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Patients' perspective on their drug therapy after bariatric surgery: A quantitative, cross-sectional interview study

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Summary

Drug therapy in patients who have undergone bariatric surgery is challenging. We aimed to investigate the patients' perspective on their drug therapy. This should allow deriving tailored measures to better support patients and their healthcare professionals with drug therapy after bariatric surgery. We conducted a quantitative telephone-based interview study with patients who have undergone bariatric surgery. The interview consisted of assessments in three parts: (i) current drug therapy: prescription, administration and adherence, (ii) changes after bariatric surgery and (iii) adverse events. (i) The 105 enrolled patients were taking a median of 10 (range: 3–30) drugs. In 1017 of 1080 drugs (94%), expectations in drug effectiveness were (rather) met. Of the 105 patients, 27% reported difficulties in drug administration, 44% forgot to take their drugs at least one time and 20% reported deviations from the prescription. (ii) Sixteen percent of the patients observed changes in drug effectiveness or tolerability—additionally to therapy adjustment by physicians. (iii) Seventy-four percent recognised at least one adverse event right before and/or after bariatric surgery, most frequently in gastrointestinal disorders. Patients who have undergone bariatric surgery have to deal with many difficulties in drug handling and adverse events. Our study emphasises the need for better and more individual support for patients with their drug therapy after bariatric surgery and, therefore, suggests a multidisciplinary approach that includes pharmacists. The stronger

Susanne Schiek and Melissa Drotleff contributed equally to this study.

involvement of the patients' perspective seems to be a valuable source in research and practice.

KEYWORDS
adverse events, bariatric surgery, obesity, patient safety, polypharmacy, self-administration

What is already known about this subject?

- Bariatric surgery may lead to pharmacokinetic changes. Close monitoring of clinical parameters is required to identify the need for changes in drug therapy.
- Weight loss due to bariatric surgery often results in the improvement of co-diagnoses, which may render some drug therapies unnecessary.
- Changes in drug regimens and additional nutritional supplementation may lead to difficulties in administration and adherence.

What this study adds?

- The study gives insight into how patients perceive and handle their drug therapies after bariatric surgery.
- The study provides additional information on changes in effectiveness, tolerability, and adverse events of drug therapies from the patients' perspective.
- The results emphasise the need for more individual, multidisciplinary support to patients with their drug therapy in bariatric follow-up care.

1 | INTRODUCTION

For patients with obesity, bariatric surgery represents the most effective weight loss intervention. It also reduces obesity-related disease burden, such as impairment caused by cardiovascular diseases or Type 2 diabetes.[1,2] However, bariatric surgery is accompanied by diverse challenges in drug therapy, such as changes in resorption requiring drug therapy adjustment.[3] Poor data about pharmacokinetics, as well as dosage and dosage form adjustments, complicate therapy in this patient group.[4] Underdosing or overdosing can easily occur, which increases the risk of both loss of effectiveness of drug therapy and the risks of adverse events. Dose adjustments are, therefore, difficult to derive and need to be estimated individually.[5,6] Weight loss may render some drug therapies unnecessary, for example, in Type 2 diabetes or hypertension.[7,8] On the other hand, the addition of nutritional supplements is necessary, which may increase the complexity of the drug therapy regimen after bariatric surgery.[9] These changes can result in difficulties in medication administration or adherence and can, therefore, be a barrier to safe drug therapy. Although the patient plays a major role in outcomes regarding medication administration, there is a paucity of data from the perspective of patients who have undergone bariatric surgery.

Therefore, we aimed to provide tailored measures on how to better support patients and their healthcare professionals with drug therapy after bariatric surgery by exploring the patients' perspective on their medication. To this end, we conducted a telephone-based interview study focusing on general aspects of the current drug therapy, such as difficulties in drug administration, changes after bariatric surgery and adverse events.

2 | MATERIALS AND METHODS

2.1 | Study design

We performed a cross-sectional quantitative study with patients who have undergone bariatric surgery using a structured telephone interview.

2.2 | Interview development

Three pharmacists and one obesity medicine physician developed an interview guide based on a literature review and their clinical experience. The literature search focused on literature regarding patient perspectives on medication-related aspects, such as medication administration and adverse events, and medication therapy issues related to bariatric surgery. We used both closed- and open-ended questions to maintain a balance between the quantitative nature of the study and capturing the patients' perspective as broadly as possible. To ensure the comprehensibility and feasibility of the questions, cognitive pre-tests were conducted face-to-face with four pharmacists (not involved in study development) and five lay persons, using concurrent think-aloud and paraphrasing as pre-test techniques. A further standard pretest of the interview was conducted face-to-face with 10 participants from the patient collective. Participants who were involved in pre-tests were not involved in the final study. After conducting the standard pretests, the final interview was expected to take approximately 30 min.

The final interview guide consisted of three parts: (i) current drug therapy, (ii) changes after bariatric surgery and (iii) adverse events. The interview guide (English version and original German version) can be found in Appendix S1. For the latter part, we created a list of adverse events that included (very) common or particularly clinically relevant adverse events based on the Summary of Product Characteristics of typically prescribed drugs in the patient collective (Appendix S2). This allowed us to capture both actively and passively reported adverse events.

2.3 | Participants and setting

Patients were invited to participate when they consulted the obesity outpatient clinic for adults at Leipzig University Hospital for bariatric follow-up care during the 6-month study period. We invited all patients who met the following inclusion criteria: age >18 years, without pregnancy, bariatric surgery at least 3 months to a maximum of 5 years ago, sufficient German language skills, and at least one prescribed medication or self-medication. After obtaining written informed consent, separate telephone appointments were made for the interviews to not disrupt routine procedures in the outpatient clinic and to allow the patient sufficient preparation time. A maximum of 10 attempts were made to contact the patient by telephone for the interview.

2.4 | Data collection and analysis

Prior to the telephone interview, relevant data such as surgery type or BMI were collected from the electronic medical record. During the telephone interview, the interviewer (the same study pharmacist for all interviews) simultaneously noted the patient's answers on the interview guide. Only completed interviews were used for data analysis and interpretation. After the interview, data were digitalized and analysed using Microsoft Excel 2016 (Microsoft Corporation, Redmond, WA, USA). Answers to open questions were categorised post hoc. Drugs were classified according to the second level of the WHO Anatomical Therapeutic Chemical (ATC) classification[10] and diagnoses were classified according to the International Statistical Classification of Diseases and Related Health Problems, Version 10 (ICD-10).[11] A random pseudonymization ensured data protection.

3 | RESULTS

3.1 | Patient characteristics

Out of 157 patients meeting the inclusion criteria, 41 patients could not be invited to participate in the study: 23 patients did not attend their appointment, one was excluded due to pregnancy and 17 were not approachable due to organisational reasons, for example, patients being severely late. Recruiting these patients would, in turn, have disrupted the strictly timed processes of the multidisciplinary outpatient clinic. Five patients refused study participation and six patients could not be reached for the telephone interview after they had given written consent. Ultimately, the interview was completed with 105 patients (Figure 1). The average interview duration was between 30 and 40 min; in exceptional cases, it was up to 150 min. The patients' characteristics are shown in Table 1.

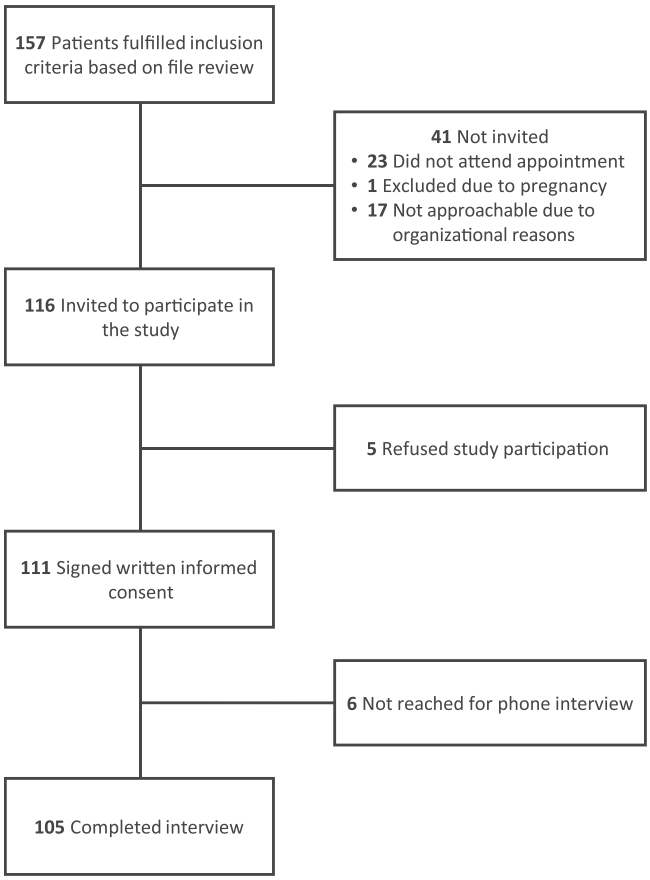

FIGURE 1 Flowchart of patients included in the study.

3.1.1 | Current drug therapy

In the first part of the interview, we acquired a total of 1080 drugs taken by the 105 patients, with a median of 10 (Q25–Q75: 7–13; min–max: 3–30) drugs per patient (Table 1). The most frequently prescribed drugs were antianemic drugs (105 participants; 100%), minerals (100; 95%), and vitamins (98; 93%; Table 2). Cardiovascular diseases were the most frequent co-diagnoses (85 out of 105 participants; 81%; Appendix S3).

In 623 of 1080 drugs (58%), the patients evaluated their expectations in terms of effectiveness as met, in 394 (37%) as rather met. In 32 (3%) and 4 (0%) drugs, patients' expectations in terms of effectiveness were rather not or not met.

Of the 105 patients, 28 (27%) reported having difficulties in drug administration. The most frequent reason was the drug size being too

TABLE 1 Patient characteristics ($n_{total} = 105$).

Characteristics	Values
Gender, *n* (%)	
Female	75 (71%)
Male	30 (29%)
Age in years, median (Q25/Q75; min–max)	54 (44/60; 23–79)
Months since surgery, median (Q25/Q75; min–max)	18 (6/31; 3–58)
Type of laparoscopic bariatric surgery, *n* (%)	
Roux-en-Y gastric bypass (RYGB)	65 (62%)
Sleeve gastrectomy (SG)	34 (32%)
Conversion of SG to RYGB	3 (3%)
Conversion of SG to Omega-Loop gastric bypass	2 (2%)
Omega-Loop gastric bypass	1 (1%)
Body mass index, median (Q25/Q75; min–max)	
Present	37.1 (31.6/42.0; 23.4–58.1)
Minimum since surgery	35.8 (30.9/41.5; 23.4–58.1)
Maximum since surgery	50.0 (43.3/56.2; 34.7–74.8)
Highest level of education, *n* (%)	
Doctoral degree or higher	0 (0%)
University degree	8 (8%)
General qualification for university entrance	8 (8%)
Secondary school	64 (61%)
Lower secondary school	21 (20%)
Without graduation	4 (4%)
Present occupation, *n* (%)	
Shift work	20 (19%)
Occupation without shift work	28 (27%)
Retired (e.g., for medical reasons)	29 (28%)
Without present occupation	28 (27%)
Alcohol consumption on a regular basis, *n* (%)	71 (68%)
Perceived alcohol intolerance	41 (39%)
Number of drugs, median (Q25/Q75; min–max); total	10 (7/13; 3–30); 1080
Drugs with peroral administration route, *n* (%)	898 (83%)
Drugs with modified dose release, *n* (%)	63 (6%)
Drugs with subcutaneous or intramuscular application route, *n* (%)	136 (13%)
Drugs with inhalation route, *n* (%)	26 (2%)
Drugs with other administration routes, *n* (%)	20 (2%)

large (16 patients, 15%). Regarding adherence-related aspects, 46 participants (44%) sometimes forgot to take at least one of their drugs and 21 (20%) took at least one of their drugs differently than prescribed by their physicians.

3.1.2 | Changes after bariatric surgery

In the second part of the interview, 92 out of 105 patients (88%) reported that at least one drug was discontinued after bariatric surgery. Thirty-four patients (32%) had to take additional drugs temporarily after surgery, while 23 (22%) still had to take additional drugs that were initiated after surgery at the time of the interview. Furthermore, 56 patients (53%) reported dose changes, of which 50 patients (48%) reported dose reduction, and 2 patients (2%) reported changes in the administration form. Changes occurred mostly in drugs for diabetes (113 of 490 reported changes; 23%), agents acting on the renin-angiotensin system (49; 10%), beta-blocking agents (31; 6%), diuretics (29; 6%) and drugs for acid-related disorders (27; 6%). In addition, 17 patients (16%) reported 21 self-observed changes in effectiveness and tolerability during the course of bariatric surgery treatment. Of these, 10 changes referred to drug effectiveness and included, for example, a stronger effect of antihypertensive drugs (four reports). The remaining 11 changes observed by the patients referred to the tolerability of drugs. Out of the 21 reports, 13 were seen in the context of bariatric surgery and 9 in the context of weight loss (multiple categories possible).

3.1.3 | Adverse events

In the third part of the interview, 78 (74%) participants reported at least one adverse event with a median number of 2 (Q25/Q75: 0/4; min–max: 4–16) per patient. Patients observed a total of 304 adverse events, of which 271 (89%) were perceived as (rather) impairing (Table 3). The three most frequently mentioned categories of adverse events were gastrointestinal disorders (91 of 304 reports, 30%), nervous system disorders (66 reports, 22%) and metabolism and nutrition disorders (64 reports, 21%). In gastrointestinal disorders, 57 (63% of 91) and in nervous system disorders, 39 (59% of 66) adverse events occurred only after but not before surgery. In metabolism and nutrition disorders, 48 (75% of 64) adverse events were experienced only before surgery (Figure 2). The 10 drugs which were most frequently suspected to cause adverse events by the patients themselves were drugs used for diabetes (43; 14% of 304 adverse events), analgesic drugs (30; 10%), psychoanaleptics (28; 9%), vitamins (28; 9%), psycholeptics (20; 7%), antibacterial drugs (15; 5%), unspecified antihypertensive drugs (14; 5%), beta-blocking agents (13; 4%), agents acting on the renin-angiotensin system (12; 4%) and antiepileptics (10; 3%). Adverse events within the system organ classes and drug details are shown in Table 4.

4 | DISCUSSION

Our study aimed to capture the patients' perspective on their drug therapy after bariatric surgery, including their perception of changes in the drug regimen, difficulties in drug administration and adherence, and the occurrence of adverse events. We expected

TABLE 2 Prescribed drugs based on the ATC code at the time of the survey.

Prescribed drugs[a], ATC second level (therapeutic subgroup)	Number of affected patients, *n* (%)	Prescribed drugs[b,c], ATC fifth level (chemical substance)
Antianemic drugs	105 (100%)	Cyanocobalamin (105), iron preparations (18), folic acid (7)
Minerals	100 (95%)	Calcium (97), zinc (35), magnesia (15), other minerals (6)
Vitamins	98 (93%)	Multivitamins (92), cholecalciferol (28), vitamin B combinations (9), other vitamins (8)
Drugs for acid-related disorders	73 (70%)	Pantoprazole (65), (es-)omeprazole (5), other drugs for acid-related disorders (5)
Analgesic drugs	60 (57%)	Metamizole (42), tilidine (10), acetaminophen (9), tramadol (6), other analgesic drugs (7)
Agents acting on the renin-angiotensin system	52 (50%)	Ramipril (19), candesartan (12), valsartan (11), other agents acting on the renin-angiotensin system (10)
Beta-blocking agents	37 (35%)	Metoprolol (20), bisoprolol (10), other beta-blocking agents (7)
Thyroid therapy	37 (35%)	Levothyroxine (41)
Diuretics	36 (34%)	Torasemide (20), hydrochlorothiazide (17), other diuretic drugs (6)
Anti-inflammatory and antirheumatic drugs	30 (29%)	Ibuprofen (20), diclofenac (7), other anti-inflammatory and antirheumatic drugs (4)
Bile and liver therapy	26 (25%)	Ursodeoxycholic acid (26)
Lipid-modifying agents	25 (24%)	Simvastatin (14), atorvastatin (7), other lipid-modifying agents (7)
Calcium channel blockers	23 (24%)	Amlodipine (17), lercanidipine (6), other calcium channel blockers (1)
Antithrombotic agents	21 (20%)	Acetylsalicylic acid (10), phenprocoumon (6), other antithrombotic agents (6)
Antigout preparations	20 (19%)	Allopurinol (18), other antigout preparations (2)
Psychoanaleptics	20 (19%)	(Es-)citalopram (6), other psychoanaleptics (18)
Drugs for constipation	17 (16%)	Macrogol (9), other drugs for constipation (10)
Drugs used in diabetes	17 (16%)	Insulin analogous (18), metformin (6), dulaglutide (5), other drugs used in diabetes (4)
Drugs for obstructive airway diseases	14 (13%)	Salbutamol (6), budesonide (6), other drugs for obstructive airway diseases (16)
Antiepileptic drugs	12 (11%)	Pregabalin (6), other antiepileptic drugs (8)
Psycholeptic drugs	10 (10%)	Quetiapine (5), other psycholeptics (16)
Sex hormones and modulators of the genital system	10 (10%)	Other sex hormones (10)
Others	42 (40%)	Urological drugs (7), antihistamines for systematic use (6), antihypertensive drugs (6), antiparkinson drugs (6), drugs for musculoskeletal system (6), drugs for functional gastrointestinal disorders (6), cardiac therapy (5), dermatological drugs (5), drugs for respiratory system (5), others (15)

Note: Multiple categories possible.

[a]Drugs (ATC second level) with number of drugs <10 were summarised in 'others'.

[b]Drugs (ATC fifth level) with numbers <5, were summarised in 'other…'.

[c]Drugs (ATC fifth level) in combination therapies are counted separately.

valuable insight into drug safety aspects from the patients' point of view and aimed to reveal aspects of drug therapy for which more support is needed. The survey showed that our patients were taking a median of 10 drugs at the time of the interview, most of which met the patients' expectations. However, nearly one-third reported difficulties in drug administration. Almost half of the patients forgot to take their medication and one-fifth reported deviations from prescriptions after bariatric surgery. Some patients observed changes in drug effectiveness or tolerability related to bariatric surgery in addition to changes in their drug regimen. Impairing adverse events was an issue for many patients. These results show that patients who have undergone bariatric surgery have to deal with difficulties in drug handling and adverse events and recognise changes in their medication effectiveness and tolerability. The results highlight the need for improved supportive measures at the individual patient level.

4.1 | Current drug therapy

Patient-reported difficulties administering the prescribed drugs were mainly caused by a size being too large to swallow. This is consistent with barriers to nutritional supplement intake reported in the literature, such as swallowing difficulties or unpleasant taste.[13] Such difficulties should be considered in bariatric follow-up care, as they may represent a barrier to medication adherence.

The fact that a considerable number of patients forgot to take some of their medication may be related to the complexity of therapy

and psychosocial comorbidities. In studies about nutritional supplementation after bariatric surgery, forgetfulness was the most commonly reported barrier to supplement intake.[13,14] Although expectations in drug therapy were mostly met, some patients took their drugs differently than prescribed. It is noteworthy that a considerable proportion has not reported this to their physician. Intensified interprofessional care may contribute to adherence and could help with drug administration difficulties. Pharmacists can be involved by counselling patients in their drug administration and handling after bariatric surgery. They can also support physicians in finding the appropriate dosage forms.[15] The follow-up care team, especially primary caregivers and pharmacists, can encourage and motivate patients to take their medications as prescribed by re-educating them about the benefits of a successful pharmacotherapy of comorbidities.

TABLE 3 Details and outcomes of patient-reported adverse events.

Categories	Values
Reported adverse events, total *n*	304
Actively reported adverse events, *n* (%)	267 (88%)
Passively reported adverse events, *n* (%)	37 (12%)
Adverse events patients reported to their physician, *n* (%)	269 (88%)
Frequent occurrence of adverse events, *n* (%)	258 (85%)
Sporadically or one-time occurrence of adverse events, *n* (%)	46 (15%)
Occurrence only before bariatric surgery, *n* (%)	136 (45%)
Occurrence only after bariatric surgery, *n* (%)	133 (44%)
Occurrence before and after bariatric surgery, *n* (%)	35 (12%)
Impairment from adverse events	
Yes, *n* (%)	156 (51%)
Rather yes, *n* (%)	115 (38%)
Rather no, *n* (%)	30 (10%)
No, *n* (%)	3 (1%)
Discontinuation of a drug due to adverse events, *n* (%)	129 (42%)

4.2 | Changes after bariatric surgery

Patients reported numerous changes in their drug regime with an expected high proportion of drug discontinuation or dose reduction. In line with the literature, the reported drugs refer mostly to diabetes therapy.[7] Although recommended in guidelines,[16] the patients hardly mentioned changes in the dosage forms. It is conspicuous that the patients noticed changes in effectiveness or tolerability across a wide range of individual drugs. The results show the inter- and intra-individual peculiarities and the importance of including the individual patient perspective in bariatric follow-up care. To address the specific needs of this patient group, increased awareness of healthcare professionals and interdisciplinary care is needed, which involves physicians, nurses, dieticians and pharmacists.[17]

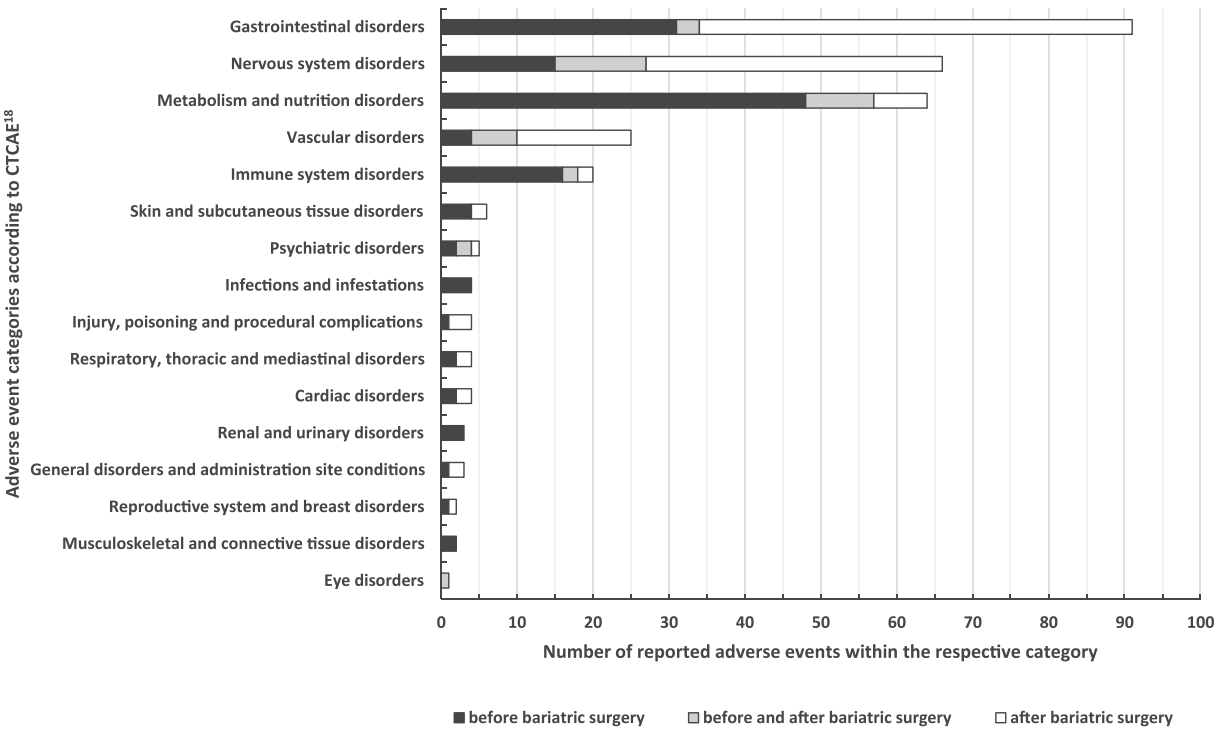

FIGURE 2 Patient-reported adverse events that occurred before or/and after bariatric surgery ($n_{total} = 304$).

TABLE 4 Patient-reported adverse events according to CTCAE[12] and suspected causative drug classes according to the ATC classification.[10]

System organ class	Affected patients, *n* (%)	Number of reported single adverse events according to the CTCAE term, *n*	Suspected causative drugs (ATC second level) according to the patient report, *n*[a]
Gastrointestinal disorders	46 (44%)	Nausea (35), vomiting (17), diarrhoea (15), abdominal pain (5), constipation (4), dry mouth (4), dyspepsia (3), stomach pain (3), mucositis oral (2), dysphagia (1), flatulence (1), [halitosis][b] (1)	Vitamins (24), analgesics (16), drugs used in diabetes (12), bile and liver therapy (8), mineral supplements (4), agents acting on the renin-angiotensin system (3), antianemic drugs (3), antibacterial drugs (3), anti-inflammatory and antirheumatic drugs (3), psychoanaleptics (3), antiepileptics (2), drugs for obstructive airway diseases (2), muscle relaxants (2), others (6)
Metabolism and nutrition disorders	36 (34%)	Weight gain (50), [increased appetite][b] (9), hypoglycemia (5)	Drugs used in diabetes (23), psychoanaleptics (13), psycholeptics (9), sex hormones and modulators of the genital system (5), beta-blocking agents (4), antiepileptics (3), corticosteroids systemic (3), drugs for obstructive airway diseases (2), others (2)
Nervous system disorders	27 (26%)	Dizziness (31), somnolence (11), extrapyramidal disorder (4), headache (4), insomnia (4), depressed level of consciousness (3), paraesthesia (3), tremor (3), anosmia (1), cognitive disturbance (1), depression (1)	[Unspecified antihypertensive drugs][c] (12), psycholeptics (8), analgesics (7), psychoanaleptics (7), agents acting on the renin-angiotensin system (5), antiepileptics (3), antihistamines for systemic use (3), beta-blocking agents (3), diuretics (3), cardiac therapy (2), muscle relaxants (2), urologicals (2), vitamins (2), others (7)
Vascular disorders	20 (19%)	Hypotension (14), hematoma (9), hot flashes (1), thromboembolic event (1)	Drugs used in diabetes (4), analgesics (3), antithrombotic agents (3), beta-blocking agents (3), psychoanaleptics (3), agents acting on the renin-angiotensin system (2), urologicals (2), others (5)
Immune system disorders	10 (10%)	Allergic reaction (20)	Antibacterial drugs (7), [unspecified drugs][c] (4), analgesics (2), others (7)
Skin and subcutaneous tissue disorders	5 (5%)	Eczema (2), hyperhidrosis (2), alopecia (1), pruritus (1)	Antibacterial drugs (3), others (3)
Cardiac disorders	4 (4%)	Chest pain – cardiac (1), myocardial infarction (1), palpitations (1), sinus bradycardia (1)	Anti-inflammatory and antirheumatic drugs (2), others (2)
Psychiatric disorders	4 (4%)	Libido decreased (2), agitation (1), anxiety (1), psychosis (1)	Others (5)
Respiratory, thoracic and mediastinal disorders	4 (4%)	Cough (2), dyspnea (1), hoarseness (1)	Others (4)
General disorders and administration site conditions	3 (3%)	Localised oedema (2), fatigue (1)	Others (3)
Renal and urinary disorders	3 (3%)	Creatinine increased (2), acute kidney injury (1)	Anti-inflammatory and antirheumatic drugs (2), others (1)
Infections and infestations	2 (2%)	Mucosal infection (2), urinary tract infection (1), vaginal infection (1)	Drugs for obstructive airway diseases (2), drugs used in diabetes (2)
Injury, poisoning and procedural complications	2 (2%)	Fall (4)	Diuretics (2), others (2)
Musculoskeletal and connective tissue disorders	2 (2%)	Generalised muscle weakness (1), osteoporosis (1)	Others (2)
Reproductive system and breast disorders	2 (2%)	Amenorrhea (1), breast pain (1)	Sex hormones and modulators of the genital system (2)
Eye disorders	1 (1%)	Blurred vision (1)	Others (1)

[a]Drugs (ATC second level) with frequency = 1 are summarised in the term 'others'.
[b]'Other, specify' according to CTCAE terms in square brackets.
[c]'Unspecified' refers to the fact that the patient could not remember the name of the drug, terms in square brackets.

4.3 | Adverse events

Adverse events are an important issue during the course of bariatric treatment, affecting nearly four-fifths of our patients. Since adverse events are a significant healthcare issue,[18] it is not surprising that patients who have undergone bariatric surgery are particularly affected. Most of the reported events were perceived as impairing, indicating the need for intensified awareness. Nearly, 90% of the reported adverse events occurred approximately in equal shares either before or after bariatric surgery. These results suggest that bariatric surgery does not reduce overall adverse events but rather shifts them to different organ classes. This highlights the susceptibility of this time frame and the importance of intensified care and monitoring.[17]

The patients most frequently reported adverse events in gastrointestinal disorders (mainly nausea) and metabolism and nutrition disorders (mainly weight gain). It seems likely that patients who have undergone bariatric surgery are particularly focused on their gastrointestinal system and their weight and show increased attention to nutrition-related aspects. It is further conspicuous that the patients noticed metabolism and nutrition disorders most likely before bariatric surgery, with drugs used for diabetes being the most commonly suspected causative drugs. Other adverse events frequently mentioned were nervous system disorders and vascular disorders, often associated with cardiovascular or psychiatric drugs. These adverse events occurred more often after bariatric surgery. Dizziness, in particular, may indicate a possible overdose of cardiovascular drugs and underlines the need for closer monitoring.[8,17]

All parties involved in the medication process should regularly inquire about adverse events after bariatric surgery to re-evaluate the risk–benefit ratio.

4.4 | Limitations

The study has several limitations: (i) The limited number of patients allows only limited conclusions about occasionally mentioned adverse events and prescribed drugs. Our survey only captured the patients' perspectives, which may differ from a professional assessment. (ii) The interview was quantitative, therefore, the in-depth analysis could not be performed. (iii) The interview guide has not been validated. Social desirability and a recall bias cannot be excluded. (iv) The reported presumed adverse events and suspected causative drugs were not further analysed. In particular, we did not test for causality. (v) We did not use a validated adherence questionnaire because it would have exceeded the interview duration, and adherence was not the primary focus of our interview. Nevertheless, our questions about adherence show a tendency in adherence-related aspects. (vi) We considered the entire course of obesity treatment and did not specifically evaluate the immediate postoperative period, although differences between the first 6 months and beyond 6 months after bariatric surgery are known.

5 | CONCLUSION

Our findings underscore the need for more support for patients who have undergone bariatric surgery with their drug therapy on an individual level. This is especially true since these patients reported significant difficulties in medication administration. In addition, adherence to drug therapy left much to be desired. These problems may also derive from medication changes, which occur frequently after bariatric surgery. The occurrence of adverse events was frequently reported in this patient group. We also noted a shift in adverse events within categories after bariatric surgery. Overall, our findings emphasise the importance of integrating the patients' perspective into the follow-up care of patients who have undergone bariatric surgery to provide safe drug therapy for the individual patient.

AUTHOR CONTRIBUTIONS

Susanne Schiek developed the study protocol and the practical intervention concept, supervised data collection, evaluated the data and drafted the manuscript. Melissa Drotleff evaluated the data and drafted the manuscript. Dorit Schueler developed and implemented the practical intervention concept, performed the data collection and evaluated the data. Katrin Heinitz developed the study protocol and supported the practical intervention concept. Annett Frisch developed the study protocol and supported the practical intervention concept. Lars Selig supported the practical intervention concept. Yvonne Remane developed the study protocol. Arne Dietrich supported the practical intervention concept. Matthias Blüher developed the study protocol, supported the practical intervention concept and supervised the practical performance of the study in the patient setting. Thilo Bertsche developed the study protocol, wrote grant applications and drafted the manuscript. All authors edited and had final approval of the submitted version.

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CONFLICT OF INTEREST STATEMENT

Susanne Schiek has been a research associate at the Medical Faculty of Leipzig University until January 2023. Lars Selig received payments for lectures from Novo Nordisk, Viatris, Baxter, Fresenius Kabi and Nutricia. Matthias Blüher received consulting fees and payment honoraria from Amgen, AstraZeneca, Bayer, BMS, Boehringer-Ingelheim, Lilly, Novo Nordisk, Novartis, Pfizer and Sanofi. Other authors declare that no conflict of interest.

ETHICS STATEMENT

The study protocol was approved by the responsible institutional research ethics committees (Ethical Committee at the Medical Faculty,

Leipzig University, 454/18-ek). The study was performed in accordance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Written informed consent was obtained from all patients prior to their participation.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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