

Prevalence and predictors of depression and well-being after hysterectomy

Citation for published version (APA):

Theunissen, M., Peters, M. L., Schepers, J., Schoot, D. C., Gramke, H-F., & Marcus, M. A. (2017). Prevalence and predictors of depression and well-being after hysterectomy: an observational study. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 217, 94-100. <https://doi.org/10.1016/j.ejogrb.2017.08.017>

Document status and date:

Published: 01/10/2017

DOI:

[10.1016/j.ejogrb.2017.08.017](https://doi.org/10.1016/j.ejogrb.2017.08.017)

Document Version:

Publisher's PDF, also known as Version of record

Document license:

Taverne

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

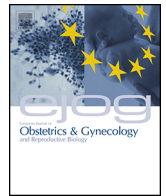
www.umlib.nl/taverne-license

Take down policy

If you believe that this document breaches copyright please contact us at:

repository@maastrichtuniversity.nl

providing details and we will investigate your claim.



Full length article

Prevalence and predictors of depression and well-being after hysterectomy: An observational study[☆]Maurice Theunissen^{a,*}, Madelon L. Peters^b, Jan Schepers^c, Dick C. Schoot^{d,e}, Hans-Fritz Gramke^a, Marco A. Marcus^{a,1}^a Department of Anaesthesiology and Pain Management, Maastricht University Medical Centre+, Maastricht, The Netherlands^b Department of Clinical Psychological Science, Maastricht University, Maastricht, The Netherlands^c Department of Methodology and Statistics, Maastricht University, The Netherlands^d Department of Gynaecology, Catharina Hospital, Eindhoven, The Netherlands^e Department of Gynaecology, Ghent University Hospital, Ghent, Belgium

ARTICLE INFO

Article history:

Received 23 December 2016

Received in revised form 10 August 2017

Accepted 12 August 2017

Keywords:

Depression

Femininity

Hysterectomy

Predictor

Well-being

ABSTRACT

Objectives: To assess risk and predictive factors for depression and well-being, 3 and 12 months after elective hysterectomy. Secondary objectives were to assess the incidence of depression, level of well-being, and feelings of femininity.

Study design: A prospective multicenter cohort study was performed among 419 women, undergoing hysterectomy for benign indication. Data were collected in the week prior to surgery, and in the per- and postoperative period up to the fourth postoperative day and 3 and 12 months after surgery. Sociodemographic variables, baseline health status, psychosocial predictors, and surgery data were assessed. Outcome measures were Center for Epidemiological Studies-Depression scale (CES-D, range 0–60), the 12-item well-being questionnaire energy and positive well-being subscales (range 0–12), and feelings of femininity. Predictor analyses were performed using linear mixed model analyses.

Results: Levels of depression, energy, and positive well-being after hysterectomy were predicted by their corresponding baseline levels (estimate 0.62 $p < 0.001$, 0.39 $p < 0.001$, 0.37 $p < 0.001$, respectively) and baseline pain (0.31 $p = 0.003$, $-0.09 p = 0.026$, $-0.10 p = 0.008$). Postoperative infection reported at 12 months affected CES-D and energy level. Several other gynaecological, psychosocial, or perioperative factors were also predictive for one of the outcomes. Prevalence of depression at baseline, 3 and 12 months was 24%, 19%, and 21%, respectively. In general, well-being scores were slightly higher 3 and 12 months after hysterectomy than at baseline. Feelings of femininity were not negatively affected in 92% of the patients.

Conclusions: Preoperative psychosocial status, perioperative pain, and postoperative infection were found as predictors of psychological outcome after hysterectomy. In the majority of patients we observed small but significant improvements with regard to postoperative depression and well-being, while feelings of femininity were unaffected.

© 2017 Elsevier B.V. All rights reserved.

Introduction

Hysterectomy is one of the most frequently performed surgical procedures in women worldwide. Although it was previously

assumed that hysterectomy could have adverse effects on psychological well-being and might be associated with increased levels of depression, recent studies using a prospective design did not find evidence for decreased well-being or quality of life [1,2] and even suggested that hysterectomy could reduce symptoms of depression and anxiety and increase general well-being [1,3–5]. Despite overall good psychosocial recovery after hysterectomy, there might however be a subgroup of women reporting negative psychological outcomes [6]. Several risk factors for suboptimal psychological recovery have been identified. These include pre-operative pain [7], pre-operative trait anxiety [7], previous emotional problems [5], and social support [8]. Type of

[☆] This study was conducted in Maastricht, Sittard-Geleen, Eindhoven, and Veldhoven, The Netherlands.

* Corresponding author at: Department of Anaesthesiology and Pain Management, Maastricht UMC+, PO Box: 5800, 6202 AZ Maastricht, The Netherlands.

E-mail address: maurice.theunissen@mumc.nl (M. Theunissen).

¹ Present address: Department of Anaesthesia/ICU and Perioperative Medicine, Hamad Medical Corporation, Doha, Qatar.

hysterectomy has generally been found to be unrelated to psychological outcome [3,4,9]. However, it is still difficult to understand the interplay between these factors. Therefore, in line with the call for studies “to properly determine the psychological effects of hysterectomy” [1], we examined the influence of sociodemographic, surgery-related, and pre-operative psychosocial variables, including childhood abuse [10], on depression, positive well-being, and vitality. In addition to our main outcomes depression, positive well-being, and vitality, we examined whether hysterectomy affects feelings of femininity. Concerns regarding femininity have previously been reported in women undergoing hysterectomy [5,11].

Materials and methods

A prospective multicentre cohort study was performed in four Dutch hospitals: Maastricht University Medical Centre+, Catharina Hospital Eindhoven, Máxima Medical Centre Veldhoven, and Orbis Medical Centre Sittard-Geleen. This study was performed after approval by the Medical Ethics Committee of Maastricht UMC+, the Netherlands, and informed consent was given by all participants. Predictors of post-operative pain, physical, psychological, and sexual recovery were studied. In this article we focus on the multiple dimensions of psychological recovery. Clinical data on pain and physical recovery are published elsewhere [12]. Data were collected during the week prior to surgery, and in the pre- and postoperative period up to day 4. Long-term recovery was evaluated at 3 and 12 months after surgery. Preoperative and follow-up assessments were performed at home by postal questionnaires. Of all outcome measures also baseline measures were assessed. Patients recorded acute pain in a pain diary, data on surgery and anaesthesia were collected during surgery by the attending anaesthesiologist, gynaecologist, or study coordinator.

Participants were scheduled for hysterectomy for benign indication between 2010 and 2014. Inclusion criteria were: informed consent, age 18–65 years, good understanding of the Dutch language, elective hysterectomy. Exclusion criteria were history of malignancy, illiteracy, and cognitive impairment.

Baseline data consisted of sociodemographic variables, preoperative health status including gynaecological history, comorbidity [13], physical functioning according to the physical functioning subscale of the RAND health survey short-form 36 [14], and pain [15,16]. Collected surgery-related data were: type of hysterectomy (median lower abdominal or Pfannenstiel incision, vaginal approach, laparoscopic assisted vaginal hysterectomy [LAVH], laparoscopic hysterectomy [LH], total or subtotal, with or without oophorectomy), indication for surgery, duration of surgery, and type of anaesthesia (general anaesthesia [GA], GA combined with epidural, spinal, GA combined with spinal).

Psychological predictors were assessed using Dutch versions of several self-report questionnaires. For surgical fear the surgical fear questionnaire (SFQ) was used [17]. Pain catastrophizing was assessed using the pain catastrophizing scale (PCS) [18]. Optimism/pessimism was assessed using the Life Orientation Test-revised (LOT-R). After reversal of the negative items a single optimism score was obtained [19]. Trait affectivity was assessed using the positive and negative affect scale (PANAS) [20]. Social support was assessed using the sum score of the Medical Outcomes Study social support survey (MOS-SSS) and a one-item score reflecting the number of close friends/relatives available for social support [21]. To screen for physical and sexual abuse during childhood two single items were included [22].

For the outcome depression the Center for Epidemiological Studies-Depression (CES-D, range 0–60) scale was used. The numbers of prevalence/incidence are based on a previously established cut-off of ≥ 16 [23]. For the multilevel predictor

analysis the non-dichotomised continuous scale was used. The outcome well-being was assessed using the well-being questionnaire (W-BQ12) energy (W-BQe) and positive well-being (W-BQpw) subscales, range 0–12 [24]. The predictor analyses for well-being were also performed using the continuous scales. In addition, participants were asked to what extent they felt less feminine after hysterectomy using an ordinal scale with four categories: not at all, a bit less, rather much less, very much less. Furthermore, it was assessed whether hysterectomy was experienced as a relief, a loss, or neutral. At baseline, corresponding expectations about feelings of femininity and hysterectomy were assessed. Finally, if patients underwent other surgery, or they reported a malignancy, or an event with potential major psychosocial impact during follow-up that might influence the answers of the follow-up questionnaires, they were excluded from follow-up analyses.

We planned to include 500 patients with an expected number of 300 suitable for follow-up analyses [12]. Missing values on multi-item psychosocial questionnaires, physical functioning, and pain interference scale, if less than 20%, were imputed by the participants mean score on that scale. Single-item sociodemographic and surgical variables were not imputed. Data are analysed using *t*-test, Chi-square or McNemar test if appropriate. To assess predictors for the 3 and 12 month follow-up outcomes, linear mixed model analyses with a random person intercept were performed. Based on an a priori selection a subset of pre-, per-, and postoperative variables was selected for multivariate analyses, to avoid overlap between variables with high level of similarity. This reduced the number of variables in the statistical models and additionally created more uniformity across analyses. To further reduce the number of psychological predictors the PCS and SFQ were combined into a single “surgical worries” score [12]. Results on predictors are presented as estimate (SD). Model fit is shown by Akaike’s Information Criterion, the lower its value the better the fit. See Supporting information file S1 for further details of these analyses. All analyses were performed using IBM SPSS Statistics for Windows, version 23.0. Armonk, NY, USA.

Results

Data of 419 participants were evaluated, see Fig. 1. Mean age (SD) was 46.9 (7.1) years. Main indications for hysterectomy were menorrhagia/metrorrhagia (203 participants) and leiomyoma (136), and furthermore prolapse (71), dysmenorrhoea (26), abdominal pain (26), cervical dysplasia (24), endometriosis/adenomyosis (23), and other (25): more than one indication was possible for each participant. Contraception was used by 86 women (21%, missing data 3), 317 participants had a premenopausal status (77%, missing data 8).

The results on psychosocial baseline and follow-up data are presented in Table 1. The mean depression scores showed small but significant improvements at 3 months and at 12 months (*t*: 4.410; *df*: 401, $p < 0.001$ and *t*: 2.280; *df*: 357, $p = 0.023$ respectively), when compared to baseline. The changes in prevalence of depression were small and statistically non-significant. The incidence at 3 months was 8.2%. The W-BQe scores revealed an increase from baseline to 3 months of mean (SD) 7.2 (2.7) to 7.7 (2.9) (*t*: -2.983 ; *df*: 401, $p = 0.003$). There was no evidence for a further mean increase, the score at 12 months was 7.9 (2.8). The mean W-BQpw scores at the three consecutive time points were 7.6 (3.0), 8.2 (3.2), and 8.0 (3.3) respectively. The mean increase from baseline to 3 months was statistically significant (*t*: -3.480 ; *df*: 399, $p = 0.001$), whereas the 12 month follow-up mean score was not significantly different from the mean at baseline.

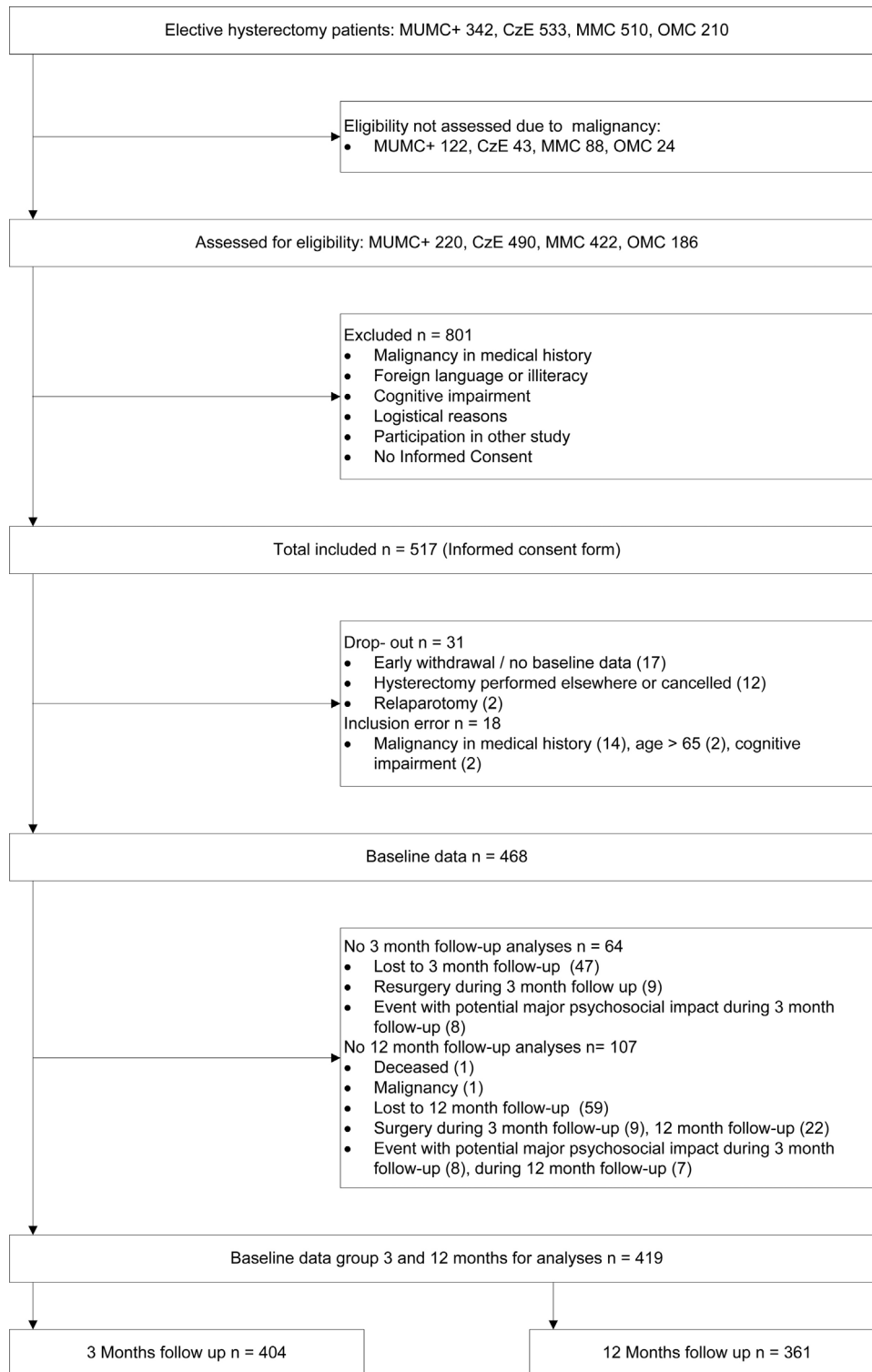


Fig. 1. Patient flow.

Attitude towards hysterectomy was shown to be positive. After 3 months 98.3% of the participants experienced it as a relief or as neutral, whereas 91.6% indicated that they did not at all feel less feminine after hysterectomy. The results after 12 months were almost identical to the 3 months results, see [Table 1](#).

An overview of all bivariate significant predictors for depression and well-being is presented in the results section of the Supporting information, file S2. The results of linear mixed analyses for depression are shown in [Table 2](#), left column (only predictors

significant at $p < 0.05$ level are shown). Higher baseline depression score and non-hysterectomy-related baseline pain were associated to elevated depression scores at follow-up. Furthermore, increased perioperative blood loss was associated with lower depression scores at 3 months and, to a lesser extent, at 12 months. Finally, for women that reported an infection at 12 month follow-up it appeared that mean depression scores increased more strongly from 3 to 12 months compared to women that did not report an infection.

Table 1
Psychosocial measures at baseline, 3 and 12 months after hysterectomy.

Measure	Baseline Sample	Sample 3 month follow-up	Sample 12 month follow-up
	N = 419	N = 404	N = 361
CES-D (0–60)	10.9 (8.3)	9.1 (8.5)***	9.9 (8.8)*
CES-D ≥ 16	99 (23.7%) [2]	77 (19.1%)	77 (21.4%) [1]
W-BQ energy (0–12)	7.2 (2.7)	7.7 (2.9)**	7.9 (2.8)***
W-BQ positive well-being (0–12)	7.6 (3.0)	8.2 (3.2)**	8.0 (3.3)
Experience hysterectomy:			
relief	314 (76%)	271 (67%)**	247 (70%)
neutral	88 (22%)	124 (31%)	100 (28%)
loss	10 (2%)	7 (2%)	8 (2%)
missing data	7	2	6
Experience less femininity:			
not at all	347 (84%)	369 (92%)***	331 (92%)***
a bit less	57 (14%)	28 (7%)	23 (6%)
rather much less	4 (1%)	3 (<1%)	2 (1%)
very much less	6 (1%)	3 (<1%)	3 (1%)
missing data	5	1	2
SFQ short-term (0–40)	16.1 (9.9)	–	–
SFQ long-term (0–40)	9.4 (8.6)	–	–
PCS (0–52)	12.3 (8.2)	–	–
LOT-R (0–24)	17.0 (3.7)	–	–
PANAS positive (5–25)	17.5 (3.2)	–	–
PANAS negative (5–25)	10.2 (4.2)	–	–
MOS-SSS number of persons	9.9 (6.9)	–	–
MOS-SSS total (0–100)	85.8 (18.6)	–	–
History of physical abuse	50 (12%) [3]	–	–
History of sexual abuse	80 (19%) [7]	–	–
History of psychological problems	120 (29%) [3]	–	–
Expected pain after 4 days (0–10)	5 (3–6)	–	–

Depression: Center for Epidemiological Studies-Depression (CES-D) scale. W-BQ: well-being questionnaire, positive well-being and energy subscales.

Experience hysterectomy and femininity at baseline: expected feelings after hysterectomy; SFQ: surgical fear questionnaire; PCS: pain catastrophizing scale; LOT-R: life orientation test-revised; PANAS: positive and negative affect scale; MOS-SSS: Medical Outcomes Study-social support survey with subscales tangible support, emotional/informative support, affective support, and positive social interaction. History of psychological problems: answer yes to "Did you ever suffer from psychological problems for which you needed support?"

Numbers are mean (SD), median (25th–75th percentile), or number (%), [missing data].

Significant difference compared with baseline: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (for Experience less femininity: dichotomized, not at all versus bit less/rather/very much less).

The results for the well-being energy subscale are presented in Table 2 second column. Increased baseline W-BQe and social support predicted higher W-BQe scores whereas baseline pain, high negative affect scores, and pain at the post anaesthesia care unit (PACU) predicted lower W-BQe scores. There were also several interaction effects with time. For postmenopausal women mean W-BQe scores were higher than for premenopausal women at 3 months but not at 12 months. Contraception use at baseline decreased W-BQe at 3 months and to a lesser extent at 12 months. Indication of cervical dysplasia (compared to leiomyoma) decreased W-BQe at 3 months and to a lesser extent at 12 months.

For positive well-being, the preoperative factors lower baseline W-BQpw, non-hysterectomy-related baseline pain, and surgery-related worries predicted lower W-BQpw. Two interaction effects with time were found. In women with indication abdominal pain the decrease in mean W-BQpw from 3 to 12 months was stronger than for women with indication leiomyoma. Baseline optimism did not appear to be associated to W-BQpw at 3 months, but at 12 months this relation was significantly more positive. Of the per- and postoperative variables, none remained in the model. See Table 2 third column.

Comment

The results of this study showed that hysterectomy was related to slightly increased wellbeing and decreased depression. Universal predictors for both a higher level of depression and a lower level of well-being 3 and 12 months after hysterectomy were

corresponding baseline levels and baseline pain non-related to the planned hysterectomy. The course of depression and well-being energy was affected by self-reported postoperative infection. Several other gynaecological or psychological predictors additionally predicted depression or well-being outcomes.

The strength of this study is that use was made of extensive questionnaire packages, allowing us to assess multiple socio-demographic, gynaecological, psychosocial, and surgical predictors of depression and well-being. We were able to explore whether previous findings were supported, and simultaneously explore other factors that may be involved in psychological recovery after hysterectomy. Furthermore, the analyses were performed including the baseline measure of the outcome measures. This enabled us to direct the selection of predictors towards variables predicting change in depression or well-being caused by hysterectomy, rather than predicting a general level of depression and well-being. A limitation is that depression was not clinically diagnosed. Furthermore, the use of hormonal treatment was assessed only at baseline, not at follow-up. This may bias our findings with regard to the predictor contraceptive use. Finally, the exploration of a large number of baseline data for statistical predictor analyses increases the risk of making Type I errors. This should be considered when drawing conclusions from our study. On the other hand, our findings with regard to the outcome depression are in agreement with a recent meta-analysis, reporting that depressive symptoms might improve after hysterectomy, and that the presence of depressive symptoms preoperatively is a risk factor for postoperative depression [1]. One of the

Table 2
Predictors of depression and well-being 3 and 12 months after hysterectomy.

Predictors	Depression		Well-Being E		Well-Being PW	
	N = 353		N = 305		N = 404	
	Est (SD)	P	Est (SD)	P	Est (SD)	P
Time						
3 months	Reference		Reference		Reference	
12 months	0.516 (0.908)	0.570	0.643 (0.585)	0.273	-2.703 (0.835)	0.001
Menopausal status						
pre-menopausal	-		Reference		-	
post-menopausal	-		1.088 (0.648)	0.094	-	
Contraception use	-		-1.977 (0.667)	0.003	-	
Indication						
leiomyoma	Reference		Reference		Reference	
prolapse	0.575 (2.075)	0.782	-1.572 (0.812)	0.053	-1.337 (0.783)	0.088
abdominal pain	-4.200 (2.738)	0.126	0.730 (1.222)	0.516	1.484 (1.058)	0.162
cervical dysplasia	4.941 (3.095)	0.111	-3.451 (1.230)	0.005	-1.500 (1.193)	0.209
Depression (0–60)	0.623 (0.041)	<0.001	-		-	
Well-being energy (0–12)	-		0.391 (0.052)	<0.001	-	
Well-being positive well-being (0–12)	-		-		0.371 (0.048)	<0.001
Negative affect (5–25)	-		-0.096 (0.033)	0.003	-	
Surgery-related worries	-		-		-0.369 (0.127)	0.004
Optimism (0–24)	-		-		-0.057 (0.073)	0.438
Social support (0–100)	-		0.019 (0.007)	0.006	0.013 (0.007)	0.063
Non-hysterectomy-related baseline pain (0–10)	0.306 (0.101)	0.003	-0.089 (0.040)	0.026	-0.101 (0.038)	0.008
Blood loss (ml)	-0.005 (0.002)	0.013	-		-	
Pain at PACU (0–10)	-		-0.134 (0.049)	0.007	-	
Surgery-related infection 12 month	-6.253 (3.490)	0.074	2.327 (1.362)	0.088	-	
Interaction with time						
postmenopausal status	-		-0.833 (0.372)	0.026	-	
contraception use	-		1.017 (0.387)	0.009	-	
indication abdominal pain	2.934 (1.593)	0.066	-		-1.395 (0.643)	0.031
indication cervical dysplasia	-		1.562 (0.706)	0.028	-	
optimism	-		-		0.136 (0.044)	0.002
blood loss	0.003 (0.001)	0.011	-		-	
surgery-related infection 12 month	4.276 (1.994)	0.033	-2.121 (0.778)	0.007	-	
Akaike's Information Criterion	4485.4		2693.6		3491.9	

Depression: CES-D, Center for Epidemiological Studies – Depression (0–60); Well-being: W-BQ, well-being questionnaire, well-being E = energy and well-being PW = positive well-being subscale (0–12).

Numbers are estimates (SD) and *p* value. Significant *p* value in bold. Main effects and interaction with time, i.e. an additional effect on 12 month compared with 3 month outcome, are only shown for variables with *p* < 0.05.

Surgery-related worries: range -1.675 to 3.665, is based on regression scores, resulting of factor analysis performed on the SFQ, PCS, LOT-R, CES-D and W-BQ12. Two factors revealed, the first, consisting of the SFQ and PCS named surgery-related worries. Negative affect: PANAS, Optimism: LOT-R (0–24), Social support: MOS-SSS (0–100), Expected pain: expected pain after 4 days (NRS 0–10), PACU: post anaesthesia care unit. Surgery-related infection: self-reported surgery-related infection during 3 or 12 month follow-up.

The Akaike's Information Criterion of all three outcome measures improved when compared with the model with control variables, baseline reference, and time: depression AIC = 5025.6, W-BQe 3520.6, and W-BQpw 3664.8.

pre-operative factors that was related to changes in depression at follow-up was pre-operative pain. This association was already described in previous studies [7,25]. Furthermore postoperative infection was related to changes in depression at follow-up. This finding is complementary with publications stipulating evidence for the link between depression and inflammatory and immunological processes [26,27]. In contrast, subgroup analyses in the meta-analyses of Darwish et al. [1] indicated that the decrease in depression after hysterectomy was mainly found in studies including premenopausal women only whereas studies that involved postmenopausal women or women with oophorectomy did not find a significant decrease in depression. In our study no effects of menopausal status or bilateral oophorectomy on depression were found. Except for baseline depression scores, none of the other psychological variables were predictive of depression scores at 3 and 12 months in our study. This is in contrast to previous studies that did report that pre-operative psychological status predicted depression at follow-up [5,7,25,28]. Concerning the outcome well-being, we found that several baseline psychological factors were predictive of outcome levels.

Post-operative energy levels were lower in the presence of negative affect and higher when social support was available. This confirms a previous report where negative affect predicted poorer outcome on all EQ-5D dimensions 12 months after percutaneous coronary interventions [29]. Moreover, social support has been related to better quality of life in other health settings, e.g. in stroke patients [30]. Finally, higher levels of positive well-being at follow-up were positively associated with optimism and negatively with surgical worries. Optimism has been related to better well-being and higher quality of life after surgery across a range of different procedures [31]. In our previous report of the physical dimensions of recovery in the same patient group, we found surgical worries to be related to increased long-term pain and decreased feelings of global recovery [12]. Together with the results of the present analyses it seems that worrying about the upcoming surgery has a relatively pervasive effect on a large range of outcomes. Similar to all other outcomes in this cohort study [12], also postoperative well-being was negatively affected by pre- and acute postoperative pain. Several other studies assessed well-being after hysterectomy, however these studies compared

different interventions, and did not provide results on the impact of perioperative pain on well-being [3,4,32,33]. Nonetheless, these studies support our results concerning type of hysterectomy, which did not affect well-being. We found that postmenopausal status was associated with higher W-BQe at 3 months, an effect that seemed to disappear at 12 months. This could possibly mean that the potential negative influence of perimenopausal status in general on the overall energy status can aggravate more in the postoperative phase in those women stopping exogenous female hormones.

Rather positive findings are that the majority of the patients indicated that they experienced hysterectomy as a relief and that feelings of femininity were not adversely affected. A previously performed literature review [6] reported inconclusive evidence with regard to effects of hysterectomy on body image.

Altogether, this study and many studies performed earlier reveal the potential impact of poor psychosocial preoperative status. Therefore selection of patients at increased preoperative risk and establishment of effective psychological interventions deserve more attention [34].

This study revealed that apart from baseline level of depression or well-being, preoperative psychosocial status, perioperative pain and postoperative infection are predictors of psychological outcome after hysterectomy. For the majority of patients hysterectomy leads to small but significant improvements in postoperative depression and well-being. Hysterectomy seems not to adversely affect feelings of femininity. To further improve postoperative outcome, a focus on analgesic treatment and infection control might benefit patients' postoperative psychological health.

Conflict of interest

M. Peters received an Innovative Research Grant (VICI) from the Netherlands Organization of Scientific Research (NWO) (grant # 453-07-005). The other authors report no conflict of interest.

Contribution to authorship

MT contributed to the design of the study, the execution of the study, analysed and interpreted the data, and wrote the article. MP contributed to the design of the study, assisted with analysing and interpreting the data, assisted with writing the article, and gave input at all stages of the study. JS assisted with analysing and interpreting the data, and assisted with writing the article. DS contributed to the design of the study, the execution of the study, and writing the article. H-FG contributed to the design of the study, assisted with writing the article, and gave input at all stages of the study. MM contributed to the design of the study, assisted with writing the article, and gave input at all stages of the study. All authors have approved the final version of the manuscript.

Funding

Departmental funding and Innovative Research Grant (VICI) from the Netherlands Organization of Scientific Research (NWO) (grant # 453-07-005). The funding sources had no involvement in conduct of the study, or publication of the article.

Acknowledgements

We thank A. van Ommering (MMC Veldhoven) for the effective patient recruitment and data collection, and S. van Riet (Maastricht University) for her support with data logistics. Furthermore we thank Dr. M. Bergmans for facilitating the data collection of two

patients included at Maastricht UMC+ who had their surgery at the Laurentius hospital Roermond. Finally we thank M. Willemsen, L. Muntinga, N.A.M. Oversier, R.V.G. Soekhoe, B. Vreeswijk, M. Herman, and B.A. de Waal, for their contribution to patient inclusion and data collection during their traineeship or residentship.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.ejogrb.2017.08.017>.

References

- [1] Darwish M, Atlantis E, Mohamed-Taysir T. Psychological outcomes after hysterectomy for benign conditions: a systematic review and meta-analysis. *Eur J Obstet Gynecol Reprod Biol* 2014;174:5–19.
- [2] Khastgir G, Studd JW, Catalan J. The psychological outcome of hysterectomy. *Gynecol Endocrinol* 2000;14(2):132–41.
- [3] Aziz A, Bergquist C, Nordholm L, Moller A, Silfverstolpe G. Prophylactic oophorectomy at elective hysterectomy: effects on psychological well-being at 1-year follow-up and its correlations to sexuality. *Maturitas* 2005;51(4):349–57.
- [4] Persson P, Brynhildsen J, Kjolhede P. Hysterectomy Multicentre Study Group in South-East S. A 1-year follow up of psychological wellbeing after subtotal and total hysterectomy—a randomised study. *BJOG* 2010;117(4):479–87.
- [5] Yen JY, Chen YH, Long CY, Chang Y, Yen CF, Chen CC, et al. Risk factors for major depressive disorder and the psychological impact of hysterectomy: a prospective investigation. *Psychosomatics* 2008;49(2):137–42.
- [6] Flory N, Bissonnette F, Binik YM. Psychosocial effects of hysterectomy: literature review. *J Psychosom Res* 2005;59(3):117–29.
- [7] Vandyk AD, Brenner I, Tranmer J, Van Den Kerkhof E. Depressive symptoms before and after elective hysterectomy. *J Obstet Gynecol Neonatal Nurs* 2011;40(5):566–76.
- [8] Thornton EW, McQueen C, Rosser R, Kneale T, Dixon K. A prospective study of changes in negative mood states of women undergoing surgical hysterectomy: the relationship to cognitive predisposition and familial support. *J Psychosom Obstet Gynaecol* 1997;18(1):22–30.
- [9] Rohl J, Kjerulf K, Langenberg P, Steege J. Bilateral oophorectomy and depressive symptoms 12 months after hysterectomy. *Am J Obstet Gynecol* 2008;199(1):22 e1–e5.
- [10] Salmon P, Hill J, Krespi R, Clark L, Fisher J, Holcombe C. The role of child abuse and age in vulnerability to emotional problems after surgery for breast cancer. *Eur J Cancer* 2006;42(15):2517–23.
- [11] Ferroni P, Deeble J. Women's subjective experience of hysterectomy. *Aust Health Rev* 1996;19(2):40–55.
- [12] Theunissen M, Peters ML, Schepers J, Maas JW, Tournois F, van Suijlekom HA, et al. Recovery 3 and 12 months after hysterectomy: epidemiology and predictors of chronic pain, physical functioning, and global surgical recovery. *Medicine (Baltimore)* 2016;95(26):e3980.
- [13] Berg van den J, Wulp van der C. Rapport van de Werkgroep Revisie POLS-Gezondheidsenquête 1999. Heerlen: Statistics Netherlands (CBS); 2003.
- [14] Ware Jr. JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Med Care* 1992;30(6):473–83.
- [15] Cleeland CS, Ryan KM. Pain assessment: global use of the Brief Pain Inventory. *Ann Acad Med Singapore* 1994;23(2):129–38.
- [16] van Seventer R, Vos C, Giezeman M, Meerding WJ, Arnould B, Regnault A, et al. Validation of the Dutch version of the DN4 diagnostic questionnaire for neuropathic pain. *Pain Pract* 2013;13(5):390–8.
- [17] Theunissen M, Peters ML, Schouten EG, Fiddelaers AA, Willemsen MG, Pinto PR, et al. Validation of the surgical fear questionnaire in adult patients waiting for elective surgery. *PLoS One* 2014;9(6):e100225.
- [18] Sullivan MJL, Bishop SR, Pivik J. The pain catastrophizing scale: development and validation. *Psychol Assess* 1995;7(4):524–32.
- [19] Scheier MF, Carver CS, Bridges MW. Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the Life Orientation Test. *J Pers Soc Psychol* 1994;67(6):1063–78.
- [20] Mackinnon A, Jorm AF, Christensen H, Korten AE, Jacomb PA, Rodgers B. A short form of the Positive and Negative Affect Schedule: evaluation of factorial validity and invariance across demographic variables in a community sample. *Pers Indiv Differ* 1999;27(3):405–16.
- [21] Sherbourne CD, Stewart AL. The MOS social support survey. *Soc Sci Med* 1991;32(6):705–14.
- [22] Thombs BD, Bernstein DP, Ziegelstein RC, Bennett W, Walker EA. A brief two-item screener for detecting a history of physical or sexual abuse in childhood. *Gen Hosp Psychiatry* 2007;29(1):8–13.
- [23] Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psych Meas* 1977;1(3):385–401.

- [24] Bradley C. The 12-Item well-being questionnaire: origins, current stage of development, and availability. *Diabetes Care* 2000;23(6):875.
- [25] Ewalds-Kvist SB, Hirvonen T, Kvist M, Lertola K, Niemela P. Depression, anxiety, hostility and hysterectomy. *J Psychosom Obstet Gynaecol* 2005;26(3):193–204.
- [26] Ghoneim MM, O'Hara MW. Depression and postoperative complications: an overview. *BMC Surg* 2016;16(1):5.
- [27] Maes M. Depression is an inflammatory disease, but cell-mediated immune activation is the key component of depression. *Prog Neuropsychopharmacol Biol Psychiatry* 2011;35(3):664–75.
- [28] Donoghue AP, Jackson HJ, Pagano R. Understanding pre- and post-hysterectomy levels of negative affect: a stress moderation model approach. *J Psychosom Obstet Gynaecol* 2003;24(2):99–109.
- [29] Versteeg H, Pedersen SS, Erdman RA, van Nierop JW, de Jaegere P, van Domburg RT. Negative and positive affect are independently associated with patient-reported health status following percutaneous coronary intervention. *Qual Life Res* 2009;18(8):953–60.
- [30] Kruithof WJ, van Mierlo ML, Visser-Meily JM, van Heugten CM, Post MW. Associations between social support and stroke survivors' health-related quality of life—a systematic review. *Patient Educ Couns* 2013;93(2):169–76.
- [31] Carver CS, Scheier MF, Segerstrom SC. Optimism. *Clin Psychol Rev* 2010;30(7):879–89.
- [32] Farquhar CM, Harvey SA, Yu Y, Sadler L, Stewart AW. A prospective study of 3 years of outcomes after hysterectomy with and without oophorectomy. *Am J Obstet Gynecol* 2006;194:711–7.
- [33] Persson P, Wijma K, Hammar M, Kjolhede P. Psychological wellbeing after laparoscopic and abdominal hysterectomy—a randomised controlled multi-centre study. *BJOG* 2006;113(9):1023–30.
- [34] Shehmar M, Gupta JK. The influence of psychological factors on recovery from hysterectomy. *J R Soc Med* 2010;103(2):56–9.