



The complexity of obesity-related health problems after bariatric surgery: The patient perspective

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ABSTRACT

Background: Bariatric surgery aims to improve quality of life by means of weight loss. Obesity-related physical and psychological health problems should improve, but long-term data are scarce.

Objectives: To evaluate preoperative physical and mental health problems perceived by the patient and the association with weight loss and quality of life, 5 years after bariatric surgery.

Methods: 101 persons (response rate 67%) who had had bariatric surgery an average of 4.6 years before this study completed a written survey on obesity-related physical and psychological health problems and three psychological questionnaires collecting information on eating behavior and quality of life. Over half of the participants (55%) had had a laparoscopic adjustable gastric banding.

Results: Preoperatively reported health problems improved but were not necessarily associated with weight loss. Minimal improvement in tiredness, shame and weight instability were associated with significantly less weight loss. Preoperative type 2 diabetes mellitus (T2D) improved but participants had significantly less weight loss and more dissatisfaction regarding the bariatric trajectory than participants without T2D. Eating concerns, emotional eating and external eating improved but not restrained eating. Compared to the Dutch population reference, most quality of life scores of the participants were lower.

Conclusion: In this analysis, participants did report satisfaction although from a patients' perspective, improvements of weight and health did not necessarily lead to satisfaction regarding the bariatric trajectory. Participants with postoperative reported fatigue and shame as well as participants with preoperative T2D showed significant less weight loss. More long-term research is necessary to close the current knowledge gap.

1. Introduction

Worldwide, obesity is associated with stigmatization and shame [1] and impacts physical and mental health. Bariatric surgery improves health but is not without risk [2]. Most studies focused on physical aspects of health as type 2 diabetes mellitus (T2D), cardiovascular disease and degenerative joint disease [2]. However, physical improvement was not necessarily associated with psychological improvement [3].

Few studies have monitored mental health, mainly preoperative screening for psychological disorder and risks and the postoperative effects of preoperative predictors such as eating behavior, personality and psychiatric disorders [4,5]. A narrative review study by Wimmelmann and colleagues focused on the psychological predictors of mental

health after bariatric surgery [6]. They concluded that literature was sparse; psychological factors did influence postoperative weight loss but results remained inconsistent [6]. More research was highly needed. A systematic review study assessing risk factors for weight regain also concluded that at least 1 in 6 patients regained 10% or more of their maximum weight loss [7]. In a substantial group, postoperative psychological health benefits were not evident and the struggle with weight continued [7].

Experiences and expectations have not routinely been collected [8] and might not fit postoperative results. In a qualitative study that focused on the patients' experiences prior to bariatric surgery, Patients expected major physical and psychological improvement and had sometimes unrealistic expectations of weight loss [1]. More long-term

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studies are needed that focus on postoperative mental health, weight stability and quality of life (QoL) [3].

The aim of this study was to add to long-term data. The focus was on obesity-related physical and psychological health problems, weight stability and QoL from the patients' perspective. The first aim was to assess whether preoperatively reported health problems improved and if improvement was associated with total weight loss. The second aim was to establish if eating behavior changed after surgery. Finally, current QoL was assessed together with the question if they would consider undergoing the bariatric trajectory again if they knew then what they know now?

2. Materials and methods

Approval for the study was granted by the Medical Ethics Committee of the Maastricht University Medical Centre (MUMC). The study was conducted in accordance with the provisions in the current version of the Declaration of Helsinki.

2.1. Subjects

Patients opting for bariatric surgery were referred for psychological screening by the Department of Surgery at the MUMC. In 2005, a list of names of patients referred between 1996 and 2002 became available. A random selection of 200 names on this list was made, mostly from the screening procedures conducted 2000 and 2001. Patients were invited to participate by phone until the predefined number of 150 subjects agreed to participate. The inclusion criterion was having undergone bariatric surgery at least two years before the inclusion date. Of those people on the list, 45 could not be tracked down, four did not agree to participation, seven did not have bariatric surgery and one had died.

As the names were selected consecutively and stratified by year, this selection procedure was expected to result in a representative study population.

2.2. Procedure

In 2005, all participants received an envelope by ordinary mail and a postage-paid envelope to facilitate return. The envelope contained an informed consent form, a written survey and four validated psychological questionnaires.

2.3. Written survey

Among other things, the survey collected data on weight loss and weight stability, preoperative physical and psychological health problems due to obesity, and postoperative improvement. Participants were able to specify their perceived improvement as 'no improvement', 'small improvement', 'large improvement' or 'problem solved'. Weight stability was defined as weight that fluctuated within a range of 3–5 kilos. Participants were asked if they needed to consult a doctor for each reported obesity-related complaint. Satisfaction with the bariatric trajectory was enquired about by means of the question "Would you consider undergoing the bariatric trajectory again if you knew then what you know now?".

2.4. Psychological questionnaires

Three questionnaires were used in the present study, two regarding eating behavior: the Dutch Eating Behavior Questionnaire (DEBQ) and the Eating Disorder Examination Questionnaire (EDE-Q), and a QoL scale: the Short-Form Health Survey (SF-36). All questionnaires were used in the pre- and postoperative phases except for the SF-36 which was only used after surgery.

The DEBQ is a validated self-administered questionnaire consisting of 33 items to evaluate eating behavior. It includes three subscales:

restrained eating, emotional eating and external eating. Restrained eating is the conscious effort to limit and control dietary intake. Emotional eating is eating in response to either a diffuse emotional state or specific emotional arousal states such as fear, anger or anxiety. The total score for emotional eating is the sum of the score on the sub scales diffuse emotions and specific emotions. The level of emotional eating reflects a measurement of disinhibition. External eating is eating in response to external food cues such as the sight and smell of food [9]. Ratings are made on a 5-point Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often).

The EDE-Q is a self-report version of the Eating Disorders Examination to assess the psychopathology associated with the diagnosis of an eating disorder. This 36-item questionnaire includes four subscales: dietary restraint, eating concern, shape concern and weight concern. Items addressing eating disorder attitudes are scored using a 7-point rating scheme. The scoring system varies from 0 to 6, with 0 indicating no days concerning an item on the four subscales within the past 28 days, 1 = 1–5 days, 2 = 6–12 days, 3 = 13–15 days, 4 = 16–22 days, 5 = 23–27 days and 6 = every day. Higher scores denote greater eating pathology [10]. A global score of 4.0 has been suggested, but not validated, as a cut-off for disordered eating behavior [11].

The SF-36 is a short form of the more extensive Medical Outcomes Study (MOS) that examines specific influences on outcomes of care [12]. It is an often-used instrument to evaluate health-related QoL on both physical and mental well-being [12]. It was designed for use in clinical practice and research. The 36 questions were aggregated into eight health domains: limitations in physical functioning because of health problems (PF, 10 items); limitations in role functioning in usual role activities because of physical health problems (RP, 4 items); limitations in usual role activities because of emotional problems (3 items); bodily pain (BP, 2 items); social functioning (SF, 2 items); mental health (MH, 5 items); vitality such as energy and fatigue (VT, 4 items) and general health perceptions (GH, 6 items) [12]. The survey was constructed for self-administration by persons aged over 14 years, and for administration in person by a trained interviewer. The questions focused on the past month. Each domain is scored in a standard manner: 0 corresponding to the worst QoL up to 100 corresponding to the best QoL. According to its developers, the SF-36 was not developed to create an overall score of health-related QoL (HRQoL) [12].

After informed consent, preoperative weight, Body Mass Index (BMI) and postoperative weight at 24 months were obtained from the medical files. BMI is a measure of body fat based on height and weight that applies to adult men and women. The equation used for calculating BMI is mass (kg)/height-square (m).

2.5. Statistical analyses

All analyses were performed using STATA, version 13. Descriptive analyses were performed for all variables. Chi-square or t-tests were used to compare responders with non-responders. Statistical significance was set at $p < 0.05$. T-tests were used to analyze whether postoperative improvement was associated with more weight loss. Regarding psychological health problems, logistic regression analyses were used to analyze whether the degree of postoperative improvement was associated with weight loss. Paired t-tests were used to analyze the scores on the four psychological questionnaires before surgery and follow-up. T-tests were used to compare postoperative QoL subscale scores with Dutch reference population norm scores. To establish whether participants were satisfied or not, a descriptive analysis was performed using the survey question "Would you consider undergoing the bariatric trajectory again if you knew then what you know now?". The Pearson Chi-square test was used to analyze satisfaction of participants with or without T2D.

3. Results

3.1. Demographic data

In 2005, 101 of 150 participants responded (response rate 67%), 82 women (82%) and 19 men (18%). Average time since first surgery was 4.6 years (SD:2.4; range 1.5–9 years; median: 3.98 years). Half of the participants (50%) had a community college level education, 37% had secondary and 13% higher educational level education. Initial mean weight and BMI were 134.5 kg. (SD: 24.1) and 46.5 kg (SD:6.7; range 33.9–69.4), respectively. Postoperative mean weight loss was 38.1 kg. (SD: 19.6). Postoperative mean BMI was 33.3 (SD:7.7; range 21.3–65.6). Reported weight stability was 58%. Types of bariatric surgery used were Laparoscopic Adjustable Gastric Banding (LAGB, 55%), Vertical Banded Gastroplasty (VBG, 39%) and Laparoscopic Roux-en-Y Gastric Bypass (LRYGB, 6%). Reoperation rate was 14%. Non-responders and responders did not differ in gender (86% and 82% women, chi-square = 0.53, $p = 0.5$, degrees of freedom (df) = 1), preoperative mean age (36.9 and 38.3 years; $t = 0.8$; df:130; $p = 0.44$), preoperative weight (129.4 and 134.5 kg, $t = 1.1$; df = 133; $p = 0.27$) and initial BMI (45.8 and 46.5 kg/m², $t = 0.5$; df:133; $p = 0.62$).

Table 1 shows the results of the reported physical and psychological health problems and doctor consultations before and after surgery, including per complaint whether weight loss was associated with improvement.

3.2. Physical health problems and weight loss

Before surgery, physical health problems of tiredness, shortness of breath, back pain and joint problems were common. Thrombosis, a cardiovascular condition, and T2D were the least-reported physical problems. In the category “other obesity-related physical health problems”, a diversity of problems was reported before surgery such as edema, gastric reflux, open wounds, sleeping problems, gall bladder problems, mobility problems, varicose veins, stomach pain, hair loss and fertility problems. After surgery, all physical problems improved and

physician consultations decreased except in the category “other obesity-related physical health problems” where the number of consultations increased. Newly-emerged health problems after surgery were problems with the bowel, swallowing, reflux and excess of skin, specific food intolerance and inflammation.

Two physical problems were significantly associated with post-operative weight loss: tiredness and T2D. Improvement in tiredness was associated with more weight loss. Minimal or no change in tiredness were associated with less weight loss. Participants with T2D showed significantly less weight loss than participants without T2D, respectively 24.0 kg (SD: 13.6 kg) versus 39.4 kg (SD: 19.7 kg, $p = 0.025$), despite similar preoperative mean weight and BMI. Also, they reported significantly less satisfaction regarding the bariatric trajectory than participants without T2D ($p < 0.01$).

3.3. Psychological health problems and weight loss

before surgery, shame, low self-esteem, depressive mood, avoidance of social contacts and problems with hobby or sports were common. Few participants reported bulimia or excessive alcohol use. After surgery, all reported psychological health problems improved but a substantial minority reported minimal or no change in shame, low self-esteem, avoidance of social contacts and depressive mood. Participants who reported no improvement in shame after surgery showed significantly less weight loss than participants who reported their shame as ‘resolved’ (16.4 kg, SD:20.0 versus 46.1 kg, SD: 14.0; $p < 0.001$). A trend of less weight loss was found in participants who reported no improvement of a depressive complaint compared with those who reported their depressive complaint had been resolved (26.9 kg, SD:19.7 versus 43.0 kg, SD: 17.2; $p = 0.08$). Within the category “other psychological health problems”, several participants reported problems such as guilt toward spouse and children which were resolved after surgery.

3.4. Psychological questionnaires (DEBQ, EDE-Q)

Table 2 shows the pre- and postoperative scores of the psychological

Table 1

Reported obesity-related health problems before and after surgery and the association of improvement with weight loss.

N = 101	Before Surgery		After surgery			Weight loss (p)	
	Yes	Consult Doctor	Improved	Medical consultation			
Physical domain (%)							
Tiredness	77	28	59	5		0.03*	
Shortness of breath	70	21	60	4		0.49	
Back pain	58	24	40	6		0.38	
Thrombosis	2	1	1	1		.	
Cardiovascular condition	7	5	4	2		0.30	
Joint problems	64	43	45	17		0.77	
Diabetes	9	6	9	5		0.03*	
Hypertension	27	16	19	5		0.91	
Increased cholesterol	27	8	8	3		0.94	
Other physical problems ^a	18	16	5	28		0.93	
Psychological domain (%)	Yes	No	Small	Large	Solved	Not applicable	Weight loss
Depressive symptoms	56	8	11	28	11	43	0.08
Excessive alcohol use	3	1	3	2	3	90	0.48
Bulimia	9	1	1	6	1	90	0.92
Relationship problems	19	4	2	4	10	80	0.88
Low self-esteem	63	3	13	32	15	37	0.14
Avoiding social contact	50	3	5	22	16	54	0.79
Working problems/no work	23	6	1	6	9	78	0.59
Problems in the household	29	1	5	9	12	73	0.36
Shame	74	7	9	34	21	29	<0.01*
Problems with hobby/sports	52	4	15	17	17	47	0.09
Other problems ^b	12	2	2	7	4	84	0.61

* = statistically significant.

^a Before surgery: other physical obesity-related problems mentioned: edema, gastric reflux, open wounds, sleeping problems, gall stones, mobility problems, varicose veins stomach pain, hair loss, fertility problems. After surgery: stomach, bowels, swallowing, eating, reflux and fertility.

^b Other obesity-related problems: problems buying clothes, guilt toward their spouse and children for inactivity.

Table 2

Psychological questionnaires: eating behavior (EDE-Q, DEBQ) and quality of life (SF-36).

N = 101	Before surgery	After surgery	p-value of t-test
<i>EDE-Q (eating behavior)</i>			
Restrained eating	Mean (SD) 7.9 (5.6)	Mean (SD) 6.9 (6.7)	0.27
Eating concern	8.9 (6.6)	3.8 (5.2)	<0.01*
Shape concern	32.6 (12.1)	18.9 (14.6)	<0.01*
Weight concern	34.3 (12.3)	18.7 (14.8)	<0.01*
<i>DEBQ (eating behavior)</i>			
Restrained	31.9 (7.6)	27.6 (8.2)	<0.01*
Emotional specific	22.0 (8.0)	18.7 (8.6)	<0.01*
Emotional diffuse	10.5 (4.3)	8.8 (4.7)	<0.01*
External	27.9 (6.3)	24.9 (5.4)	<0.01*
<i>SF-36 (quality of life)</i>			
Physical functioning	–	76.2 (25.6)	81.9 (23.2) 0.02*
Role limitation PH ^a	–	85.8 (27.8)	79.4 (35.5) 0.13
Social functioning	–	75.0 (24.4)	86.9 (20.5) <0.01*
Bodily pain	–	70.0 (26.6)	79.5 (25.6) <0.01*
General mental health	–	61.6 (24.4)	76.8 (18.4) <0.01*
Role limitation EP ^b	–	90.5 (24.1)	84.1 (32.3) 0.09
Vitality	–	56.9 (23.9)	67.4 (19.9) <0.01*
General health perception	–	64.5 (28.0)	72.7 (22.7) <0.01*

* = statistically significant.

^a PH = physical problems.^b EP = emotional problems.^c = Dutch reference population norm scores.

questionnaires. All subscales of the eating questionnaires improved significantly except for the subscale EDE-Q 'restrained eating'.

Regarding the question if a participant would consider undergoing the bariatric trajectory again if they knew then what they know now, 82% would opt for bariatric surgery again, whereas 17% would not and 1% were undecided.

3.4.1. Quality of life

Participants scored significantly lower on the SF-36 total score than the Dutch reference population with the exception of role limitation.

4. Discussion

The present study results show that all preoperative health problems improved after surgery. Most of them however, were not associated with weight reduction except for tiredness, T2D and shame. Eating questionnaires scores improved, except for the EDE-Q subscale 'restrained eating'. In the postoperative phase, also new health problems emerged. Postoperative QoL scores were below the Dutch reference population. However, 82% would opt for bariatric surgery again if they knew then what they know now. Each physical and psychological health problem will be discussed below.

4.1. Tiredness

Reported tiredness improved but participants who reported no change also had significantly less weight loss. Postoperative tiredness is a complaint commonly found in the literature. In the first year after surgery, 50% reported tiredness [13]. Another study reported 88% tiredness after five years [14]: two-thirds of participants needed a healthcare consultation and one-third were hospitalized due to tiredness [14]. Tiredness has been associated with many factors and can lead to less physical activity and weight regain [14]. This could explain why weight loss was minimal in the subgroup that reported no changes in tiredness. To our knowledge, no research has studied the association between tiredness and weight loss. Future research might reveal the possible causes of postoperative tiredness.

4.2. Back pain and joint problems

Reported back pain and joint problems improved without an association with weight loss. Joint problems remained a reason for health-care consumption. Previous research has also reported improvement, but no follow-up was longer than 3 years. Surgery was found to be a feasible but not a convincing treatment option [15]. This could present a dilemma for the patient. Obesity increases a risk of osteoarthritis and in turn the need for joint replacement arthroplasty [15]. Bariatric surgery could reduce that risk, but studies also found an increased risk of fracture after surgery [16,17], osteoporosis [18] and generalized bone pain due to impaired absorption of vitamin D and calcium [19]. Patients struggling with this dilemma should be informed about the pros and cons, including the uncertainty of long-term outcomes.

4.3. Diabetes mellitus

The preoperative prevalence of T2D was 9%. After surgery, all participants reported improvement of T2D but participants with T2D had significantly less weight loss than participants without preoperative T2D. Preoperative mean weight and BMI were equal. Despite their improvement, participants with T2D reported lower satisfaction with the bariatric trajectory.

In the literature, bariatric surgery is recognized as a procedure with a critical role for T2D [20]. The preoperative prevalence of T2D varied between 4.5% and 97.7% (median 19.8%) depending on country of residence [21]. After surgery, T2D either improved or went into remission but the variation was large [22]. In addition, remission was sometimes transient with 72% in remission two years after surgery and 36% ten years after surgery [23]. The present results were in line with a review study that found that the presence of T2D impaired weight reduction among patients with increased obesity treated with healthful nutrition, physical activity, behavior modification, and medical treatment (i.e., anti-obesity medications and bariatric surgery) compared to patients without T2D [24].

The reason for dissatisfaction within the T2D subgroup T2D remains unknown. One explanation could be the additional health expectations of patients with T2D. Expectations regarding weight loss and physical and psychological improvement were found to be high, or even unrealistic [1]. More long-term studies on postoperative expectations, T2D and the impact of weight loss on satisfaction are necessary. Sample size of the study was small and the number of patients with T2D even smaller. Therefore, results need to be replicated.

4.4. Shame

Shame was the most reported psychological problem. It improved after surgery but those who reported minimal or no change showed significantly less weight loss than participants who reported their feelings of shame had improved or resolved ($p < 0.01$) but there was a great variation; a feeling of shame was reported after a 45 kg weight loss but not reported after a 9 kg weight loss.

Research showed associations between obesity, shame and stigmatization [1], but the bariatric field has mainly studied shame in combination with excess skin [25] and weight regain, two potential postoperative consequences. The single study that did assess this association reported no association between shame and weight loss [25]. The current results need replication.

4.5. Self-esteem

In the preoperative phase, obesity-related low self-esteem was common and this improved after surgery. No association was found with

weight loss.

In the literature, few studies focused on self-esteem with mixed results. In one study, self-esteem improved six months and one year after surgery but without an association with weight loss [26]. Another study reported a positive association between self-esteem and weight loss the first year after surgery [27]. Weight-related self-esteem may represent an overlooked and important target throughout the bariatric surgery process, but more long-term studies are necessary [27].

4.6. Avoidance of social contacts

Before surgery, half the participants reported obesity-related avoidance of social contacts. After surgery, this improved without an association with weight loss.

Within the bariatric field, a supporting network has been found to be important [28]. Supportive relationships and self-care skills could facilitate postoperative weight management [29,30]. Social support by means of a Facebook group was seen to provide effective postoperative peer support, although further study was required to learn the impact on weight loss [31]. In contrast, despite social support and weight loss, participants described their postoperative life with ambivalence towards their own body, seven years after surgery [32]. Avoidance of social contacts seems to decrease after surgery, but the interaction between social contacts and weight loss needs more research.

4.7. Depression

Before surgery, obesity-related depressive problems were common. This improved after surgery. Participants who reported no change showed less weight loss compared to participants who reported their depressive problems as solved; 26.9 kg (SD:19.7) versus 43.0 kg (SD:17.2), respectively but this was not statistically significant ($p = 0.08$).

In the literature, depression is mainly studied in the context of weight regain and has been associated with many factors including shame, low self-esteem, less social contact, hopelessness and loss of control [33]. Research that focuses on depression and weight loss has shown that improvement in depressive symptoms can be associated with weight loss [34] but also improved even if there was no or minimal weight loss [35]. Another study reported initial improvement followed by decline, which seemed to correspond to initial weight loss followed by regain [36]. Our results are in line with those studies that reported improvement in depression but more research is necessary to unravel the interaction of weight fluctuations and mood.

4.8. Weight stability

Results showed that the prevalence of weight instability was high. Post hoc analysis showed that only 58% reported weight stabilization. Those who reported ongoing weight fluctuations had significantly less weight loss (27.7 kg; SD:16.7 kg) than those who reported weight stabilization (45.8 kg; SD:18.2 kg; $p < 0.01$). One hypothesis is that postoperative weight stability reflects a successfully adapted behavioral pattern, whereas postoperative weight instability reflects an ongoing struggle with weight which could negatively influence mood.

4.9. Eating behavior (DEBQ, EDE-Q)

After surgery, all DEBQ and EDE-Q scores improved except for the EDE-Q subscale 'restrained eating' which remained unchanged. In both questionnaires, the subscale 'restrained eating' was designed to collect information on a number of aspects of restrained eating. The EDE-Q assessed psychopathological eating behavior (no eating, avoidance of food), whereas the DEBQ assessed general eating behavior, e.g. eating

less to keep weight stable. Previous research has also found postoperative improvement, i.e. participants reported less emotional eating, less external eating and less concern regarding shape and weight [27]. The impact of preoperative eating behavior on postoperative weight loss remains unclear. Results varied between no predictability to less weight loss with higher EDE-Q scores [37]. Our results fitted those seen in the literature, but need to be replicated. One hypothesis could be that pathological eating behavior seems to be more difficult to change after surgery, and this could imply a dominant function, for example stress release. More research is necessary to unravel the association between eating behavior and weight loss. Understanding this complexity helps to find targeted solutions to prevent postoperative weight regain.

4.10. Quality of life (SF-36)

The SF-36 was only administered after surgery. Thus, the SF-36 could only be compared with the Dutch reference population. QoL scores of the participants were lower with the exception of role limitation. Based on the perceived improvements reported by the participants, a plausible hypothesis could be that QoL improved, despite scores were still lower than the Dutch reference population. Future research should include the SF-36 at multiple time points to further assess this.

QoL seems to be a multidimensional construct and highly individually based without consensus on its definition and no gold standard for its measurement [3].

Although two studies matched our results [38,39], research has shown contradictory results depending on time since surgery, method and type of surgery. In the first year after surgery, QoL improved [38]. Previous studies have shown both an association with weight loss [38] and no association with weight loss [40]. After four years, a positive association between QoL and weight loss was not evident [39]. After ten years, QoL had diminished despite weight loss [41]. Over time, a trend of decline might be the case [39]. Also, QoL was reduced by postoperative complications [42] and Dumping syndrome [43]. Patient information is crucial because preoperative expectations can affect postoperative QoL [1,36].

4.11. Methodological issues

The presented results add information to the small pool of long-term results but this study has several limitations. First, the results were based on patients' opinions. The phenomena of over- or under-reporting of positive or negative outcomes cannot be excluded. However, we used validated questionnaires and valid concepts such as weight loss. Thus, the impact of using subjective measures is limited. In addition, self-report is the only possible way to assess the multiple outcomes included in the present study. In research, self-reported measures could still be a valid way to gather information [44]. Second, the sample size was relatively small. Results are explorative and need to be replicated. Third, currently, laparoscopic Roux-en-Y gastric banding (LRYGB) and laparoscopic sleeve gastrectomy (LSG) are the most commonly performed bariatric procedures worldwide [45], although LAGB is still common. In the USA, LAGB is one of the three most performed interventions together with LRYGB and LSG [46]. In the present study, participants with LABG were overrepresented. Therefore, weight loss and health improvement might be lower compared to other more common and more effective bariatric procedures like sleeve gastrectomy and gastric bypass [47]. However, the focus of the present study was on the experience of the patient, not on results as weight loss or type of surgery. All types of surgery aim the same goals: weight loss and improvements of comorbidities. Insights change over time. For example, VGB used to be a common procedure but is not applied anymore in the Netherlands. However, long-term outcome were still invested in the Netherlands because of potential favorable long-term results and the

upcoming banded gastric bypass, with a similar mechanical outlet restriction and control of the pouch size [48]. Therefore, all participants with a VGB within the present study were not excluded. The patient opinion remains meaningful for future studies despite shifts in bariatric techniques.

5. Conclusions

In this analysis, after bariatric surgery, predominantly laparoscopic gastric banding, preoperative health problems improved and new health problems emerged. Improved health problems were not associated with total weight loss except for minimal change in tiredness, shame and weight instability. Although postoperative QoL was lower compared to the Dutch reference population, most participants would opt for bariatric surgery again if they knew what they know now. From a patient's perspective, postoperative weight loss and comorbidities seemed too unidimensional to define success. The present results are explorative and need replication. More long term research is needed to assess post-operative physical and mental results and their interaction to close the current gap.

Author contributions

The concept of the submission was by GK, MD, RS and RP. GK and MD participated in the methodology design. Statistical analyses were performed by GK and MD. They also edited and reviewed the article. All authors approved the final submission.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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