Risk factors for pelvic organ prolapse recurrence after sacrospinous hysteropexy or vaginal hysterectomy with uterosacral ligament suspension

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BACKGROUND: Given that the number of surgeries for pelvic organ prolapse is expected to increase worldwide, knowledge on risk factors for prolapse recurrence is of importance for developing preventive strategies and shared decision-making.

OBJECTIVE: To identify risk factors for subjective and objective failure after either sacrospinous hysteropexy or vaginal hysterectomy with uterosacral ligament suspension over a period of 5 years after surgery.

STUDY DESIGN: This was a secondary analysis of the 5-year follow-up of the SAVE-U trial. The SAVE-U trial was conducted in 4 Dutch hospitals. A total of 208 women with uterine prolapse stage 2 were randomized to sacrospinous hysteropexy or vaginal hysterectomy with uterosacral ligament suspension. For the current analysis, available annual 5-year follow-up data of 207 women were analyzed. Without missing values this analysis would have included 1035 measurements in total over the 5-year follow-up. Recurrences were analyzed as “events” using generalized linear mixed models because recurrences of anatomic failure and bothersome vaginal bulge symptoms fluctuated over time. The primary outcome was the composite outcome of failure defined as prolapse beyond the hymen, bothersome bulge symptoms, repeated surgery, or pessary use for recurrent prolapse. Secondary outcome measures were bothersome vaginal bulge symptoms, overall anatomic failure (Pelvic Organ Prolapse Quantification stage ≥2 in any compartment), apical compartment recurrence (Pelvic Organ Prolapse Quantification stage ≥2), anterior compartment recurrence (Pelvic Organ Prolapse Quantification stage ≥2), and posterior compartment recurrence (Pelvic Organ Prolapse Quantification stage ≥2).

RESULTS: For the composite outcome of failure (164 events in 66 different women), statistically significant risk factors were: body mass index (odds ratio, 1.10 [per 1 kg/m²]; 95% confidence interval, 1.02—1.19; P=.02), smoking (odds ratio, 2.88; 95% confidence interval, 1.12—7.40; P=.03), and preoperative Pelvic Organ Prolapse Quantification point Ba (odds ratio, 1.23 [per 1 cm]; 95% confidence interval, 1.01—1.50; P=.04). When analyzing each surgical outcome measure separately, body mass index and Pelvic Organ Prolapse Quantification point Ba were risk factors for overall anatomic failure (462 events in 147 women; odds ratio, 1.15; 95% confidence interval, 1.07—1.25; P<.01 and odds ratio, 1.14; 95% confidence interval, 1.00—1.30; P=.05, respectively) and anterior compartment recurrence (385 events in 128 women; odds ratio, 1.11; 95% confidence interval, 1.02—1.22; P=.02 and odds ratio, 1.17; 95% confidence interval, 1.02—1.34; P=.02, respectively). Vaginal hysterectomy was a risk factor for posterior compartment recurrence when compared with sacrospinous hysteropexy (93 events in 40 women; odds ratio, 5.21; 95% confidence interval, 2.05—13.27; P<.01). Smoking was a risk factor for bothersome vaginal bulge symptoms (70 events in 41 women; odds ratio, 3.80; 95% confidence interval, 1.48—9.75; P=.01), and preoperative Pelvic Organ Prolapse Quantification stage 3 or 4 was significantly protective against bothersome bulge symptoms (odds ratio, 0.32; 95% confidence interval, 0.11—0.89; P=.03).

CONCLUSION: Body mass index, smoking, and Pelvic Organ Prolapse Quantification point Ba were statistically significant risk factors for the composite outcome of failure (prolapse beyond the hymen, bothersome bulge symptoms, repeated surgery, or pessary use for recurrent prolapse) in the period of 5 years after surgery.

Key words: long-term follow-up, native tissue repair, pelvic organ prolapse, recurrence, repeated measures, risk factors, sacrospinous hysteropexy, surgery, vaginal hysterectomy with uterosacral ligament suspension

Introduction
Pelvic organ prolapse (POP) is a prevalent condition that can greatly reduce a woman’s quality of life.1 Worldwide, a large number of operations for POP are performed every year, which is expected to increase in the coming 20 to 40 years.2 In the Netherlands, nearly 9000 operations for uterine prolapse are performed annually.3 Most consist of native tissue vaginal repair in combination with vaginal hysterectomy (VH) with uterosacral ligament suspension, modified Manchester procedures, or sacrospinous hysteropexy (SSH). Because of the scarcity in solid evidence comparing these operations, strict guidelines are lacking, and the choice of operation is mainly based on surgeon experience4 and patient preference. To improve shared decision-making, patient risk factors should also be considered in a personalized decision process. Knowledge of risk factors not only benefits tailored management of POP but is also essential in prevention of POP and its recurrence. In the past decade, several studies have investigated risk factors for POP recurrence. A recent meta-analysis identified preoperative POP Quantification (POP-Q) stage and younger age as risk factors for POP recurrence (Schulten et al. 2021, unpublished data),5 whereas other studies identified family history as a risk...
Knowledge on risk factors for prolapse recurrence is of importance for developing preventive strategies.

Risk factors for the composite outcome of failure within 5 years after surgery are body mass index (BMI), smoking, and Pelvic Organ Prolapse Quantification (POP-Q) point Ba. Risk factors for overall anatomic failure and anterior compartment recurrence within 5 years are BMI and POP-Q point Ba. Vaginal hysterectomy is a risk factor for posterior compartment recurrence. Smoking is a risk factor for bothersome bulge symptoms, whereas preoperative POP-Q stage 3 or 4 is protective against bothersome bulge symptoms.

This secondary analysis of the SAVE-U trial presents recurrence risk factors within 5 years after prolapse surgery for multiple outcome measures.

Materials and Methods

We conducted a secondary analysis of the results over a 5-year follow-up period of the SAVE-U trial. This was a non-blinded, multicenter, noninferiority RCT conducted between 2009 and 2012 in 4 nonuniversity teaching hospitals in the Netherlands. For this analysis, the data of the 2 randomization groups were combined into 1 group and treated as a prospective cohort.

The details of the original trial protocol were published in 2011.\(^1\) Briefly, the trial was designed to compare uterine-sparing SSH with VH with uterosacral ligament suspension in women with uterine prolapse stage ≥2. Women were excluded in case of previous pelvic floor surgery, known malignancy, an abnormal cervical smear result, a wish to preserve fertility, language barriers, immunologic or hematologic diseases interfering with postoperative recovery, abnormal ultrasound findings of the uterus or ovaries, or abnormal uterine bleeding. The women were randomized in a 1:1 ratio stratified by hospital and stage of uterine prolapse. SSH was performed using 2 permanent sutures (Prolene 1.0; Ethicon, Raritan, NJ), which were placed in the sacrospinous ligament at least 2 cm from the ischial spine. Uterosacral ligament suspension involved the attachment of the uterosacral ligaments to the vaginal vault with 2 delayed absorbable sutures (Vicryl 1.0, Ethicon). Concomitant anterior or posterior colporrhaphy and anti-incontinence surgery was allowed if indicated. All women gave written informed consent before randomization, and the institutional review boards of all participating hospitals approved the study (MEC 09-0625, August 18, 2009).

The primary objective of the original SAVE-U trial was to compare surgical failure of the apical compartment 12 months after SSH vs after VH. Surgical failure of the apical compartment was defined as a recurrent prolapse stage ≥2 (POP-Q point C ≥ -1 cm) of the apical compartment (uterus or vaginal vault) in combination with bothersome bulge symptoms or repeated surgery for apical prolapse. Follow-up included annual outpatient visits until 5 years after surgery, with evaluation of POP using the POP-Q system and completion of validated questionnaires before every visit. For this secondary analysis, annual 5-year follow-up data of all women who underwent SSH or VH were used to identify risk factors. All women were analyzed “as treated” according to the original study. The primary outcome was “composite outcome of failure” defined as a prolapse beyond the hymen in any compartment or bothersome bulge symptoms or repeated surgery or pessary use for recurrent prolapse in the 5 years after surgery. Bothersome bulge symptoms were defined as a positive answer to any of the following questions from the urogenital distress inventory: “Do you experience a sensation of bulging or protrusion from the vagina?” and “Do you have a bulge or something falling out that you can see in the vagina?” in combination with the responses “somewhat bothered” to “very much bothered.” The analysis was also performed for the separate outcome measures including bothersome vaginal bulge symptoms, overall anatomic failure (POP-Q stage ≥2 in any compartment), apical compartment recurrence (POP-Q stage ≥2), anterior compartment recurrence (POP-Q stage ≥2), and posterior compartment recurrence (POP-Q stage ≥2). In addition, a sensitivity analysis was performed for the outcome measures of overall anatomic failure beyond the hymen and anterior compartment recurrence beyond the hymen.

We performed a generalized linear mixed-model analysis for the annual follow-up data until 5 years after surgery, with a binomial distribution and logit link, and an autoregressive
correlation structure of order 1 (AR[1]) for the repeated measures. This approach was chosen instead of a survival analysis because the outcomes varied over time. Smoking had 29 (14%) missing values. Smoking status was determined by a positive answer on the baseline questionnaire to the question “Do you smoke?” in combination with the number of cigarettes per day. Women who smoked on a daily basis were considered smokers. Body mass index (BMI) had 9 (4%) missing values. There were no baseline POP-Q measurements available for 5 (2%) women, leading to missing values for preoperative POP-Q stage and POP-Q points Ba, C, and HG. There were no missing values for age, vaginal parity, and type of surgery. Multiple imputation using fully conditional specification (chained equations) was applied to impute the missing values for smoking, and 10 data sets were created. Because the generalized linear mixed-model procedure of IBM SPSS Statistics (version 25.0.0.1; IBM, Armonk, NY) is not able to work with multiply imputed data, we calculated the average of the imputed smoking values per person with missing data. All available baseline characteristics, operative variables, and outcome data were used for imputation.

A preselection of possible risk factors was made on the basis of current literature, and the number of risk factors for analysis was limited to approximately 10% of the number of failures. The selected risk factors were age (<60 vs ≥60 years), BMI (per 1 kg/m²), smoking status (yes or no), vaginal parity (per 1), type of surgery as treated (SSH or VH), preoperative POP-Q stage (stage 2 vs stage 3 or 4), number of operated compartments (1 or 2 vs 3 compartments, depending on performed anterior and/or posterior colporrhaphy), and preoperative POP-Q points Ba, Bp, C, and GH. All selected risk factors were included into the multivariable analyses for the following outcomes: composite outcome of failure, overall anatomic failure, and anterior compartment recurrence. To avoid overfit of the models, for posterior compartment recurrence, all variables except POP-Q points Ba and C were taken into the analysis. Only age, BMI, smoking, vaginal parity, preoperative POP-Q stage, and POP-Q points Ba and HG were included into the analysis for the bothersome vaginal bulge symptoms outcome, and only BMI, POP-Q point C, and type of surgery for apical compartment recurrence. Regarding the sensitivity analysis, age, BMI, smoking status, preoperative POP-Q stage, and POP-Q points Ba and Bp were included into the analysis for overall anatomic failure beyond the hymen. The same variables, except POP-Q point Bp, were included into the analysis for anterior compartment recurrence beyond the hymen. Results of the multivariable analyses are presented as odds ratios (ORs) with corresponding 95% confidence intervals (CIs). For the composite outcome of failure, model-based probabilities of failure were calculated for the different levels of the statistically significant risk factors using the ORs of the full model, under the assumption that the study cohort was representative of the population of patients needing such surgery. First the probability of a composite outcome of failure during 5 years after surgery was calculated for a “reference person,” after which probabilities were calculated for different levels of BMI, smoking, and POP-Q point Ba, respectively. The reference values were based on the mean baseline characteristics. Because the type of surgery was not a statistically significant risk factor for the composite outcome of failure, the probabilities were not calculated for both surgery types separately, but the mean “surgery” value was used. All analyses were performed with IBM SPSS Statistics for Windows (version 25.0.0.1; IBM corp, Armonk, NY).

### Results

A total of 208 women were enrolled in the SAVE-U trial and randomly assigned to SSH or VH with uterosacral ligament suspension. For this study, 5-year annual follow-up data of 207 women were analyzed. One woman was excluded because she underwent abdominal hysterectomy. The flow diagram and description of dropouts during the follow-up were published previously.

Patient characteristics of all 207 women are shown in Table 1. Table 2 shows the results of the multivariable analyses for the 6 different outcome measures. As a result of a small number of events, we were not able to identify risk factors for surgical failure of the apical compartment (27 events in 13 women) and retreatment (ie, repeated surgery [20 events in 10 different women] or pessary [15 events in 7 women]). Table 2 also presents the events per outcome per year and the total events over 5 years. There seemed to be a peak in the number of events at year 2 and 3 for developing anatomic recurrence, mainly visible for the overall anatomic failure and anterior compartment recurrence outcomes.

Composite outcome of failure (ie, prolapse beyond the hymen, bothersome bulge symptoms, repeated surgery, or pessary use) occurred 164 times during 5-year follow-up in 66 different women (31.9%). Risk factors that were statistically significantly associated with composite outcome of failure were BMI (OR, 1.10 [per 1 kg/m²]; 95% CI, 1.02–1.19; P=.02), smoking (OR, 2.88; 95% CI, 1.12–7.42; P=.03), and preoperative POP-Q point Ba (OR, 1.23 [per 1 cm]; 95% CI, 1.01–1.50; P=.04). Of the 66 women who met the criteria for the composite outcome of failure, 30 women (45%) were not consistent in reporting bothersome vaginal bulge symptoms over the years. These women reported symptoms only once or twice and had no bothersome bulge symptoms at the other measurement moments.

A total of 70 events were reported for bothersome vaginal bulge symptoms during 5-year follow-up in 41 different women (19.8%). Smoking status was a statistically significant risk factor for bothersome vaginal bulge symptoms (OR, 3.80; 95% CI, 1.48–9.75; P=.01). Women with preoperative POP-Q stage 3 or 4 had a statistically significantly lower risk of recurrence of bothersome vaginal bulge symptoms during the 5 years of follow-up than women with POP-Q stage 2 (OR, 0.32; 95% CI, 0.11–0.89; P=.03). None of the 12 women who had isolated apical compartment prolapse had recurrence.
of bothersome bulge symptoms during 5-year follow-up.

Overall anatomic failure occurred 462 times during 5-year follow-up in 147 different women (71.0%). Risk factors for anatomic failure were BMI (OR, 1.15 [per 1 kg/m²]; 95% CI, 1.07–1.25; P < .01) and POP-Q point Ba (OR, 1.15 [per 1 cm]; 95% CI, 1.01–1.32; P = .04).

Apical compartment recurrence occurred 31 times during 5-year follow-up in 13 different women (6.3%). There were no statistically significant risk factors.

Anterior compartment recurrence occurred 385 times during 5-year follow-up in 128 different women (61.8%). Statistically significant risk factors for anterior recurrence were BMI (OR, 1.11 [per 1 kg/m²]; 95% CI, 1.01–1.22; P = .02) and POP-Q point Ba (OR, 1.19 [per 1 cm]; 95% CI, 1.04–1.37; P < .01).

Posterior compartment recurrence occurred 93 times during 5-year follow-up in 40 different women (19.3%). VH was a statistically significant risk factor when compared with SSH (OR, 5.46; 95% CI, 2.07–14.38; P < .01).

Table 3 shows the results of the sensitivity analyses. Because of the small number of events, we were not able to identify risk factors for apical (16 events in 6 different women) and posterior (8 events in 5 different women) compartment recurrence beyond the hymen.

Overall anatomic failure beyond the hymen occurred 62 times during 5-year follow-up in 30 different women (14.5%). BMI was a statistically significant risk factor (OR, 1.14 [per 1 kg/m²]; 95% CI, 1.05–1.25; P < .01). POP-Q point Ba was not statistically significant.

Anterior compartment recurrence beyond the hymen occurred 50 times during 5-year follow-up in 25 different women (12.1%). Risk factors for anterior compartment recurrence beyond the hymen were BMI (OR, 1.13 [per 1 kg/m²]; 95% CI, 1.05–1.25; P < .01) and POP-Q point Ba (OR, 1.55 [per 1 cm]; 95% CI, 1.16–2.08; P < .01).

Table 4 shows the probabilities for the composite outcome of failure for...
| Variable | n | Age <60 y | Ref | Age ≥60 y | Ref | BMI per kg/m² | Ref | Smoking yes/no | Ref | Vaginal parity per 1 | Ref | Number of operated compartments | Ref | Preoperative POP-Q stage baseline | Ref | POP-Q C baseline | Ref | POP-Q GH baseline | Ref |
|----------|---|-----------|-----|-----------|-----|---------------|-----|---------------|-----|-------------------|-----|----------------------|-----|----------------------|-----|----------------------|-----|----------------------|-----|
|          |   |           |     |           |     |               |     |               |     |                   |     | 1 or 2               |     | 2                   |     | 3 or 4               |     |                     |     |                     |     |
|          |   |           |     |           |     |               |     |               |     |                   |     | 4 or 122            |     |                      |     |                     |     |                     |     |                     |     |
|          |   |           |     |           |     |               |     |               |     |                   |     | 3                   |     | 61                  |     | 132 or 10            |     |                     |     |                     |     |
|          |   |           |     |           |     |               |     |               |     |                   |     | 61                  |     | 132 or 10            |     |                     |     |                     |     |                     |     |

(continued)
different levels of BMI, smoking, and POP-Q point Ba. Compared with a reference woman with a BMI of 25 kg/m², a woman with a BMI of 30 kg/m² had a 5.9% higher probability of developing a failure during the 5 years after SSH or VH. Smokers had a 14.5% higher probability of a failure during 5 years of follow-up. A woman with a POP-Q point Ba at baseline of +3 cm had a 9.2% higher probability of developing a failure during the 5 years of follow-up than a woman with a POP-Q point Ba at the hymenal level (0 cm).

Comment
Principal findings
This secondary analysis of the SAVE-U trial identified BMI, smoking, and POP-Q point Ba as risk factors for the composite outcome of failure within 5 years after surgery. Specifically, BMI and POP-Q point Ba were risk factors for overall anatomic failure and anterior compartment recurrence. Smoking was a risk factor for recurrence of bothersome vaginal bulge symptoms. POP-Q stage 3 or 4 preoperatively was a significantly protective factor against recurrence of bothersome bulge symptoms, and VH was a risk factor for POP recurrence in the posterior compartment when compared with SSH. Another finding was that recurrences and bothersome bulge symptoms fluctuated over time during long-term annual follow-up.

Results in the context of what is known
Higher BMI was associated with anatomic POP recurrence, which confirms the findings of previous studies. Rappa et al. and Mandoro et al. both investigated BMI as a risk factor for POP recurrence after VH, but had shorter follow-up. The systematic review of Friedman et al. found no statistically significant association between obesity and POP recurrence, nor did the study of Metcalfe et al. This might be because of heterogeneity of inclusion criteria of these studies in which patients were included after multiple types of surgery. In addition, the latter stated that the results might have been influenced by loss to follow-up.
Preoperative POP-Q stage 3 or 4 is a risk factor for anatomic POP recurrence confirmed by many studies. Here our results contradict the findings of previous studies. Metcalfe et al. also found no association, although they focused on preoperative apical POP-Q stage instead of overall stage. The results did not change for any of the outcomes when we used apical POP-Q stage instead of overall stage as a possible risk factor in our multivariable model. This might be explained by the relatively large group of women with stage-2 prolapse of the apical compartment in our population (n=131, 65%). Another explanation could be that the significant effect of overall preoperative POP-Q stage as a risk factor in other studies was confounded by the effect of POP-Q point Ba, which often is not included in multivariable analyses. The study of Oversand et al. found that preoperative POP-Q stage in the anterior compartment was a risk factor for POP recurrence, and Jelovsek et al. also found POP-Q point Ba to be a significant risk factor, which supports this hypothesis. Higher preoperative POP-Q stage was a statistically significant protective factor against recurrence of bothersome bulge symptoms. This might be owing to the fact that women with higher POP-Q stages tend to have more preoperative symptoms and are thereby more satisfied with the results of the procedure. To our knowledge, and as stated by Diez-Itza et al., POP-Q stage in relation to subjective recurrence has not yet been reported by other studies.

There is lack of evidence on the effect of smoking on POP recurrence. Several previous studies have identified smoking as a protective factor against developing primary anatomic POP. However, our results show a strong association with recurrent bulge symptoms, which confirms the findings by Bohlin et al, where the authors stated that smokers have lower surgical satisfaction. An explanation could be that smoking causes poorer wound healing and atrophy, and therefore bulge symptoms could be more pronounced.

VH with uterosacral ligament suspension was a risk factor for posterior compartment recurrence, although more women underwent posterior colporrhaphy in the VH group (n=49 vs n=33). Possibly, the more dorsal axis of the vagina after SSH could protect against posterior compartment recurrence. Our findings are in line with the study of Chou et al, although this study was small and had a short follow-up. Previous clinical studies that compared SSH with VH found no association between surgery type and posterior compartment recurrence, but these studies had shorter follow-up. Our study contributed relevant data by performing multivariable risk factor analysis for the posterior compartment separately.

### Clinical implications
This study adds to the evidence on risk factors for POP recurrence by providing data of long-term follow-up and multivariable analysis for multiple outcome measures. These results can help in the identification of high-risk patients preoperatively, which could facilitate individualized counseling. The calculated probabilities provide clinically relevant and practical information on the chances of developing a composite outcome of failure for different levels of BMI.
smoking, and POP-Q point Ba during 5 years after surgery. Given that patient satisfaction depends on the presence or absence of bulge symptoms, it might be wise to advise smoking cessation before surgery to reduce the risk of a composite outcome of failure by approximately 14.5%. To increase the chances of treatment success, women should also preferably have a BMI within normal ranges before surgery. A more advanced POP-Q point Ba results in higher risk of developing a composite outcome of failure during 5 years after surgery, which should be explained to patients using the different probabilities. Furthermore, VH seems to increase the risk of posterior compartment recurrence, indicating that SH or additional attention to a concomitant posterior repair might be indicated. Given that there is considerable heterogeneity in the results of studies conducting risk factor analysis for POP recurrence, this advice should be interpreted with care.

The finding that recurrences and bothersome bulge symptoms fluctuate over time is a novel and important finding that could contribute to adequate preoperative counseling and managing expectations. In this study, POP-Q measurements were performed by an adequately trained independent doctor or nurse specialist, using the standards described by the International Urogynecological Association/International Continence Society in a 45° semiuipright position. The POP-Q system has low interobserver variability when measurements are performed in the same position. However, blinding was not possible because of the absence of the cervix in women who underwent VH. Anatomic or symptomatic recurrences do not seem to be progressive in many cases, which is represented by the fluctuation. Hypothetically, changes in life stage could be causing these fluctuations. Women from the SAVE-U trial are likely to have retired during follow-up, possibly from a physically demanding job, or conversely, they might have become more physically active after retirement. Because of the fluctuations, a single event of postoperative recurrence of bulge symptoms or anatomic POP is not a legitimate reason for an immediate repetition of intervention.

### Research implications

The changes in bothersome bulge symptoms and recurrences over time show that future studies need to consider this also in their design. We used mixed models to be able to take the fluctuation of events into account. Long-term follow-up is important, but only 1 follow-up visit provides merely a snapshot. Therefore, more research is needed on the optimal follow-up schedule over a long period of time in POP research. Because there is little available information on the effect of smoking on POP recurrence, future studies should include smoking into risk factor analysis and could also investigate the effect of preoperative cessation of smoking.

Furthermore, we encourage future risk factor studies to perform multivariable analysis including family history and, if possible, pelvic floor imaging for multiple outcome measures. In this way, studies will be better comparable and future systematic reviews will be able to draw conclusions with more certainty.

### Strengths and limitations

This secondary analysis of the SAVE-U trial provides clinically useful results with data of long-term annual follow-up. This study applied generalized linear mixed models on long-term annual follow-up data for POP recurrence. A major strength of this study is the analysis of risk factors for composite outcome measures and for separate subjective and objective outcome measures, which facilitates comparison with results of other studies. With these multiple outcome measures, we focused on patient-centered outcomes and provided practical insights for clinicians.

We acknowledge some limitations of our study. Firstly, there was a substantial number of missing data for the risk factor of smoking. We attempted to overcome this limitation by using multiple imputation for this variable.

Furthermore, information on family history, estrogen use, and levator defect was missing in our database. In the past few years, some studies have described the effect of family history and levator defect on POP recurrence. Instead of levator defect, we evaluated POP-Q point GH as possible risk factor because previous studies indicated an association between levator defect and genital hiatus size. However, in our study, POP-Q point GH was not found to be a significant risk factor. Currently, the 10-year follow-up of the SAVE-U trial is being performed, which allows us to easily supplement the database with family history.

### Table 4: Probability of composite outcome of failure

| Variable       | Probability (%) |
|----------------|-----------------|
| BMI (kg/m²)    |                 |
| 20             | 8.2             |
| 25             | 12.4            |
| 30             | 18.3            |
| 35             | 26.2            |
| 40             | 36.0            |
| Smoking        |                 |
| No             | 12.4            |
| Yes            | 26.9            |
| POP-Q Ba (cm)  |                 |
| -3             | 6.8             |
| -2             | 8.3             |
| -1             | 10.2            |
| 0              | 12.4            |
| 1              | 15.0            |
| 2              | 18.1            |
| 3              | 21.6            |

Probability calculations were performed for each of the statistically significant risk factors based on the generalized linear mixed model (Table 2), using reference values for the other risk factors.

Reference values: age, 60 years; BMI, 25 kg/m²; smoking, no; parity, 2; preoperative POP-Q stage, 2; POP-Q Ba, 0 cm; POP-Q C, −1 cm; POP-Q Bp, 0 cm; POP-Q GH, 4 cm; number of operated compartments, 2.

Surgery type was included as a mean value between sacrospinous hysteropy and vaginal hysterectomy.

BMI, body mass index; POP-Q, Pelvic Organ Prolapse Quantification; Ref, reference category.

Schulten. Risk factors for prolapse recurrence after native tissue repair. Am J Obstet Gynecol 2022.
Conclusions

This secondary analysis of the 5-year follow-up of the SAVE-U trial demonstrated that BMI, smoking, and POP-Q point Ba are risk factors for the composite outcome of failure after SSI or VH with uterosacral ligament suspension. BMI and POP-Q point Ba were significantly associated with overall anatomic failure and anterior compartment recurrence. For the recurrence of bothersome vaginal bulge symptoms, smoking was a significant risk factor, whereas POP-Q stage 3 or 4 preoperatively was a significantly protective factor. VH with uterosacral ligament suspension was a risk factor for POP recurrence in the posterior compartment when compared with SSI.

There was remarkable fluctuation over the 5-year follow-up in bothersome bulge symptoms and anatomic recurrence that could not be explained by retreatment.

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