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REVIEW ARTICLE

Prevention of infection and assessment of fever following laparoscopic hysterectomy

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ABSTRACT

Background: A major side effect of hysterectomy is surgical site infection (SSI). Abdominal hysterectomy has higher infection rates than minimally invasive hysterectomy. The fact that fewer incisions are made as opposed to a significant front abdominal wall incision is reflected in the lower SSI rates. SSI following laparoscopic hysterectomy is prévalentdespite the reduced rates. We examine the pre-, intra-, and postoperative risk factors for infection in this article. Also included are the incidences of postoperative fever following laparoscopic hysterectomy and when does a feverish patient needs to be evaluated for infection. **Method:** Using phrases and keywords from the National Library of Medicine, Medical Subject Headings (MeSH) such as "postoperative," "surgical site," "infection," "fever," "laparoscopic," "laparoscopy," and "hysterectomy," PubMed was searched for papers exclusively in English. **Conclusions:** One of the best method to increase patient safety is to lower hospital acquired illnesses like SSI. The gynecologic surgeon or hospital might take focused preventive steps when they are aware of the risk factors for infection following laparoscopic hysterectomy.

Keywords: Hysterectomy, surgical wound infection, and postoperative fever.

Compared to laparoscopic hysterectomy, abdominal hysterectomy has a higher rate of surgical site infection (SSI) (4% vs. 2%) [1]. Cellulitis rates after total abdominal hysterectomy (TAH) were 2.6%, compared to 0.6% in total vaginal hysterectomy (TVH) and total laparoscopic hysterectomy (TLH), when SSI rates were compared based on abdominal access method in a cross-sectional study. Infection rates in the deep/organ space were 1.2% in TAH, 1.0% in TVH, and 0.5% in TLH [2]. The advantages of anterior abdominal wall punctures over bigger anterior abdominal wall incisions are reflected in these decreased rates.

There might still be potential for improvement even though the rate of SSI is low for minimally invasive hysterectomy. Despite advancements in aseptic technique, antibiotic prophylaxis, and technology, infection rates following laparoscopic hysterectomy have been reported to be as high as 9% in one series of more than 10,000 cases. For this reason, it is important to talk about preventive measures and strategies [3]. The Joint Commission and the Centers for Medicare and Medicaid Services (CMS) have sponsored healthcare initiatives that focus on preventing hospital - acquired infections, including SSI, as one of the best methods to increase patient safety.

Given the prevalence of laparoscopic hysterectomy and its high likelihood of SSI, lowering this rate is a key objective for gynecologic surgeons. One of the beneficial measures that minimize SSI is weight-based dosing with antimicrobial prophylaxis (AMP) [4]. Surgeons must be aware of the pre, intra, and postoperative risk factors to prevent

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post hysterectomy infections. Implementing preventive measures is made possible by the gynecologic surgeon's and hospital's knowledge and awareness of these risk factors. In this article, we discuss how to prevent postoperative infection by reducing risks before, during, and after surgery. We also briefly review the pathogenesis of surgical site infections in laparoscopic hysterectomy. When appropriate, we concentrate on both general operating concepts and those unique to gynecologic surgeons. We also go through the prevalence of postoperative fever following laparoscopic hysterectomy and when a febrile post-operative patient has to be evaluated for infection.

Methods

We searched PubMed for English-only articles using a variety of National Library of Medicine Medical Subject Headings (MeSH) terms and keywords, including but not limited to "postoperative," "surgical site," "infection," "fever," "laparoscopic," "laparoscopy," and "hysterectomy," to start this review of the best practices to prevent infection after laparoscopic hysterectomy. Each search's results were examined, and if appropriate, articles were included. The search parameters were expanded and recommendations were extrapolated from papers and data on postoperative infection that included other laparoscopic or open surgical cases, including TAH, when the literature lacked articles with explicit advice for the prevention of infection following TLH.

Surgical site infections pathogenesis: When the skin's integrity is compromised during surgery, as well as when the vagina is opened, the skin, muscle, and abdominal tissue are exposed to endogenous flora. Aerobic gram-positive cocci from the patient's endogenous skin flora are the main pathogens responsible for trocar related illness. Staphylococcus aureus, coagulase-negative staphylococcus spp., enterococcus spp., and escherichia coli are often found pathogens in abdominal incisions [5]. However, hysterectomies differ from other abdominal and gynecologic surgeries in that, in addition to the bacteria from the skin, possible harmful microorganisms may also climb to the operating site from the breached vagina and endocervix. The facultative and obligate anaerobic gram-positive and negative organisms that make up the vaginal flora are complex and dynamic. Gynecologic SSIs are typically polymicrobial as a result [6,7]. A large bacterial inoculum, inadequate AMP, and inefficient host defensive mechanisms are common effects of infection [8]. In order to contain injected bacteria and avoid infection, both systemic and local host immune mechanisms work, and sufficient antimicrobials in the tissue support natural host immunity. As contaminating bacterial numbers and pathogenicity rises, so does the chance of infection. It has been quantified that if the surgical site is contaminated with >105 bacteria per gram of tissue, the infection rate will be significantly increased. However, the necessary inoculum drops to 103 bacteria per gram of tissue when foreign materials, such as mesh or suture material, are present [9-11].

The postoperative infection risk factors

Anteoperative variables: Certain patient features have been directly and/or indirectly linked to the rise in SSIs. Risk factors for SSI include uncontrolled diabetes, tobacco usage, extended steroid use, extended hospital stays, and concurrent infections [12]. In non-emergent situations, the majority of these host factors can be changed [2, 12, 13]. Diabetic individuals should have their blood glucose levels under control [1]. Diabetes should be managed whenever possible since higher glucose levels (>140 mg/dL) in the 48 hours before and after surgery have been linked to an increased risk of postoperative infection [12-14]. It should always be encouraged to stop smoking. Before any elective surgery, patients should be advised to quit smoking at least 30 days in advance [15]. A lengthy hospital stay before surgery should be avoided since it may result in the development of a nosocomial infection, raising the risk of SSI [12, 16]. Before surgery, especially in cases that are not urgent, all infections should, whenever possible, be properly diagnosed and treated. Upper and lower respiratory tract infections, as well as urinary tract infections, should receive special attention because if they are not treated, they could be incorrectly labeled as postoperative infections. About 20-30% of healthy people have S. aureus in their nares, a common SSI isolate [17]. It has been established that S. aureus nasal carriage and postoperative infection are related. Mupirocin was applied to the nares before to surgery in a non-gynecologic research, which reduced the risk of SSI [18]. A systemic review and meta-analysis revealed that decolonized MRSA carriers who were given an anti-MRSA prophylactic antibiotic were significantly protected, even though preoperative screening for methicillin resistant S. aureus (MRSA) is not advised (against gram-positive SSI) [18]. As a result, surgeons are advised to include an anti-MRSA antibiotic, such as vancomycin, in the standard AMP administered to patients who have a history of MRSA colonization or infection, regardless of how remotely SSI and bacterial vaginosis (BV) have both been connected. Preoperative regular BV testing has been recommended for individuals undergoing

hysterectomy or other vaginal surgery [8, 19]. Preoperative screening is recommended because, in the event that a diagnosis is made, an appropriate course of treatment calls for seven days of antibiotics, including oral or intravaginal. Patients who don't obtain preoperative care should receive perioperative care. Because BV may reoccur or patients can forget to take their medicine. One study showed that adding metronidazole to cefazolin for AMP is also financially advantageous [20]. Preoperative testing for BV is advised, and if it is positive, metronidazole or adding it to AMP should be considered.

Incision time factors: Chlorhexidine preoperative showers has been proven to lower the rate of SSI in various nongynecological investigations [21]. A cochrane review, however, did not uncover sufficient data to suggest routine use [22]. Chlorhexidine washes lower microbial colony numbers on the skin and may lower SSI risk in some people. Given the paucity of conclusive evidence, it is reasonable for surgeons to recommend preoperative showers with chlorhexidine soaps or impregnated sponges for elective surgical cases. This is a straightforward step that patients can take on their own to lower microbial counts before an operation and thereby lower the risk of an SSI. It is not a novel idea to use chlorhexidine alcohol to prepare the skin around a surgical site. It has been demonstrated to be better than povidone - iodine and is generally recognized and utilized [23, 24]. For patients with iodine allergies, a solution of chlorhexidine gluconate in low- or no-alcohol (e.g., 4% chlorhexidine scrub) is a safe and effective substitute for cleaning the vagina [25, 26]. Chlorhexidine was found to be more successful at reducing bacterial colony counts in the vaginal operation field in a randomized controlled experiment comparing the efficiency of povidone - iodine and chlorhexidine for vaginal hysterectomy [26]. When preparing the vagina for a laparoscopic hysterectomy, surgeons should think about using 4% chlorhexidine without alcohol. Shaving the surgical site before surgery has been linked to an increased risk of SSI [12]. Electric clippers, depilatory, or no removal are all appropriate techniques of hair removal. Before surgery, the patient should be advised from using a razor, and hair should only be plucked off if it interferes with the surgical site [27]. The use of AMP lowers the risk of SSI and shortens hospital stays [4, 28]. It should obtain acceptable tissue and serum levels before the skin and vagina are breached in surgery, also be safe, affordable, and effective against the majority of germs frequently found during surgery. Throughout the procedure, the drugs' concentrations in the serum and tissue should be kept at therapeutic levels [4]. In the US, cephalosporins are frequently employed. Both gram-positive and negative microbes are susceptible to them. The most widely utilized AMP in the US is cefazolin. To ensure that antibiotics get to the surgical site, AMP should be given at least 30 minutes before the procedure (30-60 minutes is fine). Cefazolin intraoperative concentrations in various tissue samples have been studied and the results indicate that the tissue concentration is inversely correlated with the patient's body mass index (BMI), therefore the dose should be weight-based [28]. Recent modifications have been made to the AMP's hysterectomy recommendations. For patients weighing up to 120 kg, 2 gm of cefazolin is advised, and individuals weighing more than 120 kg should take 3 gm [4]. On the basis of roughly two times the drug's half-life, redosing is advised (i.e. cefazolin should be redosaged 4 hours from the first dose). Antimicrobials should also be redosaged to patients if blood loss increases (>1500 mL).

Operative variables: There are numerous surgical and aseptic techniques that should be used during laparoscopic hysterectomy to avoid SSI. Direct trocar insertion or an open entrance approach may offer a lower postoperative infection rate than entry with the Veress needle, according to a randomized prospective experiment. It has been noted that standard 4-port surgeries have a higher infection rate than single-port laparoscopic hysterectomy [29, 30]. From a postoperative infection perspective, robot-assisted hysterectomy does not offer a benefit over the traditional laparoscopic technique. However, given that laparotomies have a greater incidence of infection, a robotic approach should be taken into account and used before laparotomies [2, 3, 31, 32]. A comparison of SSIs following laparoscopic supracervical hysterectomy (LSH), TLH, laparoscopic-assisted vaginal hysterectomy (LAVH), and transvaginal hysterectomy (TVH) revealed rates of cellulitis after use of these minimally invasive routes to be 1.3, 0.6, 0.8, and 0.6%, respectively, and deep/organ space infection rates to be 0.7, 0.5, 1.5, and the rate of deep/organ space infections and cellulitis was lowest in TLH. It's important to highlight that no statistical analysis of the subgroups for minimally invasive hysterectomy was done. Therefore, it is unclear whether these variations should be taken into account when choosing a strategy or whether there are multiple suitable options. To prevent SSI, excellent surgical technique is crucial. Important intraoperative steps in preventing infection include maintaining hemostasis, gently

touching tissue, removing devitalized tissues, eliminating dead space hematoma or seromas, and avoiding hypothermia [12]. It is also recommended to utilize irrigation and hemostatic medications wisely and appropriately, such as oxidized regenerated cellulose. However, if administered excessively, hemostatic medications might act as an infection nidus [11].

Postoperative care: When the urinary catheter is no longer required, it should be removed to help prevent infections in the postoperative period [33]. Early catheter removal following the end of the procedure or after six hours seemed preferable to removal 24 hours after hysterectomy [34]. Early ambulation and the use of incentive spirometry should be promoted for patients who stay in the hospital overnight in order to prevent postoperative lung infection [35]. Blood transfusions and anaemia are connected to SSI. When possible, it is recommended to increase haemoglobin levels prior to surgery and to use postoperative blood transfusions sparingly [2, 36].

Postoperative fever analysis: It is critical to note that even with the best patient care, some patients will still experience a postoperative infection or a fever. Although it's crucial to identify and manage SSIs, not all fevers are a sign of a postoperative infection. Both endogenous and external pyrogens can cause a fever. Prostaglandins are stimulated to release during surgery by endogenous pyrogens, which raise the body's thermoregulatory set point [37]. Microorganisms or their metabolites are often where exogenous pyrogens originate. When summoned to assess a patient with postoperative fever, it is crucial to keep in mind that they have the potential to produce fever [38, 39]. When compared to open surgery, laparoscopic hysterectomy has lower rates of postoperative fever. This is also true for infection [39, 40]. Between 0-15% of patients gets postoperative fever following laparoscopic hysterectomy, which varies greatly with institutions. Only a small portion, though, can be attributed to infection [41, 42]. In general, it is probably more economical to monitor fever stricken patients for the first 24-48 hours following a hysterectomy than to start treatment right away [43, 44]. A thorough history and physical examination should be performed on patients who have a persistent fever of 38.3°C (101°F) at 24 hours after surgery, 2 temperature readings of 38.0°C (100.4°F) taken at least 4-6 hours apart after 24 hours, or ones that are at high risk for infection based on their medical history (such as diabetic or immunocompromised patients) and surgical history (surgery lasting more than 2 hours and ASA clinical status classification >3). The 5 Ws mnemonic (wind, water, wound, walking, and wonder drug) [45] should be used to evaluate patients who have early postoperative fevers in order to pinpoint the source of the infection. The emphasis and foundation of any investigation (blood tests and imaging examinations) into a fever should be the surgeon's assessment. If obtained without a focused review to identify the source of fever, the majority of routine investigations are low yield [46-49]. If there is no sign of infection, it is best to avoid giving empiric antibiotics or extending the AMP, especially in the first 24-48 hours following surgery. A thorough history and physical examination should be performed on patients who have a persistent fever of 38.3°C (101°F) at 24 hours after surgery, 2 temperature readings of 38.0°C (100.4°F) taken at least 4-6 hours apart after 24 hours, or ones that are at high risk for infection based on their medical history (such as diabetic or immunocompromised patients) and surgical history (surgery lasting more than 2 hours and ASA clinical status classification >3). The differential diagnosis of infection related fever following gynecological surgery includes cellulitis, necrotizing fasciitis, superficial abscess, deep abscess, urinary tract infection, and pelvic thrombophlebitis for patients in whom a workup for fever is recommended. Consideration should also be given to non-SSIs that are frequently treated surgically, including pneumonia. The literature has covered recommendations for the diagnosis and management of these disorders in great depth elsewhere [51, 52].

Conclusions and learning resources

Although SSI following laparoscopic hysterectomy is uncommon, it may be avoidable with thorough assessment and management of patient risk factors. Chlorhexidine alcohol preoperative skin preparation will reduce the risk of superficial SSI. Cefazolin dosage should be dependent on weight (i.e., 120 kg = 2 g; >120 kg = 3 g). For female patients with a history of MRSA, include an anti-MRSA antibiotic (such as vancomycin) in the AMP. If the patient has a history of BV, check for BV and supplement cefazolin with metronidazole for AMP. The first 24 to 48 hours following a hysterectomy are typically when fevers are noticed. A comprehensive history and physical examination should be performed on patients who have a persistent fever of 38.3°C (101°F), 2 temperature readings of 38.0°C (100.4°F) taken at least 4-6 hours apart, or who are at a high risk of infection based on their medical history. The centre and foundation of the fever investigation should be the surgeon's assessment.

Ampicillin-sulbactam and cefoxitin are the alternatives to cefotetan.

a. Fluoroquinolones, such as ciprofloxacin or levofloxacin, are linked to a higher risk of tendonitis and tendon rupture in people of all ages. With single-dose AMP, this risk is anticipated to be minimal.
b. Fluoroquinolone and ampicillin-sulbactam resistance in E. coli is on the rise, so it is important to check the susceptibility profiles of the local population before applying any medication.

Table 1: Recommended agents for antimicrobial prophylaxis in hysterectomy [53]

Recommended agents	**Alternative agents in patients with β-Lactam allergy**
Cefazolin	Clindamycin or vancomycin
OR	PLUS
Cefotetan	Gentamicin or aztreonam or fluoroquinolone [a, b]
OR	OR
Cefoxitin	Metronidazole
OR	PLUS
Ampicillin-sulbactam	Aminoglycoside or fluoroquinolone

a. Adult patients with normal renal function should receive the initial dosage and a redosing interval; redosing in the operating room is advised at intervals that are roughly two times the agent's half-life.
b. The recommended redosing intervals denoted as not applicable (NA) are based on the length of a normal case; redosing may be required for extremely lengthy operations.

In general, only one dose of gentamicin should be administered prior to surgery as part of the antibiotic prophylaxis. Based on the patient's actual body weight, the doses are determined. The dosage weight (DW) can be calculated as follows if the patient's actual weight is greater than 20% over their ideal body weight (IBW): IBW real weight, thus DW = IBW Plus 0.4.

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References

1. Catanzarite T, Saha S, Pilecki MA, Kim JY, Milad MP. Longer Operative Time During Benign Laparoscopic and Robotic Hysterectomy Is Associated With Increased 30-Day Perioperative Complications. J Minim Invasive Gynecol. 2015;22(6):1049-58
2. Jin J, Fan X, Dong X, Zhai X, Ma Y, Tang J. Infection and the evaluation of biomarkers in obstetrics and gynecology patients with infectious disease: a retrospective observational study from clinical pharmacists' consultation experience. Eur J Med Res. 2022 Nov 3; 27(1): 229
3. İnan AH, Budak A, Beyan E, Kanmaz AG. The incidence, causes, and management of lower urinary tract injury during total laparoscopic hysterectomy. J GynecolObstet Hum Reprod. 2019 Jan;48(1): 45-9.
4. Barie PS. Guidelines for antimicrobial prophylaxis in surgery: a must-read, must-heed for every surgeon. Surg Infect (Larchmt). 2013 Feb;14(1):5-7
5. Ayeleke RO, Mourad S, Marjoribanks J, Calis KA, Jordan V. Antibiotic prophylaxis for elective hysterectomy. Cochrane Database Syst Rev. 2017 Jun 18;6(6): CD004637
6. Lachiewicz MP, Moulton LJ, Jaiyeoba O. Pelvic surgical site infections in gynecologic surgery. Infect Dis Obstet Gynecol. 2015;2015:614950
7. Frobenius W, Bogdan C. Diagnostic Value of Vaginal Discharge, Wet Mount and Vaginal pH - An Update on the Basics of Gynecologic Infectiology. Geburtshilfe Frauenheilkd. 2015 Apr;75(4):355-66.
8. Faro C, Faro S. Postoperative pelvic infections. Infect Dis Clin North Am. 2008;22: 653-63
9. James RC, MacLeod CJ. Induction of staphylococcal infections in mice with small inocula introduced on sutures. Br J ExpPathol. 1961;42: 266 - 77.
10. Altemeier WA, Culbertson WR, Hummel RP. Surgical considerations of endogenous infections-sources, types, and methods of control. SurgClin North Am. 1968;48: 227- 40.
11. Fagotti A, Costantini B, Fanfani F, et al. Risk of postoperative pelvic abscess in major gynecologic oncology surgery: one-year single-institution experience. Ann SurgOncol. 2010;17: 2452 – 58.
12. Mangram AJ, Horan TC, Pearson M, et al. Guideline for prevention of surgical site infection. Infect Control Hosp Epidemiol. 1999;20: 247 – 64.
13. Jamie W, Duff P. Preventing infections during elective C/S and abdominal hysterectomy. Contemp Obstet Gynecol. 2003; 48: 60-9.
14. King JT, Goulet JL, Perkal MF, et al. Glycemic control and infections in patient with diabetes undergoing non cardiac surgery. Ann Surg. 2011;253: 158-65.
15. Grønkjer M, Eliasen M, Skov-Ettrup LS, et al. Preoperative smoking status and postoperative complications: a systematic review and meta-analysis. Ann Surg. 2014;259:52–71.

16. Cavanillas B, Rodrìguez-Contreras R, Delgado Rodriguez M, et al. Preoperative stay as a risk factor for nosocomial infection. Eur J Epidemiol. 1991; 7: 670 - 76.
17. Perl TM, Golub JE. New approaches to reduce staphylococcus aureus nosocomial infection rates: treating S. aureus nasal carriage. Ann Pharmacother. 1998;32: s7s16
18. Schweizer M, Perencevich E, McDanel J, et al. Effectiveness of a bundled intervention of decolonization and prophylaxis to decrease gram positive surgical site infections after cardiac or orthopedic surgery: systematic review and meta-analysis. BMJ. 2013; 346: f2743.
19. Soper DE, Bump RC, Hurt WG. Bacterial vaginosis and trichomoniasis vaginitis are risk factors for cuff cellulitis after abdominal hysterectomy. Am J Obstet Gynecol. 1990;163:1016-21.
20. McElligott KA, Havrilesky LJ, Myers ER. Preoperative screening strategies for bacterial vaginosis prior to elective hysterectomy: a cost comparison study. Am J Obstet Gynecol. 2011;205:500.e1–e7
21. Zywiel MG, Daley JA, Delanois RE, et al. Advance pre-operative chlorhexidine reduces the incidence of surgical site infections in knee arthroplasty. IntOrthop. 2011; 35:1001-6.
22. Webster J, Osborne S. Preoperative bathing or showering with skin antiseptics to prevent surgical site infection. Cochrane Database Syst Rev. 2012; 9: CD004985.
23. Kjolhede P, Halili S, Lofgren M. Vaginal cleansing and postoperative infectious morbidity in vaginal hysterectomy: a register study from the Swedish national register for gynecological surgery. Acta Obstet Gynecol Scand. 2011; 90: 63 – 71.
24. Darouiche RO, Wall MJ, Jr, Itani KM, et al. Chlorhexidine-alcohol versus povidone-iodine for surgical-site antisepsis. N Engl J Med. 2010; 362:18-26.
25. American Congress of Obstetricians and Gynecologists. Solutions for surgical preparation of the vagina. Committee Opinion No. 571. Obstet Gynecol. 2013; 122: 718-20.
26. Culligan PJ, Kubik K, Murphy M, et al. A randomized trial that compared povidone iodine and chlorhexidine as antiseptics for vaginal hysterectomy. Am J Obstet Gynecol. 2005;192: 422 - 25.
27. Tanner J, Norrie P, Melen K. Preoperative hair removal to reduce surgical site infection. Cochrane Database Syst Rev. 2011;9:CD004122.
28. Pevner L, Swank M, Krepel C, et al. Effects of maternal obesity on tissue concentrations of prophylactic cefazolin during cesarean delivery. Obstet Gynecol. 2011;117: 877 – 82.
29. Bratzler DW, Dellinger EP, Olsen KM, et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health Syst Pharm. 2013;70: 195 - 83 and ACOG Practice Bulletin No.104. Obstet Gynecol. 2009113:1180-89.
30. Li M, Han Y, Feng YC. Single-port laparoscopic hysterectomy versus conventional laparoscopic hysterectomy: a prospective randomized trial. J Int Med Res. 2012; 40: 701- 8.
31. Wright JD, Ananth CV, Lewin SN, et al. Robotically assisted vs laparoscopic hysterectomy among women with benign gynecologic disease. JAMA. 2013;309:689-98.
32. Rosero EB, Kho KA, Joshi GP, et al. Comparison of robotic and laparoscopic hysterectomy for benign gynecologic disease. Obstet Gynecol. 2013; 122: 778 - 86.
33. Platt R, Polk BF, Murdock B, et al. Risk factors for nosocomial urinary tract infection. Am J Epidemiol. 1986; 124:977 - 85.
34. Ahmed MR, Sayed Ahmed WA, Atwa KA, et al. Timing of urinary catheter removal after uncomplicated total abdominal hysterectomy: a prospective randomized trial. Eur J Obstet Gynecol Reprod Biol. 2014;176:60-3.
35. Craven JL, Evans GA, Davenport PJ, et al. The evaluation of the incentive spirometer in the management of postoperative pulmonary complications. Br J Surg. 1974; 61: 793 - 97.
36. Bakkum-Gamez JN, Dowdy SC, Borah BJ, et al. Predictors and costs of surgical site infections in patients with endometrial cancer. Gynecol Oncol. 2013; 130:100-6.
37. Isselbacher KJ, Braunwald E, Wilson JD, et al. Harrison's Principles of Internal Medicine. New York: McGraw-Hill; 1994.
38. De la Torre, Mandel L, Goff BA. Evaluation of postoperative fever: usefulness and cost-effectiveness of routine workup. Am J Obstet Gynecol. 2003;188: 1642-47.

39. Peipert JF, Weitzen S, Cruickshank C, Story E, Ethridge D, Lapane K. Risk factors for febrile morbidity after hysterectomy. Obstet Gynecol. 2004;103: 86-91.
40. García Padial J, Sotolongo J, Casey MJ, Johnson C, Osborne NG. Laparoscopy - assisted vaginal hysterectomy: report of seventy-five consecutive cases. J Gynecol Surg. 1992;8:81 – 5.
41. Wongpia I, Thinkhamrop J, Seejorn K, et al. Incidence of and risk factors for febrile morbidity after laparoscopic-assisted vaginal hysterectomy. Int J Womens Health. 20146:385 - 88.
42. Nezhat C, Main J, Paka C, Soliemannjad R, Parsa MA. Advanced gynecologic laparoscopy in a fast-track ambulatory surgery center. JSLS. 2014;18:e2014.00291
43. Dall'Asta A, Patrelli TS, Franchi L, et al. Total laparoscopic hysterectomy: our experience from 2008 to 2012. Ann Ital Chir. 2013;84: 645 – 48.
44. Yavuzcan A, Cağlar M, Ustün Y, Dilbaz S, Kumru S. Evaluation of the outcomes of laparoscopic hysterectomy for normal and enlarged uterus (>280 g). Arch Gynecol Obstet. 2014:289: 831 - 37.
45. Muzii L, Basile S, Zupi E, et al. Laparoscopic-assisted vaginal hysterectomy versus minilaparotomy hysterectomy: a prospective, randomized, multicenter study. J Minim Invasive Gynecol. 2007;14: 610 – 15.
46. Nezhat F, Nezhat CH, Admon D, Gordon S, Nezhat C. Complications and results of 361 hysterectomies performed at laparoscopy. J Am Coll Surg. 1995; 180: 307 - 16.
47. Schwartz RO. Complications of laparoscopic hysterectomy. Obstet Gynecol. 1993; 81:1022 - 24.
48. Schwandt A, Andrews SJ, Fanning J. Prospective analysis of a fever evaluation algorithm after major gynecologic surgery. Am J Obstet Gynecol. 2001; 184: 1066 - 67.
49. Schey D, Salom EM, Papadia A, Penalver M. Extensive fever workup produces low yield in determining infectious etiology. Am J Obstet Gynecol. 2005; 192: 1729 - 34.
50. Eckert LO, Soper DE. ACOG e-module. Infectious Disease. January 2014. Available from: http://cfweb. acog.org/ onlineModules/
51. Jaiyeoba O. Postoperative infections in obstetrics and gynecology. Clin Obstet Gynecol. 2012; 55: 904 -13.
52. Lachiewicz MP, Moulton LJ, Jaiyeoba O. Pelvic surgical site infections in gynecologic surgery. Infect Dis Obstet Gynecol. 2015; 614950
53. Bratzler DW, Dellinger EP, Olsen KM, et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health Syst Pharm. 2013; 70: 195 - 83.

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