throughout the master's course and work in preparing this paper for publication.

References

1. The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG). Hysterectomy [Internet]. Melbourne: RANZCOG; 2018 [cited 2022 Sep 26]. Available from: www.ranzcog.edu.au/wp-content/uploads/2022/06/Hysterectomy-pamphlet.pdf.
2. Ozceltik G, Hortu I, Itil IM, Yeniel AO. Impact of transvaginal natural orifice transluminal endoscopic surgery on hysterectomy practice [Internet]. J Gynecol Obstet Hum Reprod. 2022[cited 2022 Sep 26];51(1). DOI: 10.1016/j.jogoh.2021.102241
3. Lauterbach R, Matanes E, Amit A, Wiener Z, Lowenstein L. Transvaginal natural orifice transluminal endoscopic (vnotes) hysterectomy learning curve: Feasibility in the hands of skilled gynecologists [Internet]. Isr Med Assoc J. 2020[cited 2022 Sep 26];22(1):13–6. Available from: www.ima.org.il/MedicineIMAJ/viewarticle.aspx?year=2020&month=01&page=13
4. Badiglian-Filho L, Faloppa CC, de Oliveira Menezes AN, Mantoan H, Kumagai LY, Baiocchi G. Vaginally assisted NOTES hysterectomy with adnexectomy (vNOTES) compared with conventional laparoscopy: A retrospective observational cohort study [Internet]. Int J Gynaecol Obstet. 2021[cited 2022 Sep 26];153(2):351–6. DOI: 10.1002/ijgo.13483
5. Housmans S, Stuart A, Bosteels J, Deprest J, Baekelandt J. Standardized 10-step approach for successfully performing a hysterectomy via vaginal natural orifice transluminal endoscopic surgery [Internet]. Acta Obstet Gynecol Scand. 2022[cited 2022 Sep 26];101(6):649–56. DOI: 10.1111/aogs.14367
6. Baekelandt J, De Mulder PA, Le Roy I, Mathieu C, Laenen A, Enzlin P, et al. Postoperative outcomes and quality of life following hysterectomy by natural orifice transluminal endoscopic surgery (NOTES) compared to laparoscopy in women with a non-prolapsed uterus and benign gynaecological disease: A systematic review and meta-analysis [Internet]. Eur J Obstet Gynecol Reprod Biol. 2017[cited 2022 Sep 26];208:6–15. DOI: 10.1016/j.ejogrb.2016.10.044
7. Baekelandt JF, Bosteels JJA, De Mulder PA, Le Roy I, Mathieu C, Laenen A et al. Hysterectomy by transvaginal natural orifice transluminal endoscopic surgery versus laparoscopy as a day-care procedure: A randomised controlled trial [Internet]. BJOG. 2019[cited 2022 Sep 26];126(1):105–13. DOI: 10.1111/1471-0528.15504

8. Kapurubandara S, Lowenstein L, Salvay H, Herijgers A, King J, Baekelandt J. Consensus on safe implementation of vaginal natural orifice transluminal endoscopic surgery (vNOTES) [Internet]. Eur J Obstet Gynecol Reprod Biol. 2021[cited 2022 Sep 27];263:216–22. DOI: 10.1016/j.ejogrb.2021.06.019
9. Siati A, Zeraidi N, Lakhdar A, Baidada A, Kharbach A. Transvaginal natural orifice transluminal endoscopic surgery (vNOTES) in gynecology: A case presentation and literature review [Internet]. PAMJ Clinical Medicine. 2020[cited 2022 Sep 26];4. DOI: 10.11604/pamj-cm.2020.4.90.21859
10. Levy L, Tsaltas J. Recent advances in benign gynecological laparoscopic surgery [Internet]. Fac Rev. 2021[cited 2022 Sep 27]. DOI: 10.12703/r/10-60
11. Goldenberg M, Burke YZ, Matanes E, Lowenstein L. Transvaginal natural orifice transluminal endoscopic surgery (vNOTES) for prophylactic bilateral salpingo-oophorectomy [Internet]. Surg Oncol. 2020[cited 2022 Sep 27];35:79–80. DOI: 10.1016/j.suronc.2020.07.006
12. Whittemore ER, Knafl K. The integrative review: Updated methodology [Internet]. J Adv Nurs. 2005[cited 2022 Oct 8];52(5):546–53. DOI: 10.1111/j.1365-2648.2005.03621.x
13. Li C, Hua K. Transvaginal natural orifice transluminal endoscopic surgery (vNOTES) in gynecologic surgeries: A systematic review [Internet]. Asian J S. 2020 [cited 2022 Sep 26];43(1):44–51. DOI: 0.1016/j.asjsur.2019.07.014
14. 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 [Internet]. Pain Ther. 2021[cited 2022 Sep 26];10(2):1401–11. DOI: 10.1007/s40122-021-00300-
15. Wang X, Li J, Hua K, Chen Y. Transvaginal natural orifice transluminal endoscopic surgery (vNOTES) hysterectomy for uterus weighing ≥1 kg [Internet]. BMC Surg. 2020[cited 2022 Sep 26];20(1):234. DOI: 10.1186/s12893-020-00897-3
16. Yang E, Nie D, Li Z. Comparison of major clinical outcomes between transvaginal NOTES and traditional laparoscopic surgery: A systematic review and meta-analysis [Internet]. J Surg Res. 2019[cited 2022 Sep 26];244:278–90. DOI: 10.1016/j.jss.2019.06.012
17. Lee C-L, Wu K-Y, Huang C-Y, Yen C-F. Comparison of LigaSure™ tissue fusion system and a conventional bipolar device in hysterectomy via natural orifice transluminal endoscopic surgery (NOTES): A randomized controlled trial [Internet]. Taiwan J Obstet Gynecol. 2019[cited 2022 Sep 26];58(1):128–32. DOI: 10.1016/j.tjog.2018.11.024
18. Basol G, Cora AO, Gundogdu EC, Mat E, Yildiz G, Kuru B et al. Hysterectomy via transvaginal natural orifice transluminal endoscopic surgery versus single-port laparoscopy: Comparison of early outcomes [Internet]. J Obstet Gynaecol Res. 2021[cited 2022 Sep 26];47(9):3288–96. DOI: 10.1111/jog.14874
19. Zhang J, Dai Y, Leng J, Zhu L, Lang J, Sun D. Hysterectomy and bilateral adnexectomy using transvaginal natural orifice transluminal endoscopic surgery: The role of multichannel abdominal PORT and vaginal support ring [Internet]. J Obstet Gynaecol Res. 2021[cited 2022 Sep 26];47(7):2521–58. DOI: 10.1111/jog.14752
20. Cui Y, Liu K, He L, Deng L, Huang L, Zhou Y et al. Comparison of two different anesthesia methods on the quality of surgical condition in transvaginal natural-orifice transluminal endoscopic surgery (vNOTES): A prospective single-blind randomized clinical trial [Internet]. Perioper Care Oper Room Manag. 2022[cited 2022 Sep 26];27. DOI: 10.1016/j.pcorm.2022
21. Yildiz GO, Sertcakacilar G, Bostancı I, Akyol D, Hergunsel GO, Kaya C. Gynecological natural orifice transluminal endoscopic surgeries from an anesthesiologist's perspective: A retrospective cohort study [Internet]. Journal of Surgery & Medicine (JOSAM). 2021[cited 2022 Sep 26];5(10):1062–6. DOI: 10.28982/josam.946535
22. 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 [Internet]. J Invest Surg. 2022[cited 2022 Sep 26];35(4):862–7. DOI: 10.1080/08941939.2021.1927262
23. Reddy H, Kim SW, Plewniak K. Applications of vaginal natural orifice transluminal endoscopic surgery (vNOTES) in gynecologic surgery [Internet]. Curr Opin Obstet Gynecol. 2022[cited 2022 Sep 27];34(4):220–6. DOI: 10.1097/GCO.0000000000000799
24. Chene G, Nohuz E, Mansoor A, Cerruto E, Lamblin G, Galea M et al. Easy way to perform salpingectomy by transvaginal natural orifice transluminal endoscopic surgery (vNOTES) (with video) [Internet]. J Gynecol Obstet Hum Reprod. 2021[cited 2022 Sep 27];50(5):102005. DOI: 10.1016/j.jogoh.2020.102005
25. Buzzaccarini G, Noventa M, D'Alterio MN, Terzic M, Scioscia M, Schäfer SD et al. vNOTES hysterectomy: Can it be considered the optimal approach for obese patients? [Internet]. J Invest Surg. 2022[cited 2022 Sep 27];35(4):868–9. DOI: 10.1080/08941939.2021.1939467
26. Australian College of Perioperative Nurses Ltd (ACORN). The New ACORN Standards: Volume 3 – 2023 Standards for Safe and Quality Care in the Perioperative Environment (SSQCPE) for Organisations. Adelaide: ACORN; 2023.
27. Spruce L. Back to Basics 2.0: Positioning the patient [Internet]. AORN J. 2021[cited 2023 Aug 10];114(1):75–84. DOI: 10.1002/aorn.13442
28. Buzzaccarini G, Stabile G, Török P, Petousis S, Mikuš M, Della Corte L et al. Surgical approach for enlarged uteri: Further tailoring of vNOTES hysterectomy [Internet]. J Invest Surg. 2022[cited 2022 Sep 27];35(4):924–5. DOI: 10.1080/08941939.2021.1967528