

A multidisciplinary approach for non-responders after bariatric surgery: why does it matter?

Marleen Romeijn (✉ Marleen.Romeijn@mmc.nl)

Maxima Medisch Centrum <https://orcid.org/0000-0001-6582-5255>

Martine Uittenbogaart

Maxima Medisch Centrum

François M. H. van Dielen

Maxima Medisch Centrum

Arijan A. P. M. Luijten

Maxima Medisch Centrum

Loes Janssen

Maxima Medisch Centrum

Wouter K. G. Leclercq

Maxima Medisch Centrum

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Abstract

Background: 20-30% of patients show a lack of response after bariatric surgery. These non-responders may experience insufficient weight loss or significant weight regain. While ongoing studies about the beneficial effect of revisional surgery on non-response are being reported, studies about the contributiveness of a multidisciplinary approach fall behind. The aim of this study was to describe the effect of a multidisciplinary approach on treatment strategy in non-responders after gastric bypass and sleeve gastrectomy.

Methods: this retrospective study included non-responders that were reviewed in a multidisciplinary team meeting. Outcomes assessed were: given treatment (conservative versus operative), weight loss and complications after operative treatment. Outcomes were described separately for primary non-responders and secondary non-responders.

Results: a total of 104 patients were included (n=15 primary, n=89 secondary non-response). Eleven patients underwent revisional surgery (13%), while 73 patients received conservative treatment as they were not eligible for surgery due to lifestyle and/or behavioural factors. Twenty patients did not show up at their appointment with the dietician, physical therapist and/or medical psychologist and were excluded from further analysis. Conservatively treated patients lost 2.1kg <12 months (SD=7.29) and 0.8kg <24 months (SD=5.08). Surgically treated patients lost 12.0kg <12 months (SD=4.29) and 26.3kg <24 months (SD=2.75). One complication occurred in a patient that underwent revisional surgery.

Conclusions: a conservative treatment was more frequently proposed by the multidisciplinary team than a surgical treatment. A multidisciplinary approach can be beneficial for the identification of lifestyle and/or behavioural factors contributing to the development of non-response. More studies would help to establish the position of a multidisciplinary approach in the treatment of non-responders in future practices.

Background

Bariatric surgery has proven to be the most effective treatment for obesity in achieving long-term weight maintenance [1-2]. Unfortunately, 20-30% of patients do not respond well after bariatric surgery as they experience insufficient weight loss or significant weight regain [3-4]. Popular criteria for describing insufficient weight loss are <50% excess weight loss (EWL), or <20% total weight loss (TWL) 1-2 years after surgery [5]. Hereafter, insufficient weight loss is described as primary non-response (1NR) while regaining an excessive amount of weight, after initial successful weight loss, is described as secondary non-response (2NR) [6]. The etiology for non-response can be lifestyle related but can also be found in anatomical alterations like a dilated pouch or gastroenterostomy, or gastro-gastric fistula [7-8].

Revisional bariatric surgery constitutes a popular solution for non-responders. Commonly offered revisional procedures are Roux-en-Y gastric bypass (RYGB), one anastomosis gastric bypass/mini gastric bypass (OAGB/MGB), lengthening of biliopancreatic limb, band placement, revision of the gastric pouch

and/or stoma or biliopancreatic diversion/ duodenal switch (BPD/DS) [7-11]. Up to now, the efficacy and safety of these procedures remain controversial as each procedure brings along specific risks [11-12]. Lengthening of the biliopancreatic limb may result in severe malnutrition leading to the need for reoperations. Band placement may result in reoperation due to dysphagia and/or band migration. Revision of the pouch and/or stoma displayed unsatisfactory results with no BMI loss comparing the pre-revision and 2-year post-revision situation [13].

In 1991, the National Institutes of Health Consensus Statement advocated that a multidisciplinary team is required to optimize bariatric patient care [14]. This resulted in the formation of dedicated teams consisting of bariatric surgeons, obesity physicians, dieticians, physical therapists and medical psychologists. The beneficial effect of multidisciplinary teams on surgical outcome has extensively been described in surgical oncology [15-17]. However, the effect of a multidisciplinary team in non-responders after bariatric surgery is relatively poorly understood. It was Srivastava et al. who demonstrated that a multidisciplinary lifestyle intervention combined with medication could improve early weight loss in non-responders [18]. It is likely that the role of a multidisciplinary team needs further expansion in the management of non-responders after bariatric surgery. The aim of this study was to describe the effect of a multidisciplinary approach, in a bariatric tertiary referral center, on treatment strategy in non-responders after bariatric surgery.

Methods

Study population

Data about non-responders after RYGB and sleeve gastrectomy (SG) was collected in our center from January 2016 till December 2018. Patients were included if they regained >5% weight with respect to the lowest postoperative weight after RYGB or SG (nadir weight). At the moment of inclusion, >5% regain was a commonly used cut-off point [6]. Patients were excluded in case of a banded RYGB and OAGB/MGB because these were less frequently performed procedures, which would introduce heterogeneity otherwise. If a patient had a history of laparoscopic adjustable gastric banding or Mason gastroplasty prior to the RYGB or SG, this was no reason for exclusion.

The primary procedure could have taken place in our center or elsewhere. In our center, all patients were screened for primary bariatric surgery by a multidisciplinary team and IFSO criteria were used for qualification [19]. On top of the regular treatment, an individual preoperative treatment with the dietician, physiotherapist and/or medical psychologist was offered if the multidisciplinary team decided that this was necessary (e.g. detrimental eating habits, signs of emotional eating). Patients were regularly monitored in the outpatient clinic by members of the multidisciplinary team for a period of 5 years.

Patients were categorized as primary non-response (1NR) if the patients' excess weight loss (EWL) was less than 50% 12-24 months after primary surgery; patients were categorized as secondary non-response (2NR) if the EWL exceeded the 50% EWL threshold and a regain of >5% was reported (nadir weight). All

patients were discussed in a multidisciplinary meeting. The below section describes in more detail the process and approach taken before and during the multidisciplinary assessment.

Assessment before multidisciplinary team meeting

Initial assessment of the patient was done by the bariatric surgeon. Hereafter, the patient was referred to the dietician and physical therapist for assessment of nutritional habits and physical activity. The dietician focused on food intake, food choices, satiety, hunger and signs of emotional eating; the physical therapist focused on an activity habits. If indicated, consultation of a medical psychologist was offered. Gastrointestinal contrast studies and laboratory tests were only performed on indication.

Multidisciplinary team meeting

Once the patient had a consultation with all members of the team individually, the treatment strategy was discussed in a joint multidisciplinary meeting (weekly occurrence). These meetings included at least one member of the following fields of expertise: bariatric surgeon, nurse practitioner, dietician, physical therapist and medical psychologist; the meeting was chaired by an experienced bariatric surgeon. Notably, under certain circumstances the patient was discussed in the meeting despite that he/she was not seen by all members of the team. For example, in case of persistent lack of attendance at one of the appointments.

Treatment strategy

After evaluation of the patient by the team, a decision was taken whether the patient needed further lifestyle and/or behavioral intervention, or whether the patient was qualified for revisional surgery. On behalf of this study, treatment options were divided into conservative and operative treatment (Figure 1). A conservative treatment consisted of a nutritional and/or physical intervention, summarized as "lifestyle". A nutritional intervention was indicated, for example, in case of unhealthy food choices and detrimental eating patterns. A physical intervention was indicated in case of a sedentary lifestyle with the goal to increase activity habits. A behavioral intervention was indicated when there were signs of emotional eating and problems in impulse control. If there were signs indicating an eating disorder, patients were referred to a psychiatric clinic specialized in treatment of such disorders. The indication for revisional surgery was not based on the degree of weight loss or regain, so no cut-off scores were applied by any surgeon. The type of procedure depended on the index procedure, perioperative findings and expert opinion.

Study outcomes

Patient demographics evaluated in this study include gender, age, BMI, weight loss, previous surgical history and relevant comorbidities. The primary outcome was the given treatment, categorized as conservative and operative treatment in primary and secondary non-responders. Secondary outcomes were weight loss in a period of 24 months after the multidisciplinary team meeting and complications after operative treatment.

Weight loss was described as %EWL and was calculated as follows: $(\text{initial weight} - \text{final weight}) / (\text{initial weight} - \text{ideal body weight}) \times 100\%$. Ideal body weight is based on a BMI of 25 kg/m²; initial body weight was the weight at the moment of screening. Optional, weight loss was expressed in percent total weight loss (%TWL) and was calculated as follows: $((\text{preoperative weight} - \text{final weight}) / \text{preoperative weight}) \times 100\%$. The percent of regain was calculated as percent kg gained after reaching lowest postoperative weight. Body weight at 6 and 12 months were used or possibly combined (averaged) to retrieve weight ≤ 12 months, and body weight at 18 and 24 months were used or possibly combined (averaged) to retrieve weight ≤ 24 months.

Statistical Analyses

Descriptive statistics were computed for demographic and medical characteristics. Normally distributed data is presented as mean with standard deviation, while not normally distributed data is presented as median with interquartile range. Categorical data are expressed in percentages. A paired t-test was performed for comparing pre- and posttreatment weight.

Results

Description of the population

A total of 119 non-responders were assessed. Fifteen patients were excluded, either for having a banded RYGB (n=9 or an OAGB/MGB (n=2), or because they did not receive RYGB or SG but a different procedure (Laparoscopic Adjustable Gastric Banding, LAGB n=3, BPD n=1). In total, 104 patients were included in the study. The group of 1NR consisted of 15 patients and the group of 2NR consisted of 89 patients (table 1). In the group of 2NR, 19 patients received an individual treatment, while in the group of 1NR none of the patients received an individual treatment. Moreover, 40% of the patients with 1NR had a history of gastric banding, while only 16% had this history in the group of 2NR.

Table 1. Baseline characteristics of the study population

	Total n=104	1NR n=15	2NR n=89
Gender, no. (%)			
Female	92 (88.5)	11 (73.3)	81 (91.0)
Male	12 (11.5)	4 (26.7)	8 (9.0)
Age# (years) ¹	44.2±9.8 (27-69)	44.4±10.6 (23-69)	44.2±9.7 (27-66)
Preoperative comorbidities, no. (%)			
Hypertension	20 (19.2)	2 (13.3)	18 (20.0)
Type II diabetes	9 (8.7)	-	9 (10.1)
Dyslipidaemia	5 (4.8)	1 (6.7)	4 (4.5)
AS	10 (9.6)	2 (13.3)	8 (9.0)
Osteoarthritis	7 (6.7)	-	7 (7.9)
Postoperative morbidity, no. (%)			
Unchanged	18 (17.3)	1 (6.7)	17 (19.1)
Disappeared	19 (18.3)	1 (6.7)	18 (20.2)
Recurrence	4 (3.8)	1 (6.7)	3 (3.4)
Preoperative individual treatment, no. (%)	19 (18.3)	-	19 (21.3)
History of bariatric surgery, no. (%)			
GB	20 (19.2)	6 (40.0)	14 (15.7)
Mason	6 (5.8)	2 (13.3)	4 (4.5)
SG	6 (5.8)	4 (26.7)	2 (2.2)
Preoperative procedure, no. (%)			
GB	93 (89.4)	14 (93.3)	79 (88.8)
Laparoscopic	11 (10.6)	1 (6.7)	10 (11.2)
Laparotomy	99 (95.2)	14 (93.3)	85 (95.5)
Open	5 (4.8)	1 (6.7)	4 (4.5)
Postoperative complications, no. (%)			
Clavien-Dindo grade I	92 (88.5)	15 (100.0)	77 (86.5)
Clavien-Dindo grade II	2 (1.9)	-	2 (2.2)
Clavien-Dindo grade III	3 (2.9)	-	3 (3.4)
Clavien-Dindo grade III	7 (6.7)	-	7 (7.9)
Interval to presentation (years) ²	4 (3-6)	5 (3-7)	4 (3-5)
Preoperative weight (kg) ¹	130.9±23.5 (94-231)	135.8±29.7 (102-188)	130.1±22.4 (94-231)
Preoperative BMI (kg/m ²) ²	43.6 (40.8-48.4)	47.4 (36.2-53.5)	43.5 (41.1-47.9)
Maximal EWL (%) ¹	75.9±24.3 (9-127)	37.7±10.8 (9-48)	82.4±19.4 (50-127)
Maximal TWL (%) ¹	32.6±10.1 (3-52)	16.6±6.6 (3-27)	35.3±7.9 (19-52)
Weight regain (%) ²	20.3 (14.1-30.9)	12.4 (8.0-18.0)	1. (14.9-32.1)

Age at time of MDT meeting

¹ Expressed in mean ±SD (range); ² Expressed in median (IQR 25-75)

List of abbreviations: MDT= Multidisciplinary Team, OSAS= Obstructive Sleep Apnoea Syndrome, BMI= Body Mass Index, LAGB= Laparoscopic Adjustable Gastric Banding, RYGB= Roux-en-Y Gastric bypass, SG= Sleeve Gastrectomy, EWL= Excess Weight Loss, TWL= Total Weight Loss, SD= Standard Deviation, IQR= Interquartile Range.

Data presented as number (%), mean (standard deviation) or median (interquartile range)

Description of given treatment

Prior to the multidisciplinary team meeting, 98% was referred to a dietician, 97% was referred to a physical therapist and 28% was referred to a medical psychologist (table 2; figure 2). Twenty patients (19%) did not show up at the appointment with the dietician and/or physical therapist and/or medical psychologist. Therefore, no optimal treatment could be advised and consequently these patients were excluded from further analysis. In total, 87% received a conservative treatment and 13% an operative treatment. When focusing on the conservative treatment, 86% received a nutritional intervention, 63% received a physical intervention and 25% received a behavioral intervention.

Table 2. Overview of given treatment in non-responders

	Total n=104	1NR n=15	2NR n=89
Referred patients			
Dietician	102 (98.1)	15 (100.0)	87 (97.8)
Physical therapist	101 (97.1)	15 (100.0)	86 (96.6)
Medical psychologist	29 (27.9)	6 (40.0)	23 (25.8)
Did not show	20 (19.2)	3 (20.0)	17 (19.1)
	Subtotal n=84	1NR n=12	2NR n=72
Operative treatment, no.	11	-	11
Alternation of the limb length	3 (27.3)	-	3 (27.3)
Revision of the gastric pouch and/or stoma	7 (63.6)	-	7 (63.6)
RYGB	2 (18.2)	-	2 (18.2)
Gastric placement	1 (9.1)	-	1 (9.1)
Conservative treatment, no.	73	12	61
Nutritional intervention	63 (86.3)	53 (86.9)	10 (83.3)
Physical intervention	46 (63.0)	39 (63.9)	7 (58.3)
Behavioral intervention	18 (24.7)	14 (23.0)	4 (33.3)
Referred to psychiatric institution	4 (5.5)	2 (3.3)	2 (16.7)

Data presented as number (%)

Weight loss outcomes

Table 3 displays the effect on weight loss within 12 months and 24 months after start of the treatment. As a result of conservative treatment, patients with 1NR lost 1.2kg within 12 months (SD=4.3) and 2.8kg within 24 months (SD=2.7). Patients with 2NR lost 2.4kg within 12 months (SD=7.8) and 0.4kg within 24 months (SD=5.4). These results did not reach significance compared to their baseline weight. Additional analysis showed that within the group of conservatively treated patients with 2NR 49% did not gain any more weight or lost weight, while 51% gained weight within 24 months. The results of the surgically treated patients with 2NR are more pronounced. On average, these patients lost 12.0kg within 12 months (SD=10.8) and 26.3kg within 24 months (SD=1.1). The weight loss within 12 and 24 months was statistically significant ($p < 0.05$). In conservatively treated patients, weight loss outcomes were missing in

43% of patients within 12 months and in 77% of patients within 24 months, while in the surgically treated patients this was 18% and 82%.

Table 3. Effect of conservative and operative treatment on weight loss outcomes in non-responders

	Weight at start of treatment (kg) mean, \pm SD	Δ Weight \leq 12 months			Δ Weight \leq 24 months		
		n	mean kg \pm SD	p value	N	mean kg \pm SD	p value
Conservative treatment							
Total	106.2 \pm 21.5	42	- 2.1 \pm 7.3	.06	17	- 0.8	.49
Primary non-response (NR)	128.7 \pm 25.0	7	- 1.2	.48	3	\pm 5.1	.21
Secondary non-response (2NR)	101.9 \pm 17.9	35	\pm 4.3 - 2.4 \pm 7.8	.08	14	- 2.8 \pm 2.7 - 0.4 \pm 5.4	.77
Surgical treatment							
Secondary non-response (2NR)	115.6 \pm 17.9	9	- 12.0 \pm 10.8	.01*	2	- 26.3 \pm 1.1	.02*

* Paired t-test: significant difference compared to the initial weight, $p < 0.05$

The results were recalculated in %TWL. When using $\geq 15\%$ TWL as a cut-off point for successful weight loss, six patients were categorized as 1NR and 98 patients as 2NR. This gives an enlargement of the group of the 2NR without affecting weight loss outcomes (conservatively treated patients lost -2.4kg <12 months SD=7.6 and -1.7kg <24 months SD=5.4, data not shown).

Description of operative treatment

Eleven patients were selected for operative treatment since no major nutritional-, physical-, or behavioral changes were identified. These re-operated patients were all categorized as 2NR. The index procedure was RYGB in 9 patients and SG in 2 patients. Four different surgical procedures were performed in these patients which are described in table 2. In detail, 2 patients with prior SG underwent conversion to RYGB; 3 patients with perioperative common limb lengths between 440-600cm underwent shortening of this common limb; 7 patients with a perioperative large pouch and/or stoma underwent resizing; 1 patient additionally received a gastric ring. Postoperative, one complication occurred in a patient with a history of gastric banding, followed by RYGB and subsequent alteration of the limb length. This patient developed, one year after alteration, an ulcerative stenosis at the gastroenterostomy treated with endoscopic dilatation.

Discussion

There is no standardized approach in the treatment of non-responders following bariatric surgery. While ongoing studies about the efficacy of revisional surgery are being reported in literature [7-10], studies

about the effect of a multidisciplinary approach fall behind. Although it is proposed that a multidisciplinary approach is useful in the analysis of patients with non-response [8,11, 20], this study is the first in describing the impact of such a multidisciplinary approach. The main finding of this study is that, in the vast majority of patients, the multidisciplinary team identified patient-specific factors which most likely contributed to the development of non-response. The multidisciplinary team advocated a conservative treatment more frequently than a surgical treatment. The minority of patients (13%) were, at the moment of the multidisciplinary team meeting, considered eligible for revisional surgery.

When reviewing weight loss outcomes, revisional surgery was most effective in managing non-response. The nine re-operated patients achieved a weight loss of 12.0kg (SD=10.8), recalculated as 35.9% EWL (SD=36.2) and 29% TWL (SD=5.2) 12 months after surgery. These results outweigh the conservatively treated patients who only lost 2.1kg (SD=7.29), while in detail 49% remained stable in weight or lost weight, and 51% gained weight. The question that arises is why a conservative treatment should be advocated as this resulted in less weight loss than revisional surgery. In the context of revisional surgery it is important that the patient is exposed to the risks of major complications [13], as well as that the patients' weight loss may not be sustainable in the long term. Surgery does not resolve the lifestyle and/or behavioral problems that may have contributed to non-response in the first place [11, 21-23].

The observed complication rate within our study is in line with other literature. Complication rate after pouch/anastomosis revision is estimated at 3.5% and after limb alteration 12% [12]. Revision of the gastric pouch and/or stoma was most frequently performed in this study. None of the seven patients that underwent this procedure suffered from a complication. Yet, one patient suffered from an ulcerative stenosis at the gastroenterostomy after limb length alteration, which is a frequently reported complication in literature [24-25].

This study distinguished outcomes between primary and secondary non-responders. Previous studies did not report treatment outcomes using this classification, though it is proposed as standardized terminology [6, 24]. This study supports this classification, as it was found that only patients with secondary non-response were treated surgically, indicating a different treatment strategy than patients with primary non-response. A note of caution is necessary as there were significant demographic differences between the two groups. Speculatively, primary non-response might be a manifestation of insufficiently treated or even untreated eating behaviors and/or psychological problems, whereas secondary non-response might point towards anatomical problems. This theory should be further explored to prove that different treatments strategies might result in different outcomes for the two groups of non-responders.

Based on previous research in our center between 2012 and 2015, it has been identified that before the introduction of a multidisciplinary team, 68% of the non-responders underwent surgery after failed RYGB [9]. That study included 65 patients with weight loss failure and weight regain who were consulted by a bariatric surgeon, though consultation by a dietician and physical therapist and/or medical psychologist was not scheduled routinely. Furthermore, no joint meeting by the multidisciplinary team took place. That

result (68% revisional surgery) is in sharp contrast with the result of the current study (13% revisional surgery). One can argue that the multidisciplinary team may have underselected appropriate candidates for revisional surgery or contrary, may have optimized the selection of candidates. The short follow-up period, small sample size and heterogeneity in revisional procedures in the current study restricts statements about this. Further elucidation is also not possible as there does not exist contributing literature concerning this topic.

This retrospective study has multiple limitations that should be mentioned. Not all patients received their primary surgery in our center and therefore information about preoperative screening and treatment could be missed. It is questionable whether certain lifestyle and/or behavioral factors were present prior to primary surgery and if the patients' adjustments met the standards used in our center. Another limitation could be the possibility that the multidisciplinary team experienced a learning curve as the multidisciplinary evaluation of non-responders was introduced in 2016 in our center. It is possible that the different members of the team experienced a change in their evaluation and treatment of non-response. Moreover, pharmacological therapy has not been considered in this study cohort, while it has shown beneficial results in the treatment of non-responders [26]. It should also be mentioned that results regarding weight loss and complication rates are limited due to the small selected group of patients that underwent revisional surgery. Furthermore, the 19% of patients that were excluded from the analysis due to no-show may have introduced selection bias, as well as the patients that did not show up at their follow-up appointments after the treatment was set. Notwithstanding these limitations, the study shows that a multidisciplinary team is valuable for identifying patient-specific factors contributory to the non-response. For further practices, a checklist of patient-specific and anatomical factors was made when evaluating a patient with non-response (table 4).

Table 4. Checklist of factors that can be used during assessment of a patient with non-response advocating conservative and surgical treatment

Factors in favor of conservative treatment	Factors in favor of surgical treatment
Excessive dietary intake Inappropriate food choices Lack of satiety Constant hunger sensation Emotional eating Binge eating Sweet eating Grazing behavior Physically inactive Mental health disorder, e.g., depression, anxiety, personality disorders Alcohol or drug use	Signs of surgical failure, e.g., pouch or stoma dilatation, gastro-gastric fistula Dietary compliance No signs of maladaptive eating habits Physically active No signs of mental health disorder No signs of alcohol or drug use

Conclusions

This study demonstrated that when a patient with non-response after bariatric surgery is evaluated by a multidisciplinary team, the team advocated a conservative treatment rather than a surgical treatment. The team identified patient-specific factors contributing to the non-response and these factors constituted the framework for a conservative treatment. The conservative treatment stabilized the weight or even reduced the weight in half of the patients. The question that remains unanswered at present is whether a multidisciplinary approach set the right treatment, as perhaps their selection of candidates for revisional surgery was incorrect. More studies are needed to position the multidisciplinary approach in the treatment of non-response, as well as determine what kind of revisional procedure should be preferred outweighing the risks of complication and long-term weight loss.

List Of Abbreviations

BMI, body mass index; BPD/DS, biliopancreatic diversion/ duodenal switch; EWL, excess weight loss; LAGB, Laparoscopic Adjustable Gastric Banding; 1NR, primary non-response; 2NR, secondary non-response; OAGB/MGB, one anastomosis gastric bypass/mini gastric bypass; RYGB, Roux-en-Y gastric bypass; SG, sleeve gastrectomy; TWL, total weight loss.

Declarations

Ethics approval of consent to participate

For this type of study formal consent was not required from all individual participants. Ethical approval has been obtained from the Medical Ethics Committee of the Máxima MC. Reference number: N19.054 (L19.065).

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MR, LJ, FD and WL conceived the original study and design. MR is responsible for data collection, data recording and preparing the manuscript. MU and AL contributed to writing the manuscript. All authors have read and approved the final manuscript.

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Figures

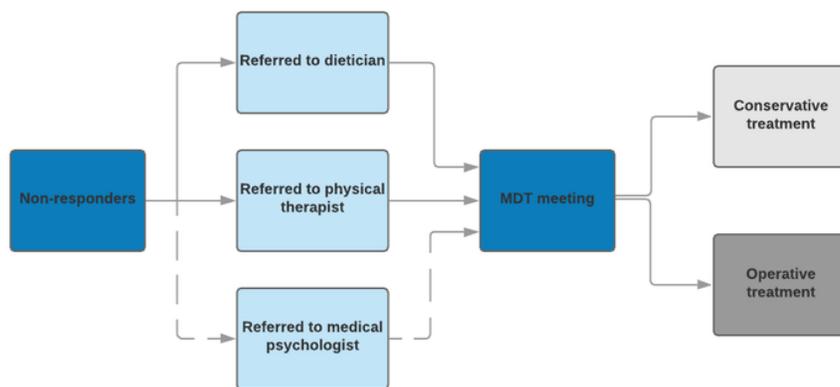


Figure 1

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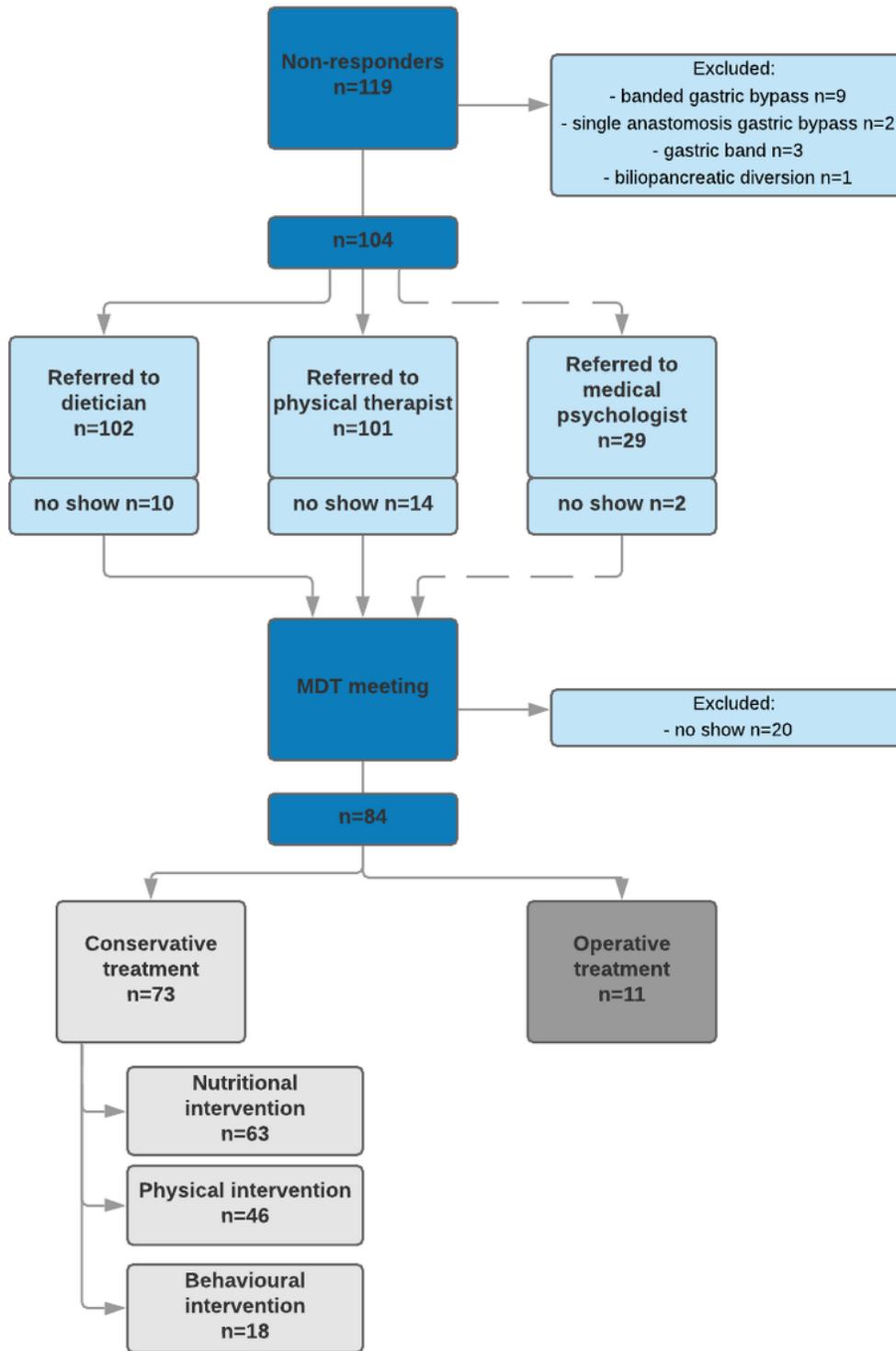


Figure 2

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