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Guidelines for Vulvar and Vaginal Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations

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1 **Guidelines for Vulvar and Vaginal Surgery: Enhanced Recovery After Surgery**
2 **(ERAS) Society Recommendations**

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33

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35 **Abstract:**

36

37 This is the first collaborative Enhanced Recovery After Surgery (ERAS) Society guideline for
38 optimal perioperative care for vulvar and vaginal surgery. An Embase and Pubmed database
39 search of publications was performed. Studies on each topic within the ERAS vulvar and vaginal
40 outline were selected, with emphasis on meta-analyses, randomized controlled trials and
41 prospective cohort studies. All studies were reviewed and graded according to the Grading of
42 Recommendations, Assessment, Development and Evaluation (GRADE) system. All
43 recommendations on ERAS topics are based on best available evidence. The level of evidence
44 for each item is presented.

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56 **Introduction**

57 Enhanced Recovery After Surgery (ERAS) is regarded as a global surgical quality improvement
58 initiative that results in clinical ¹ and cost benefits.² The ERAS Gynecologic/Oncology
59 guidelines ^{3,4} were first published in 2016 and updated in 2019.⁵ The ERAS gynecology
60 protocols to date, however, have focused mainly on intraabdominal surgery, with no
61 recommendations for vulvar and vaginal surgery, often performed in the oncology and
62 urogynecology settings, respectively. To address this gap, the ERAS Society Gynecology chapter
63 convened to critically review existing evidence and make recommendations for elements of pre-,
64 intra- and post-operative care as it relates to vulvar and vaginal surgery.

65

66 **Methods**

67 *Literature search*

68 The guideline was developed according to published methodology from the ERAS Society.⁶
69 The authors convened in September 2019 to discuss topics for inclusion – the topic list was
70 based on the ERAS Gynecologic/Oncology Guidelines ³⁻⁵ which were used as a template, and
71 expanded to include topics unique to vulvar and vaginal surgery. The topics were then allocated
72 amongst the group according to expertise. The literature search used Embase and PubMed to
73 search medical subject headings between 1975-2020, including “gynecology”, “gynecologic
74 oncology”, “urogynecology” and all pre-, intra- and post-operative ERAS items (see Table 1).
75 Reference lists of all eligible articles were crosschecked for other relevant studies. Meta-
76 analyses, systematic reviews, randomized controlled trials (RCT), nonrandomized controlled
77 studies, reviews, and case series were considered for each individual topic. Two to three authors

78 reviewed the evidence base for each item. The quality of evidence for each item was then
79 reviewed and crosschecked by the senior editorial team (AA, GN and SD). The final manuscript
80 was then reviewed by all authors to assess quality of evidence and relevant studies for final
81 inclusion; all papers that were examined for inclusion are listed in the supplemental appendix
82 (Supplement #1). The search strategy was focused on relevant papers and supplemented by
83 expert citation searches to identify further important studies. The purpose of the search strategy
84 and guideline formation was not to obtain a comprehensive summary of all literature, but to
85 ensure that the most important and current work is highlighted.⁶

86

87 *Quality assessment*

88 The quality of evidence and recommendations were assessed based on the GRADE (Grading of
89 Recommendations, Assessment, Development and Evaluation) system,⁷ presented in Table 2 as
90 per previous guidelines.³⁻⁵ Each study included was assessed according to GRADE criteria and
91 the final list of referenced studies was decided upon by the guideline development group;
92 although not all papers are referenced in the final product, the studies chosen are representative
93 of the best quality of evidence with the broadest scope of application.⁶ Recommendations are
94 based on the level of evidence as high, moderate and low, equalized by desirable and deleterious
95 effects. Strong recommendations mean that the ERAS group felt that the advantages of the
96 recommendations outweighed the risks, whereas a weak recommendation indicates that the
97 group felt that the advantages likely outweigh the risk, but felt less confident in the overall
98 strength of evidence. As such, there may be cases in which strong recommendations are reached
99 from low evidence data, and weak recommendations from strong evidence data.

100

101 **Results**

102 The recommendations, evidence level and recommendation grade are provided for each of the
103 individual ERAS elements in Table 1, with summary descriptions of the evidence below with the
104 associated level of evidence in brackets.

105

106 **Preadmission information, education and counselling**

107 The goal of preoperative education is to physically prepare the patient for surgery, but also to
108 prepare them for what to expect after surgery. Preoperative preparation allows patients to better
109 understand the procedure, feel more in control, experience decreased postoperative pain and
110 anxiety, and can even reduce length of hospital stay.⁸

111

112 Information may be provided in many forms: verbal, written or multimedia, and should be
113 adapted to cultural and social aspects. Written information was found to be superior to verbal
114 alone in one randomised trial for satisfaction, days of hospitalization and pain.⁹ However the
115 addition of an education video for pelvic reconstructive surgery did not improve patient
116 preparedness for surgery.¹⁰

117

118 **Recommendation:**

119 While there is limited evidence in this field, most studies from other specialities provide
120 evidence of beneficial effects and no evidence of harm. It is therefore recommended that patients
121 should routinely receive dedicated pre-operative information, education and counselling (Low).

122

123 Preoperative optimization

124 In the past it has been postulated that since hair harbours bacteria, removal of hair should
125 decrease surgical site infection rates. A Cochrane review showed lack of evidence supporting
126 hair removal, however there were no specific studies examining removal of pubic hair.¹¹ A
127 small study comparing perineal shaving to no hair removal showed no difference in infection
128 rates.¹² However, if pubic hair is removed to improve visualization of the surgical field, clipping
129 should be used over shaving to reduce the rate of surgical site infections.¹¹

130 The use of preoperative vaginal estrogen in postmenopausal women has been shown to increase
131 the maturation index and vaginal epithelial thickness but there is lack of evidence that this
132 translates to improved outcomes in prolapse surgery.¹³ An RCT using vaginal estrogen prior to
133 and one year following vaginal prolapse surgery with mesh found no estrogen to be noninferior
134 to estrogen therapy when examining mesh erosion and anatomical success as endpoints.¹⁴

135 Recommendation:

136 Routine removal of pubic hair for vulvar surgery does not decrease infection rates (Low). If hair
137 is removed, it should be clipped and not shaved (High). There is little evidence to support use of
138 preoperative vaginal estrogen in postmenopausal women to decrease postoperative complications
139 (Low).

140

141 Preoperative bowel preparation

142 Traditionally mechanical bowel preparation (MBP) in gynecologic surgery, especially in
143 anticipation of potential bowel resection, was believed to decrease the risk of anastomotic leak
144 and prevent perioperative infectious morbidity.¹⁵ In 2018, a meta-analysis of 21568 patients

145 undergoing colorectal surgery showed that MBP was not associated with any difference in
146 anastomotic leak rates, surgical site infection, intraabdominal collection, reoperation or hospital
147 length of stay, when compared with no MBP.¹⁶ Similar conclusions were reached in a 2015
148 meta-analysis of 5 RCTs in gynecologic surgery.¹⁷ There is limited data in vaginal surgery with
149 the exception of a recent RCT which showed that women who underwent MBP prior to
150 minimally invasive sacrocolpopexy demonstrated benefit to post-operative defecatory function
151 and improved surgeon's perceptions of the case.¹⁸ Enemas, however do not appear to adversely
152 impact recovery or electrolytes, and may be useful to reduce the stool burden at the time of
153 vaginal or vulvar procedures, although no further data exists on rates of infection.

154

155 Recommendation: Preoperative bowel preparation is not recommended before vulvar
156 (Moderate) and vaginal surgery (Low); enemas may be considered to reduce the stool burden at
157 the time of vaginal surgery.

158

159 **Prophylaxis against venous thromboembolism**

160 The literature suggests the risk of venous thromboembolism (VTE) in vulvar and vaginal cancer
161 surgery is similar to that observed for patients undergoing surgery for other gynecologic
162 cancers.¹⁹ Formulation of guidelines is complicated by wide variations in surgical complexity for
163 vulvar procedures, ranging from outpatient laser ablation and limited wide-local excisions, to
164 radical resections with inguinal lymphadenectomy, and potential reconstruction. In an evaluation
165 using the American College of Surgeons National Surgical Quality Improvement Program (ACS-
166 NSQIP) database, the 30-day rate of DVT and/or pulmonary embolism (PE) was 1.2% in 497
167 patients undergoing surgery for vulvar cancer, compared to 3.0%, 1.4%, and 1.5% for ovarian,

168 cervical, and endometrial cancer, respectively.²⁰ However, less than a third of patients
169 undergoing vulvar resection had a concurrent inguinal lymphadenectomy, suggesting that many
170 of these patients had preinvasive or micro-invasive disease, and the VTE rate may therefore be
171 underestimated. A single institution study over a 10-year period reported on 219 patients with
172 vulvar and 141 with vaginal cancer (including resection for Paget's disease), only 5 of whom
173 were not comprehensively staged.¹⁹ Perhaps due to a higher rate of lymphadenectomy or longer
174 follow-up, the rates of VTE were higher than reported in ACS-NSQIP, 3.7% for vulvar and 0.7%
175 for vaginal cancer. Patients were purported to have received prophylaxis with stockings and low
176 molecular weight heparin (LMWH) from 48 hours to 14 days postoperatively, but no assessment
177 of compliance was provided.

178

179 Patients undergoing surgery for vulvar or vaginal cancer should therefore receive dual VTE
180 mechanical prophylaxis and chemoprophylaxis with either LMWH or unfractionated heparin
181 (UFH), to begin before the induction of anesthesia as recommended by the American Society of
182 Clinical Oncology (ASCO).²¹ Dual prophylaxis should continue throughout the hospital stay. In
183 keeping with ASCO recommendations, procedures lasting >30 minutes should be managed as
184 described above. In contrast to patients with advanced ovarian cancer, the residual tumor burden
185 for patients with vulvar and vaginal cancer is quite low; no data exists for prolapse or benign
186 procedures. For this reason, it is premature to recommend routine extended prophylaxis for these
187 patients, although may be considered in elderly, frail and immobile patients depending on their
188 Caprini scores.²²

189

190 In benign vaginal surgery, the data continue to be limited as well. In a large retrospective
191 analysis of NSQIP data, 26,103 women who underwent surgery for pelvic organ prolapse were
192 evaluated for VTE; 81.7% had a vaginal approach. The overall rate of VTE in this population
193 was < 1% for all groups, with the vaginal group having the lowest rate of 0.17% ($p<0.01$).²³ A
194 second similar study for 20,687 women with pelvic reconstructive surgery showed a rate of VTE
195 of 0.1%.²⁴

196

197 Summary and Recommendation:

198 Patients undergoing procedures lasting >30 min should receive dual mechanical prophylaxis and
199 chemoprophylaxis with either LMWH or UFH for cancer surgery (Moderate). Prophylaxis
200 should be initiated pre-operatively and continued throughout the hospital stay for malignant
201 surgery (Vulva – Moderate; Vaginal – Low). In benign vaginal and vulvar surgery, the rates of
202 VTE are very low, but prophylaxis may still be considered (Low). Studies on extended
203 postoperative prophylaxis are needed in vulvar/vaginal surgery for both malignant and benign
204 indications (Low).

205

206 **Antimicrobial prophylaxis**

207 It is well established that patients undergoing vaginal hysterectomy, like abdominal
208 hysterectomy, should receive single-dose antimicrobial prophylaxis within 1 hour of incision.²⁵
209 A Cochrane review showed that compared with placebo, women who received antimicrobial
210 prophylaxis for vaginal hysterectomy had a reduction in total postoperative infections, including
211 urinary tract infections.²⁶

212 For patients undergoing vaginal surgery without hysterectomy, such as with anterior or posterior
213 colporrhaphy, the evidence for antimicrobial prophylaxis is less clear. While theoretically there
214 could be benefit from prophylaxis in these cases given that they are classified as clean-
215 contaminated, at the present time there is insufficient evidence to make concrete
216 recommendations, thus the decision is left up to the discretion of the surgeon.²⁷ Although this
217 appears to be similar for patients having vaginal surgery with the use of mesh (e.g. midurethral
218 sling) where infection rates are very low,^{28,29} 93% of surgeons said they administered some form
219 of antibiotic prophylaxis when graft material was used in prolapse surgery.³⁰

220 Vulvar procedures such as vulvectomy which are typically performed for cancer are associated
221 with a high risk of infection. Radical vulvectomy has a surgical site infection rate (SSI)
222 comparable to that of patients undergoing abdominal hysterectomy with a type IV wound.^{31,32}
223 Like vaginal surgery without hysterectomy, there is no randomized evidence supporting
224 antimicrobial prophylaxis in this setting. However, given the high rate of SSI it seems reasonable
225 to give a single dose of antibiotic, consistent with other published guidelines.²⁵

226 Recommendation:

227 IV antibiotics should be administered routinely within 60 min before vaginal hysterectomy
228 (High). IV antibiotics should be considered for vaginal surgery without hysterectomy (Low) and
229 vulvar procedures (Low), particularly radical vulvectomy (contaminated wound), where SSI
230 rates are high.

231

232 **Standard anesthetic protocol and fluid management**

233 The anesthetic protocol for patients undergoing major vulvar and vaginal surgery is conducted
234 with the aim of providing anesthesia that reduces the surgical stress response, provides analgesia,

235 and encourages the rapid return of mobilization, eating, and drinking. In addition, postoperative
236 nausea and vomiting (PONV) with multimodal prophylaxis in this high-risk group of patients is
237 required. Extremes of fluid balance and organ dysfunction should be avoided.^{33,34}

238

239 For many patients either general and/or regional anesthesia can be used; there is little evidence to
240 recommend one technique over the other. If general anesthesia is chosen, maintenance can be
241 provided with either a volatile-based approach or total intravenous anesthesia (TIVA). Nitrous
242 oxide is not recommended due to increased nausea and vomiting.^{35,36} There is much enthusiasm
243 for TIVA over a volatile anesthesia as it reduces the incidence of PONV and in those patients
244 with malignancy may improve long term survival.³⁷ If TIVA is used, processed EEG monitoring
245 (eg Bispectral Index) is recommended to ensure appropriate depth of intraoperative anesthesia,
246 permitting rapid return of consciousness.³⁸ If neuromuscular (NM) blocking drugs are
247 employed, then complete reversal of NM function must be confirmed at the end of the procedure
248 with objective NM monitoring. The use of protective mechanical ventilation with tidal volume
249 6-8 ml/kg and the use of positive end expiratory pressure (PEEP) may be of benefit.⁵

250

251 Regional anesthesia (such as intrathecal or epidural) can provide excellent intraoperative and
252 postoperative analgesia. However, side-effects such as motor block, hypotension, and urinary
253 retention limit their postoperative use. If an epidural catheter has been used, it should be
254 discontinued soon after surgery as analgesic requirements are generally modest. There is little
255 evidence to support other modalities such as ketamine, lidocaine, alpha-2 agonists and pregabalin
256 although some advocate the use of these drugs if undertaking opioid free anesthesia to reduce the
257 problems associated with opioids, particularly opioid tolerance and opioid-induced

258 hyperalgesia.³⁹ Three small RCTs have shown efficacy of preemptive paracervical block in
259 patients undergoing vaginal hysterectomy.^{40,41} A number of series have indicated that local
260 anesthesia with sedation can be successfully employed for vaginal prolapse surgery.⁴²

261

262 Fluid management should be directed towards replacing intraoperative blood loss whilst aiming
263 for euvolemia to avoid the problems associated with fluid overload (eg edema, ileus) or
264 hypovolemia (eg acute kidney injury). Maintenance of blood pressure once euvolemia is
265 achieved should be with vasoactive drugs to avoid fluid overload. The use of cardiac output
266 monitoring and/or goal directed therapy is not routinely recommended.⁴³

267

268 Recommendation:

269 The use of short-acting anesthetics (Low), monitoring of neuromuscular block depth and
270 complete reversal is recommended (High). Fluid balance should be directed with the goal of
271 euvolemia (Moderate). Preemptive analgesia is recommended for vaginal hysterectomy, and can
272 be considered for vaginal prolapse surgery (Moderate).

273

274 **Urinary drainage**

275 Immediate postoperative voiding dysfunction is potentially a complication of most pelvic
276 surgeries. It is a particular problem for procedures targeting the urethra such as surgeries for
277 stress urinary incontinence. It is such a common issue that some centers routinely teach patients
278 how to perform clean intermittent self-catheterization as part of preoperative teaching. Following
279 stress incontinence surgeries such as midurethral sling, bladder emptying is assessed with a
280 voiding trial (VT). VT involves measuring voided volume followed by an assessment of the

281 post-void residual (PVR). There are multiple methods of filling the bladder before a VT that
282 involves filling the bladder in the OR to a defined volume, retrograde catheter fill in the post-
283 anesthesia care unit (PACU), or awaiting spontaneous bladder fill in the PACU. Foster et al.
284 performed a randomized trial evaluating bladder function after outpatient vaginal surgery and
285 found that patients were more likely to successfully void after a retrograde fill compared with
286 spontaneous bladder fill (61.5 vs 32.1% respectively, $p = 0.02$).⁴⁴ In a subsequent trial, Myers et
287 al. documented that retrograde filling the bladder in the OR rather than in the PACU was an
288 effective strategy for the postoperative voiding trial. However, this approach did not significantly
289 reduce total PACU time. In both studies the retrograde bladder fill method was demonstrated to
290 be more accurate, preferred by patients, and enabled women to be discharged from the PACU up
291 to 27 min earlier.⁴⁵

292 A small randomized prospective study examined catheterization in 100 women undergoing
293 vaginal hysterectomy, and found that catheterization after surgery was unnecessary, but there
294 were no increased complications if left in for 24 hours.⁴⁶ In women undergoing Burch
295 colposuspension, a randomized trial reviewed the removal of catheter postop day 1 vs 5, and
296 found no benefit for prolonged catheterization.⁴⁷ A randomized trial in patients undergoing
297 vaginal prolapse surgery, with removal of catheter postop day 1 vs 5, again found no benefit to
298 prolonged catheterization, with a higher rate of positive cultures, prolonged hospitalization and
299 increased re-catheterization rate in the day 5 group.⁴⁸ A Cochrane review was performed in 2006
300⁴⁹ on short term catheterization policies, and included 39 RCTs with a heterogeneous mixture of
301 surgeries including: vaginal or abdominal hysterectomy, anterior/posterior repairs, Burch
302 colposuspension and urological surgery; the length of catheterization also varied from 1-28 days.
303 The review found that not using a catheter had an increased risk of re-catheterization; similarly

304 urethral catheterization had a high risk of re-catheterization compared to a suprapubic approach
305 after removal.^{49,50} In 11 trials, shorter catheterization resulted in lower rate of infections. Finally
306 using a clamp-release protocol resulted in a higher risk of infection and delay of normal urination
307 when compared to an immediate release policy.⁴⁹

308

309 Recommendation:

310 Retrograde bladder filling for voiding trial should be considered in vaginal surgery since it
311 appears to be preferred by patients and may shorten time in the PACU (High). Urinary catheters
312 should be used for postoperative bladder drainage in complex vaginal surgery, but may be safely
313 eliminated in simple vaginal hysterectomy. Removal after a short period postoperatively appears
314 to be associated with lower rates of re-catheterization, bladder infection and length of stay
315 (Vaginal – High, Vulvar - Low). The suprapubic route is associated with a lower rate of bladder
316 infection but higher rate of catheter related complications, and may be considered if a prolonged
317 catheterization is expected. There remains insufficient data on urinary drainage in vulvar surgery.

318

319 **Postoperative analgesia**

320

321 Patients presenting with vulvar and vaginal abnormalities requiring surgical resection frequently
322 complain of pain, particularly those with ulcerative/malignant lesions may already be receiving
323 preoperative analgesics and are often anxious about control of their postoperative pain. However,
324 removal of the lesion usually reduces pain significantly, even when large resections are needed,
325 and postoperative pain control is rarely problematic. Published studies evaluating optimal control

326 of postoperative pain in patients undergoing vulvar procedures are nonexistent, but the paradigm
327 of multimodal, opioid-sparing post-operative analgesia used commonly within ERAS pathways
328 should also be used for these patients too.⁵¹ In addition the postoperative strategy should be
329 reviewed with patients prior to surgery to aid optimal pain control and functional recovery, yet
330 minimize nausea, sedation, fatigue and risk of opioid addiction.⁵²

331

332 The use of preoperative oral acetaminophen and an anti-inflammatory drug (if not
333 contraindicated) has been shown to reduce opioid requirements and should be a routine element
334 in all ERAS pathways.^{53,54} Since patients undergoing vulvar procedures, particularly patients
335 with vulvar cancer, tend to be elderly, anti-convulsant medications and chronic pain drugs should
336 not routinely be used in the post anesthesia care unit.^{55,56} The use of local anesthetic medication
337 may be feasible into the wound edges, but its use in regional anesthetic techniques e.g. caudal
338 epidural anesthesia is not advocated, as it may be associated with post-operative problems such
339 as hypotension and urinary retention for vulvar procedures. For vaginal surgery, there is some
340 support for using local anesthetics, especially for paracervical and vaginal cuff blocks;^{54,57}
341 liposomal bupivacaine may be helpful, but still requires further study.^{54,58} Postoperatively,
342 patients should receive scheduled oral acetaminophen and ibuprofen, oral opioids as needed, and
343 intravenous opioids for breakthrough pain. Given the rarity of severe pain in this population,
344 patients with breakthrough pain should be carefully evaluated for infections, wound breakdown
345 or other complications. Patients who do not require opioids in hospital, will not require home-
346 going opioid prescriptions and should be counseled to continue scheduled ibuprofen and
347 acetaminophen. For patients requiring home-going opioids, we recommend a prescription for the

348 minimum duration e.g. 10 tablets of oxycodone, 5mg in order to minimize the risk of opioid
349 dependence and diversion.⁵⁹

350

351 Recommendation:

352 A multimodal post-operative analgesic protocol should be used routinely, and home-going opioid
353 prescriptions should be minimized (High).

354

355 **Preoperative and postoperative nutrition**

356 Historically, surgical patients have been subjected to the “NPO after midnight” rule
357 preoperatively with no supporting evidence. In fact, adoption of modern fasting rules whereby a
358 patient is allowed to have a light snack up until 6 h, and clear fluids (including oral carbohydrate
359 drinks) up until 2 hours prior to surgery has been shown to be safe⁶⁰. Furthermore,
360 administration of oral carbohydrates preoperatively is associated with improved pre-operative
361 well-being, and reduced post-operative insulin resistance.⁶¹ There remain no specific trials in
362 vulvar or vaginal surgery, but the underlying principles from laparotomy can be broadly adopted
363 here until further research is completed.

364 Similarly, in the past it was common practice to withhold food from postoperative patients until
365 passage of flatus. Early feeding, whereby nutrition is introduced within 24 hours post-
366 gynecologic surgery, has been shown to be safe without increased gastrointestinal concern or
367 postoperative complications.⁶² This approach is associated with earlier return of bowel function,
368 shorter length of hospital stay, and improved patient satisfaction. A number of studies have now
369 successfully and safely incorporated these perioperative nutritional practices into their

370 urogynecologic ERAS protocols. Lastly, there is little concern for ileus in patients undergoing
371 vulvar or vaginal surgery,^{63,64} which further strengthens an early refeeding approach.

372 Recommendation:

373 Patients should be encouraged to eat a light snack up until 6 hours, and clear fluids (including
374 oral carbohydrate drinks) up until 2 hours prior to initiation of anesthesia (High). A regular diet
375 within the first 24 hours after vaginal/vulvar surgery is recommended based on extrapolation
376 from larger more invasive procedures (Moderate by indirectness).

377

378

379 **Postoperative Dressing care**

380 Vaginal packing is thought to decrease postoperative vaginal and vault hematoma formation and
381 consequently decrease infection rates in prolapse surgery. However, it has been suggested that
382 packing also increases pain, prolongs hospitalization and can lead to leaving packing
383 accidentally in place, resulting in retained "foreign objects". Recent trends have been to use
384 vaginal packing for 24 hours postoperatively,⁶⁵ which requires indwelling catheterization. One
385 RCT involving 190 women examined outcomes at 24 hours post-operatively for patients packed
386 with proflavine soaked cotton gauze versus no packing, and found no difference in pain scores,
387 infectious morbidity or hematoma formation (7.3 % in pack group vs 14.8 % in no pack group p
388 =0.204).⁶⁶ A second small RCT showed similar pain on a visual analog scale (VAS) but less use
389 of ketorolac in the first 24 hours and nursing reported pain in the packing group.⁶⁷ Two RCT's
390 investigated length of time for packing and found no difference between 3h and 24h; there was
391 no difference in febrile morbidity and complications, but shorter packing was associated with
392 non-significantly higher urinary retention rates.^{68,69}

393 Although no specific research has been done for patients undergoing laser of the vulva, several
394 studies have examined the role of occlusive dressings after laser skin resurfacing. A small
395 retrospective study of open wound care compared to perforated silicone occlusive dressing found
396 a decrease in the rate of erythema, swelling and crusting.⁷⁰ Occlusive dressings may promote re-
397 epithelialization and improve wound healing by creating a moist environment.⁷¹⁻⁷³

398 Vacuum Assisted Closure (VAC) dressings have also occasionally been used for closure of
399 radically excised perineal and vulvar wounds.⁷³⁻⁸⁰ One investigation retrospectively examined
400 54 patients with VAC compared to standard postoperative care in patients after radical excisions
401 and found a decrease in time to complete healing (44.4 vs 60.2 days; $p=0.0175$).⁸⁰ Another
402 group retrospectively assessed 24 patients with penile or urethral cancer requiring
403 inguinofemoral lymph node dissections and found decreased rates of hospitalization,
404 lymphocele, persistent lymphorrhoea and lymphedema with use of VAC.⁸¹ Contamination with
405 stool and urine must be avoided when VAC dressings are applied to the vulva and perineum;
406 immediate treatment solutions have included use of foley catheters, antimotility agents (e.g.
407 Imodium and Codeine), rectal tubes and waterproof dressings (e.g. Duoderm).^{75,77} VAC
408 dressings have also been used in complicated inguinal incisions.^{73,78,82-84} Although it continues to
409 be common practice, there are no high-quality studies examining the utility of silver sulfadiazine
410 cream after laser vaporization of the vulva.

411 Recommendation:

412 Vaginal packing does not appear to decrease post-operative bleeding and hematoma formation or
413 increase postoperative pain (High). Vaginal packing may result in an increase in postoperative
414 infection rates when left for longer than 24 hours (Low) and longer use of packing results in

415 longer catheterization, and thus higher rates of UTI. Occlusive dressings may be used post-laser
416 to promote healing (Low).

417

418 **Postoperative drains and adjuvant therapies**

419 Postoperative drains after systematic inguino-femoral lymph node (IFLN) dissection are used
420 routinely and often left in situ until producing < 20-50 ml/24 hours,⁸⁵⁻⁸⁹ with some
421 recommendations to leave the drains in place at least 5-7 days postoperatively.^{73,90,91} This is
422 thought to decrease lymphocyst formation by allowing the overlying skin flaps to adhere to the
423 underlying connective tissue.⁸⁵ Separate vulvar drainage has been abandoned by most.³²

424 Adjuvant products such as fibrin sealant and albumin-glutaraldehyde adhesive have not been
425 proven to decrease morbidity.^{73,92-94} Preservation of the saphenous vein appears to reduce the
426 rate of lymphedema, cellulitis, and dehiscence.⁹⁵

427 Multiple retrospective studies have investigated time-based or volume-based IFLN drainage to
428 guide drain removal, with no definitive conclusions. Overall, short duration of use (<3 days) was
429 associated with higher rates of wound breakdown, while longer duration of use (>7 days) was
430 associated with higher rates of lymphedema.⁸⁶ Drain use has also been shown to have higher
431 rates of cellulitis.⁹⁶ Another investigation showed that higher drain output on the final day
432 before removal was a risk factor for complications, including lymphocele formation.⁹¹ Two
433 prospective studies demonstrated that removal once output had decreased to <30-50cc/day
434 resulted in lower rates of lymphocele formation and other complications. No prospective studies
435 have evaluated drainage after inguinal sentinel lymph node biopsy in women with vulvar cancer.

436 There were no studies examining the role of surgical drains for vaginal or prolapse surgery.

437 Novel postoperative therapies:

438 Routine postoperative vulvar care for radical vulvar excisions, often consists of irrigation and
439 perineal drying with either a hair dryer or vulvar blower/fan.^{73,80} However, no studies have been
440 identified showing efficacy for this practice.

441 A small RCT was performed on granulocyte colony-stimulating factor (G-CSF) versus placebo
442 in 40 vulvar cancer resection patients based on an earlier retrospective study.⁹⁷ The authors
443 found no difference in rates of wound infection between the groups, with increased cost
444 associated with G-CSF. Adjuvant platelet gel has been studied in a retrospective study⁹⁸ applied
445 to the vaginal resection portion of the radical vulvectomy; the platelet gel group had significantly
446 less wound complications; no prospective or randomized trials have been performed.

447 Hyperbaric oxygen (HBO) has been used to improve tissue oxygenation, thereby stimulating
448 healing and angiogenesis. Investigation of HBO in radical vulvectomy patients showed
449 significantly less wound breakdown compared to historic controls ($p=0.0105$).^{89,99} Although a
450 very promising treatment that is commonly utilized, further trials must be performed to
451 demonstrate efficacy of this expensive therapy.

452 Zinc has been shown to be necessary for the early stages of repair, and oral supplementation is
453 thought to restore sub-clinically low levels. A pilot study investigated zinc sulfate 220 mg orally
454 three times daily for 7 days preoperatively in patients undergoing radical vulvectomy and
455 lymphadenectomy. The authors showed a decreased rate of wound dehiscence and a reduced
456 hospital stay from 37 to 18 days.⁷³

457

458 Recommendation:

459 Drainage of inguinal lymph node dissection should continue until < 30-50 cc/day of drainage
460 (Moderate). Saphenous vein preservation should be considered in IFLN dissection (Moderate).

461

462 **Comment:**

463 This guideline summarizes current evidence examined by the ERAS Society Gynecology chapter
464 on recommendations for elements of pre-, intra- and post-operative care in vulvar and vaginal
465 surgery. In several instances, where good quality data were not available, recommendations
466 were made based on other surgical disciplines and the original Gynecologic/Oncology ERAS
467 guidelines. The ERAS gynecology committee decided to combine vulvar and vaginal surgery
468 since these are common approaches in practice for general gynecology and subspecialties
469 including urogynecology and gynecologic oncology. The authors felt that the peri-operative care
470 for both was similar, and differences have been highlighted in the sections above. Since ERAS
471 guidelines are created by reviewing all current and updated literature, including systematic
472 reviews, metaanalyses, RCTs, retrospective studies and studies in similar disciplines, it does not
473 follow the same process as a systemic review of looking at only specialty specific randomized
474 trials. The advantages of this process include using any relevant information that is currently
475 available, which is then reviewed by an international panel of experts. The disadvantages are
476 that some of the recommendations are based on expert opinion and low levels of evidence.

477

478 This guideline summarizes the best evidence in common practices for vulvar and vaginal surgery
479 but recognizes the paucity of evidence specific to this area in topics such as ileus prevention,
480 postoperative diet and mobilization. We hope that these guidelines will help expand ERAS

481 protocols into gynecologic surgeries outside of the realm of laparotomy/laparoscopy, helping

482 improve patient outcome, optimize hospital stay and reduce systemic costs.

483

484

Journal Pre-proof

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800 **Table 1** Guidelines for Vulvar and Vaginal surgery Enhanced Recovery After Surgery (ERAS)

801 Society Recommendations

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842 **Table 2:**

843 Grading of Recommendations, Assessment, Development and Evaluation (GRADE) system
844 rating of quality and strength of evidence

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Journal Pre-proof

Supplement 1: Reference list of all articles examined for the review of the ERAS guideline

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ITEM	RECOMMENDATION	EVIDENCE LEVEL		RECOMMENDATION GRADE	
		Vulvar	Vaginal	Vulvar	Vaginal
PREADMISSION INFORMATION, EDUCATION AND COUNSELLING	Patients should routinely receive dedicated pre-operative information, education and counselling.	Low	Low	Strong	Strong
PREOPERATIVE OPTIMIZATION	Routine removal of pubic hair should not be used to decrease infection rates	Low	n/a	Strong	n/a
	If hair is removed, it should be clipped and not shaved	High	n/a	Strong	n/a
	Use of preoperative vaginal estrogen in postmenopausal women decreases postoperative complications	n/a	Low	n/a	Weak

Table 1
Guidelines for Vulvar and Vaginal surgery Enhanced Recovery After Surgery (ERAS) Society Recommendations

Journal Pre-proof

PREOPERATIVE BOWEL PREPARATION	Preoperative bowel preparation should not be used before vulvar and vaginal surgery	Moderate	Low	Strong	Weak (may consider enema to reduce stool burden)
PROPHYLAXIS AGAINST THROMBOEMBOLISM	Patients undergoing malignant procedures lasting >30 min should receive dual mechanical prophylaxis and chemoprophylaxis with either low molecular weight heparin or unfractionated heparin.	Moderate	Moderate	Strong	Strong
	Prophylaxis should be initiated pre-operatively and continued throughout the hospital stay for malignant surgery	Moderate	Low	Strong	Strong
	Prophylaxis should be initiated pre-operatively and continued throughout the hospital stay for benign surgery	Low	Low	Weak	Weak
	Extended postoperative prophylaxis	Low	Low	Weak	Weak
ANTIMICROBIAL PROPHYLAXIS	IV antibiotics should be administered routinely within 60 min before vaginal hysterectomy	n/a	High	n/a	Strong
	Antibiotic prophylaxis may be considered for vaginal surgery without hysterectomy	n/a	Low	n/a	Weak
	Antibiotic prophylaxis may be considered for vulvar surgery	Low	n/a	Strong (Radical vulvectomy)	n/a
STANDARD ANESTHETIC PROTOCOL AND FLUID MANAGEMENT	Use of short acting anesthetics	Low	Low	Strong	Strong

	Objective monitoring of the level of neuromuscular block and ensuring complete reversal	High	High	Strong	Strong
	Fluid balance to achieve euvolemia	Moderate	Moderate	Strong	Strong
	Preemptive analgesia is recommended for vaginal surgery	n/a	Moderate	n/a	Strong
URINARY DRAINAGE	Retrograde bladder fill for voiding trial should be considered for vaginal procedures	n/a	High	n/a	Strong
	Urinary catheters should be removed as soon as possible for vaginal procedures	n/a	High	n/a	Strong
	Urinary catheters should be removed as soon as possible for vulvar procedures	Low	n/a	Strong	n/a
POSTOPERATIVE ANALGESIA	A multimodal post-operative analgesic protocol should be used routinely and home-going opioid prescriptions should be minimized	High	High	Strong	Strong
	Combination of acetaminophen and non-steroidal anti-inflammatory drugs should be used	High	High	Strong	Strong
PREOPERATIVE AND POSTOPERATIVE NUTRITION	Patients should be encouraged to eat a light snack up until 6 h, and clear fluids (including oral carbohydrate drinks) up until 2 h, prior to initiation of anesthesia.	High	High	Strong	Strong
	A regular diet within the first				

	24 hours after vaginal/vulvar surgery is recommended.	Moderate (by indirectness)	Moderate (by indirectness)	Strong	Strong	
POSTOPERATIVE DRESSING CARE	Vaginal packing does not decrease post-operative bleeding and hematoma formation or increase postoperative pain	n/a	High	n/a	Strong	
	If used, vaginal packing should not be left in for more than 24 hours	n/a	Low	n/a	Strong	=====
	Occlusive dressings may be used post-laser to promote healing	Low	n/a	Weak	n/a	
POSTOPERATIVE DRAINS AND ADJUVANT THERAPIES	Inguinofemoral drains should continue until < 30-50 cc/day of drainage (cancer surgery)	Moderate	n/a	Strong	n/a	
	Saphenous vein preservation should be considered in all Inguinofemoral lymph node dissection (cancer surgery)	Moderate	n/a	Strong	n/a	

Table 2:

Grading of Recommendations, Assessment, Development and Evaluation (GRADE) system rating of quality and strength of evidence

EVIDENCE QUALITY LEVEL	DEFINITION
HIGH	Subsequent research unlikely to change confidence in estimate of effect
MODERATE	Subsequent research likely to have impact on estimate of effect and may change estimate
LOW	Subsequent research very likely to have impact on estimate of effect and likely to change estimate
VERY LOW	Any estimate is uncertain

RECOMMENDATION LEVEL	DEFINITION
STRONG	Desirable effects of intervention clearly outweigh, or clearly do not outweigh, the undesirable effects
WEAK	Effects are much more unclear

Guyatt GH, Oxman AD, Vist GE, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*. 2008;336(7650):924-926.

AD Altman: Conceptualization, Methodology, Investigation, Writing original draft, Collation of sections, Reviewing and editing final draft; **M Robert:** Investigation, Writing original draft, Reviewing and editing final draft; **R Armbrust:** Investigation, Writing original draft, Reviewing and editing final draft; **WJ Fawcett:** Investigation, Writing original draft, Reviewing and editing final draft; **M Nihira:** Investigation, Writing original draft, Reviewing and editing final draft; **CN Jones:** Investigation, Writing original draft, Reviewing and editing final draft; **K Tamussino:** Investigation, Writing original draft, Reviewing and editing final draft; **J Sehouli:** Investigation, Writing original draft, Reviewing and editing final draft; **SC Dowdy:** Methodology, Investigation, Writing original draft, Reviewing and editing final draft, Supervision; **G Nelson:** Methodology, Investigation, Writing original draft, Reviewing and editing final draft, Supervision