

Global variations in preoperative practices concerning patients seeking primary bariatric and metabolic surgery (PACT Study): A survey of 634 bariatric healthcare professionals

Yang, W., Abbott, S., Borg, C. M., Chesworth, P., Graham, Y., Logue, J., Ogden, J., O’Kane, M., Ratcliffe, D., Sherf-Dagan, S., Singhal, R., Snowdon-Carr, V., Tahrani, A. & Mahawar,

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1 **Title Page**

2
3 **Title:** Global variations in preoperative practices concerning patients seeking primary
4 bariatric and metabolic surgery (PACT Study): A survey of 634 bariatric healthcare
5 professionals

6
7 **Running Title:** Global variations in preoperative BMS practices

8
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47 surgery; metabolic surgery

48

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54

55 **Conflict of Interest:**

56

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72 ***other authors*** declare that they have no conflicts of interest.

73

74

75 **Global variations in preoperative practices concerning patients seeking primary**
76 **bariatric and metabolic surgery (PACT Study): A survey of 634 bariatric**
77 **healthcare professionals**

78

79 **ABSTRACT**

80 **Background** Bariatric and Metabolic Surgery (BMS) is a popular weight-loss
81 intervention worldwide, yet few scientific studies have examined variations in
82 preoperative practices globally. This study aimed to capture global variations in
83 preoperative practices concerning patients planned for BMS.

84

85 **Methods** A 41-item questionnaire-based survey was designed and the survey link was
86 freely distributed on social and scientific media platforms, email groups and circulated
87 through personal connections of authors. The survey included eight parts: basic
88 information; criteria for BMS; preoperative nutritional screening; preoperative weight
89 loss; preoperative diets for liver size reduction; preoperative glycemic control; other
90 laboratory investigations and preparations; decision making, education, and consents.
91 Descriptive statistics were used to analyse data and graphs were used for representation
92 where applicable.

93

94 **Results** Six hundred thirty-four bariatric healthcare professionals from 76
95 countries/regions completed the survey. Of these, n=310 (48.9%) were from public
96 hospitals, n=466 (73.5%) were surgeons, and the rest were multidisciplinary

97 professionals. More than half of respondents reported using local society/association
98 guidelines in their practice (n=310, 61.6%). The great majority of respondents routinely
99 recommend nutritional screening preoperatively (n=385, 77.5%), mandatory
100 preoperative diets for liver size reduction (n=220, 53.1%), routine screening for T2DM
101 (n=371, 90.7%), and mandate a glycemic control target before BMS in patients
102 with T2DM (n=203, 55.6%). However, less than half (n=183, 43.9%) recommend
103 mandatory preoperative weight loss to all patients. Most respondents (n=296, 77.1%)
104 recommend psychological intervention before surgery for patients diagnosed with
105 psychological conditions. Variations were also identified in laboratory investigations
106 and optimisation; and in the aspects of decision making, education and consent.

107

108 **Conclusions** This survey identified significant global variations in preoperative
109 practices concerning patients seeking primary BMS. Our findings could facilitate future
110 research for the determination of best practice in these areas of variations, and
111 consensus-building to guide clinical practice while we wait for that evidence to emerge.

112

113 **Keywords:** Preoperative practices; gastric bypass; sleeve gastrectomy; bariatric
114 surgery; metabolic surgery

115

116 **INTRODUCTION**

117 Hundreds of thousands of Bariatric and Metabolic Surgical (BMS) procedures are
118 carried out annually worldwide (1). An increasing body of evidence suggests that BMS
119 procedures are safe (2) and effective in terms of weight loss and improvement of
120 comorbidities such as Type 2 Diabetes Mellitus (T2DM) (3). This group of patients
121 forms a unique subset of high-risk surgical patients because of severe obesity and all
122 its associated comorbidities.

123

124 As opposed to patients seeking other types of surgeries, many preoperative screening
125 and interventions are being used for patients seeking BMS. Some of these practices
126 may even prolong the time and cost of preoperative preparation. Similarly, in several
127 healthcare systems, patients are required to “successfully” go through medical weight
128 management before they can “qualify” for BMS(4). However, the rationale of this
129 requirement is unclear and some authors have labelled them as tools for rationing (5).

130

131 There is currently a lack of robust evidence to guide the preparation of patients seeking
132 BMS. Determination of best practice is academically only possible when we are fully
133 aware of all the prevalent practices as even the commonest practice may not be the best
134 practice. Hence, we conducted a comprehensive global survey of healthcare
135 professionals involved in the care of patients seeking BMS to capture global variations
136 in preoperative practices concerning patients seeking BMS.

137

138 **METHODS**

139 A multi-disciplinary team of BMS professionals from several countries formed an
140 expert steering group for this study. The team included four surgeons (KM, WY, RS,
141 CB), two physicians/endocrinologists (AT, JL), three psychologists (JO, DR, VS), three
142 dietitians (MO, SA, SSD), one clinical academic (YG), and one patient representative
143 (PC).

144

145 We designed a 41-item questionnaire-based survey on SurveyMonkey® in the English
146 language (*Supplementary file 1*) following good practice in the conduct and reporting
147 of survey research, recommended by the EQUATOR network guidelines(6). The
148 steering group for this study together designed the questions included in the survey. The
149 survey was made live on 19th April 2021 and closed for analysis on 21st July 2021. The
150 survey link (<https://www.surveymonkey.com/r/PACTstudy>) was freely shared on social
151 and scientific media platforms (WhatsApp®, WeChat®, Facebook®, Twitter®,
152 ResearchGate®, LinkedIn®) email groups of BMS professionals, and circulated
153 through personal network of authors.

154

155 The survey included 8 parts: (1) Basic information; (2) Criteria for BMS; (3)
156 Preoperative nutritional screening; (4) Preoperative weight loss; (5) Preoperative diets
157 for liver size reduction; (6) Preoperative glycemic control; (7) Other laboratory
158 investigations and preparations; (8) Decision making, education, and consents.

159

160 The survey answers were prepopulated with all the variations in practices that the expert
161 steering group members were aware of. Comment boxes were provided to capture
162 “other” practices and an option to select "not applicable to my specialty" was given for
163 all questions to ensure survey participants could enter all variations in practices
164 including those not suggested by us; and that they were not forced to comment about
165 an area out of their expertise. This was keeping the multidisciplinary nature of bariatric
166 teams in mind where not all survey respondents would feel able to comment about all
167 areas of practice. This explains the different denominators for each response.
168 Percentages were worked out for each response based on the total number of
169 respondents who answered that question. All authors contributed to the survey design.
170 The survey underwent both a process of content validity and face validity by the authors
171 listed in the paper (experts in the field of BMS). All data were analysed using Microsoft
172 Excel®. Descriptive statistics were used to analyse data and graphs were used for
173 representation where applicable. Statement of informed consent was not applicable.
174 IRB approval was not applicable.
175

176 **RESULTS**

177 A total of 634 respondents from 76 countries/regions completed the survey
178 *(Supplementary file 2)*. Of these n=310 (48.9%) were from public hospitals, n=193
179 (30.4%) were from private hospitals, n=127 (20.0%) worked in both and n=4 (0.6%)
180 were from other settings. In terms of health profession, n=466 (73.5%) were surgeons,
181 n=45 (7.1%) were nurses, n=44 (6.9%) were dietitians/nutritionists, n=28 (4.4%) were
182 physicians (of them 8 endocrinologists), and n=19 (3.0%) were psychologists /
183 psychiatrists.

184

185 **Eligibility for BMS**

186 *Table 1* provides a complete breakdown of various guidelines used by respondents to
187 determine the suitability of patients for BMS. More than half of the respondents (n=293,
188 58.3%) reported that they followed local metabolic and bariatric society or association
189 guidelines. *Table 2* provides a complete breakdown of parameters used for determining
190 eligibility for BMS. The great majority of respondents reported Body Mass Index (BMI)
191 (n=480, 95.4%), presence of T2DM (n=399, 79.3%), and presence of other
192 comorbidities related to obesity (n=386, 76.7%) as the main determinants of eligibility
193 criteria for BMS. *Table 3* shows the minimum BMI level that the respondent would
194 consider for primary BMS in patients with and without T2DM. The commonest answer
195 for patients with T2DM was BMI of 30 kg/m² (n=156, 31.0%) and for patients without
196 T2DM was BMI of 35 kg/m² (n=198, 39.4%). *Table 4* presents the results of the
197 responses obtained when asked regarding contraindications to BMS in certain clinical

198 situations. The commonest reported contraindications included present addiction to
199 alcohol or drugs state (n=388, 77.1%), untreated eating disorder (n=337, 67.0%) and
200 unwillingness to take vitamin and mineral supplementation (n=231, 45.9%).

201

202 **Non-surgical Methods of Weight Loss to qualify for BMS**

203 Most respondents indicated that they routinely recommended lifestyle and dietary
204 interventions for weight loss before surgery (n=388, 77.1%), weight loss by
205 pharmacological methods (n=203, 40.3%), weight loss by endoscopic means (n=107,
206 21.2%) and a minority (n=65, 13.0%) do not recommend any of the above.

207

208 **Preoperative Nutritional Screening and Treatment**

209 **Table 5** presents nutritional screening routinely recommend before BMS and **Table 6**
210 presents nutritional deficiencies or abnormalities that respondents correct
211 preoperatively. Most respondents (n=385, 77.5%) routinely recommend preoperative
212 nutritional screening for all patients whereas only a minority recommend it according
213 to the type of the surgery (n=41, 8.2%), in specific cases (n=40, 8.0%) or never
214 recommend any preoperative screening (n=13, 2.6%). Similarly, most respondents
215 (n=274, 64.6%) routinely recommend preoperative treatment for nutritional
216 deficiencies or abnormalities for all patients, but a minority would only correct
217 preoperative deficiencies for some specific surgery types (n=58, 13.7%) or patients
218 (n=83, 19.6%).

219

220 **Mandatory Preoperative Weight Loss**

221 Less than half of the respondents (n=183, 43.9%) indicated that they recommended
222 mandatory preoperative weight loss for all patients. Approximately 40.5% (n=169)
223 would only do so for specific cases, and 10.3% (n=43) would never recommend it. The
224 commonest reasons provided for mandatory preoperative weight loss were to make
225 surgery easier technically (n=271, 75.5%), safer (n=260, 72.4%), to assess patient's
226 motivation for surgery (n=202, 56.3%), to improve weight loss outcomes (n=110,
227 30.6%), and to fulfil the requirement from the funding body (n=49, 13.7%). When
228 asked regarding the magnitude of mandatory preoperative weight loss, a quarter of
229 respondents (n=93, 25.9%) indicated that they ask for 5% total body weight loss, fifth
230 (n=76, 21.2%) recommend 10% of total body weight loss, third (n=124, 34.5%)
231 suggested that the amount depended on the patient, while the others ask for 5-10 kg
232 (n=38, 10.6%) and ≤ 5.0 kg weight loss (n=19, 5.3%).

233

234 **Preoperative Diets for Liver Size Reduction**

235 About half of respondents (n=220, 53.1%) recommended mandatory preoperative diets
236 for liver size reduction for all patients, whereas the rest recommend it in specific cases
237 only (n=124, 30.0%) or never recommend it (n=53, 12.8%). The most commonly
238 recommended diet types for liver size-reduction preoperatively were low-calorie diet
239 (47.5%) and very-low-calorie diet (41.9%) (*Figure 1*). The most-reported
240 recommended duration for such diets was 8-14 days (44.3%) (*Figure 2*).

241

242 Preoperative Glycaemic Control, Laboratory Investigations, and Preparations

243 Most of the respondents (n=371, 90.7%) routinely screen patients for T2DM. Common
244 tests used for this purpose are HbA1c (92.1%) and serum fasting blood glucose (75.3%)
245 (*Figure 3*). Commonly recommended targets for glycemic control before BMS in
246 patients with T2DM are presented in *Table 7*. Other recommended screenings and tests
247 before BMS are presented in *Table 8*.

248

249 Most respondents (n=261, 68.0%) screen for Helicobacter Pylori (HP) by endoscopy,
250 and only a few respondents (n=21, 5.5%) never screen for it, while blood tests (n=44,
251 11.5%), breath tests (n=97, 25.2%), and stool tests (n=56, 14.6%) are also used to screen
252 for HP. For patients with positive test for HP, the majority of the respondents (n=275,
253 71.6%) would recommend eradication before surgery. For preoperative screening for
254 OSA, approximately 39.8% (n=153) use STOP BANG score, approximately 37.5%
255 (n=144) use Epworth Sleepiness Score, , and 32.3% (n=124) use Sleep Studies.

256

257 Most respondents (n=242; 63.0%) indicated that they insist patients quit smoking
258 before considering any BMS (i.e., surgery will not happen if they don't), and only a
259 few (n=61, 15.9%) insist patients quit smoking only for patients planned for a gastric
260 bypass surgery type. A minority (n=68, 17.7%) do not insist that patients quit smoking
261 for patients undergoing any procedure.

262

263 Psychological Preoperative Intervention

264 Most respondents (n=296, 77.1%) recommend psychological intervention before
265 surgery for all patients when the patient is diagnosed with psychological conditions,
266 and others (n=75, 19.5%) recommend it only in specific cases. Most respondents
267 (n=304, 79.2%) would recommend intervention or treatment in cases of eating disorder
268 before surgery, while a few (n=58, 15.1%) would recommend intervention or treatment
269 before surgery only in specific cases of those diagnosed with eating disorders.

270

271 **Preoperative Referral to Pharmacists or Obstetricians**

272 Only a minority of respondents (n=45, 11.7%) reported that they would routinely refer
273 patients to pharmacists for all patients, whereas approximately 29.7% (n=114) would
274 only do this for specific cases and a half (n=192, 50.0%) would never do so. The
275 majority of the respondents (n=234, 60.1%) reported that they do not routinely refer
276 women in the child-bearing age group to obstetricians for discussion regarding birth
277 control options after surgery, while about a quarter (n=109, 28.4%) reported that they
278 would recommend it. Most respondents (n=345, 89.8%) recommend delaying
279 pregnancy for at least 12-24 months post-surgery.

280

281 **Decision Making, Education, and Consents**

282 Surgeon (n=364, 97.3%), dietitian (n=306, 81.8%) and psychologist (n=227, 60.7%)
283 were the most common core members that were reported to be part of the MDT (*Figure*
284 *4*). Most respondents (n= 244, 65.24%) encourage patients to bring partners, families
285 and/or carers to routine appointments, and only a few (n=33, 8.2%) encourage patients

286 to bring them to support group meetings, encourage patients to bring them to both (n=53,
287 14.2%), or do not involve patients/ family/ partners/ carers in routine appointments or
288 support groups (n=32, 8.6%).

289

290 About half of respondents (n=190, 50.8%) would "always" involve patients' families in
291 the decision making about surgery whereas the rest (n=162, 43.3%) reported it depends
292 on the case, and a few (n=11, 2.9%) reported they would never do so. Most preoperative
293 education about BMS options with patients was reported to be via face-to-face
294 appointments (n=320, 85.6%), printed materials (n=200, 53.5%), virtual (online)
295 personal appointments (n=153, 40.9%) and websites (n=156, 41.7%). **Table 9** provides
296 information on items that respondents would discuss with their patients as part of the
297 consenting process.

298

299 **Hospitalisation for Surgery and Low Molecular Weight Heparins (LMWH)**

300 **Prophylaxis**

301 Most respondents (n=199, 53.2%) admit patients on the day of surgery or the day before
302 (n=93, 24.9%) and only a few (n=31, 8.3%) would admit patients two days before
303 surgery or would admit patients ≥ 3 days before surgery (n=32, 8.6%). Most of the
304 respondents (n=175, 46.8%) commence LMWH prophylaxis on the day of surgery,
305 whereas the rest would commence it the day before surgery (n=80, 21.4%) or do not
306 recommend any preoperative LMWH prophylaxis at all (n=22, 5.9%).

307

308 **DISCUSSION**

309 To the best of our knowledge, this is the first study capturing the broad range of
310 variations in preoperative practices for patients seeking BMS. We found considerable
311 variations in practices with regards to almost every aspect examined. Our findings
312 should lead to focussed studies for the identification of best practices.

313

314 ***Criteria for BMS***

315 The National Institutes of Health (NIH) in the United States of America first established
316 guidelines for bariatric surgery in 1991(7). Approximately 65% of the respondents
317 reported using one of these guidelines in their practice. It is remarkable that bariatric
318 surgery worldwide continues to be largely driven by these guidelines developed more
319 than 30 years ago even though during this time, the safety of surgery and evidence base
320 in favour of it has grown exponentially. There are growing calls for these to be updated
321 (3, 8). Meanwhile, local guidelines have been developed in many areas of the world to
322 address this (9-11), and our survey confirms that about 60% of respondents are using
323 these in their decision-making. There is a need for an up-to-date global consensus for
324 determining eligibility criteria for BMS. A list of some of the local bariatric metabolic
325 and societies guidelines is provided in ***Supplementary File 3***.

326

327 BMI and the presence of comorbidities are still the most commonly used parameter for
328 determining the eligibility of patients for BMS. With increasing awareness of
329 limitations of BMI in measuring adiposity, (12, 13), it was inevitable that clinicians

330 would use other measures to assess body size and composition. Moreover, it is now
331 further recognised that the BMI thresholds should be different for different ethnicities
332 e.g. reduced by 2.5kg/m² for Asian patients (10). Moreover, minimum BMI cut-offs
333 indicated by respondents for patients with and without T2DM also make an interesting
334 finding as 109 (21.7%) respondents indicated that they would consider surgery for
335 patients with BMI ≤ 30 kg/m² in without T2DM and 280 (55.7%) would consider this
336 for patients with BMI ≤ 30 kg/m² in with T2DM.

337

338 *Preoperative Nutritional Screening and Treatment*

339 It is known that patients with obesity may have many pre-existing nutritional
340 deficiencies, which may be exacerbated by surgery and may lead to postoperative
341 complications if not treated (14-20). However routine supplementation after surgery
342 with adequate dosages of micronutrients (21, 22) is probably more important than
343 preoperative correction. In our survey, most respondents routinely recommend
344 preoperative nutritional screening (77.5%) and preoperative treatment for nutritional
345 deficiencies or abnormalities (64.6%) for all patients. This is interesting especially
346 because the cost-effectiveness of some of these interventions has not been fully
347 examined. At the same time, it is worth emphasising here that both the American
348 Society for Metabolic and Bariatric Surgery (ASMBS) and the British Obesity and
349 Metabolic Surgery Society (BOMSS) have recommended preoperative nutrition
350 screening and treatment (23, 24) for a variety of micronutrients even though the
351 evidence base for these recommendations was relatively poor.

352

353 ***Preoperative Weight Loss***

354 There is debate in the scientific literature with regards to the benefits of mandatory
355 preoperative weight loss; and the type, duration, and necessity of any preoperative diets
356 (25-27). A systematic review showed that preoperative very-low-calorie diets (VLCD)
357 led to preoperative weight loss and liver volume reduction, but its effect on surgical
358 risks was unclear (28). Our study showed that 53.14% of respondents recommended
359 mandatory preoperative diets for liver size reduction, but there was no consensus on the
360 type and duration of such diet.

361

362 ***Preoperative Glycaemic Control and Helicobacter Pylori eradication***

363 Though there was significant variation, the majority of the respondents used a target
364 HbA1c or glucose level for preoperative diabetes control. However, a minority 6.9%
365 do not use any such preoperative glycaemic target, and 41.6% tailor it depending on the
366 patient. It is worth highlighting here that studies (29) have challenged the need for
367 aggressive preoperative diabetes control for patients undergoing BMS. Similarly,
368 despite widespread routine screening for HP as confirmed in this survey, the rationale
369 of this practice is unclear, especially for patients undergoing Sleeve Gastrectomy, the
370 commonest bariatric procedure worldwide.

371

372 ***OSA Screening***

373 Current guidelines suggested that all patients going forward for bariatric surgery should

374 be screened for OSA to reduce the risk of perioperative complications(30, 31), such as
375 hypoxemia and cardiopulmonary complications. However, this is not routine for
376 patients with severe obesity undergoing other types of surgery – some of which involve
377 a significantly longer time under anaesthesia. Despite the widespread use of screening
378 for OSA, variations exist and further studies should aim to identify which BMS patients
379 can safely avoid OSA screening (32).

380

381 ***Smoking Cessation***

382 Approximately 60% of respondents in this survey insist that patients quit smoking
383 before considering surgery. Possible reasons include improving smoking-related
384 comorbidities and decreasing postoperative complications(33). However, data suggest
385 that most of these patients resume smoking soon after surgery. Better strategies are,
386 therefore, needed for successful long-term smoking cessation (33).

387

388 ***Psychological Preoperative Intervention***

389 Psychosocial interventions can improve eating pathology and psychosocial functioning
390 (34). As such it was expected that the majority of respondents in the survey recommend
391 psychological intervention before BMS for the patients diagnosed with psychological
392 conditions.

393

394 ***Preoperative Referral to Pharmacists or Obstetricians***

395 Studies on the involvement of pharmacists before BMS are limited. In this survey, half

396 of the respondents do not recommend preoperative referral to pharmacists. Therefore,
397 future research into the role of pharmacists in the bariatric multidisciplinary team and
398 patient support are recommended (35).

399

400 About 90% of respondents recommend patients delay pregnancy for at least 12-24
401 months post-surgery, but only a few recommend preoperative referral to obstetrics. This
402 may reflect the different healthcare systems. For example, in the UK, it would normally
403 be the general practitioners who would discuss contraception with the patients.

404

405 **Decision Making, Education, and Consents**

406 The involvement of patients and families in decision-making can support patients make
407 informed choices before they seek to undergo the surgery (36). In this survey, 50.8%
408 of the respondents involved patients and families in decision-making.

409

410 ***LMWH Prophylaxis***

411 Nearly half of the respondents commence LMWH prophylaxis on the day of surgery
412 for the patients undergoing BMS but a minority did not recommend any. A review of
413 the literature showed that LMWHs might be better options than unfractionated heparin
414 (UFH) for venous thromboembolism (VTE) prophylaxis in bariatric patients, but
415 further research and consensus are needed for the best thromboprophylaxis modality,
416 dose, and duration(37-39).

417

418 **Strengths and Limitations**

419 To the best of our knowledge, this is the first global study reporting on variations
420 concerning a large range of preoperative practices concerning patients seeking BMS.
421 We believe our findings will pave way for future research aimed at identifying best
422 practices for each of the identified preoperative areas discussed in this study. One of the
423 limitations of this study is that we are not able to give a precise response rate due to the
424 distribution methodology. However, given that our objective was to capture all
425 variations in practice, with 634 responses from 76 countries/regions, we believe we
426 have probably achieved that. At the same time, authors would like to caution against
427 the interpretation of commonest practice as best practice. Determining best practices
428 for each of these variations requires further research and is beyond the scope of this
429 paper. Another limitation of this study is that we are unable to carry out a meaningful
430 comparison of practices amongst different countries or continents. This was indeed not
431 the objective of this study and future studies will need to address this gap in the
432 literature.

433

434 **Conclusions**

435 This survey identifies global variations in preoperative practices concerning patients
436 seeking primary BMS. Our findings identified several areas for future research for the
437 identification of best practices amongst the range of variations.

438

439

440 **AUTHOR CONTRIBUTIONS**

441 **WY** and **KM** conceived and designed the idea, wrote, and drafted the manuscript. **WY**,
442 **YG**, and **KM** led the data analysis, interpretation, and manuscript preparation with
443 input from all authors. All authors contributed to the survey design, survey distribution,
444 data collection, editing, and revising the manuscript, and have read and approved the
445 final manuscript.

446

447 **CONFLICT OF INTERESTS**

448 *Mary O’Kane* has been paid honoraria by Novo Nordisk for services
449 provided/consultancy and Johnson and Johnson for educational activities. *Abd Tahrani*
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464

465 **References**

- 466 1. Angrisani L, Santonicola A, Iovino P, Ramos A, Shikora S, Kow L. Bariatric
467 Surgery Survey 2018: Similarities and Disparities Among the 5 IFSO Chapters. *Obes*
468 *Surg.* 2021;31(5):1937-48.
- 469 2. Arterburn DE, Telem DA, Kushner RF, Courcoulas AP. Benefits and Risks of
470 Bariatric Surgery in Adults: A Review. *Jama.* 2020;324(9):879-87.
- 471 3. Cummings DE, Rubino F. Metabolic surgery for the treatment of type 2 diabetes in
472 obese individuals. *Diabetologia.* 2018;61(2):257-64.
- 473 4. Hazlehurst JM, Logue J, Parretti HM, Abbott S, Brown A, Pournaras DJ, et al.
474 Developing Integrated Clinical Pathways for the Management of Clinically Severe
475 Adult Obesity: a Critique of NHS England Policy. *Curr Obes Rep.* 2020;9(4):530-43.
- 476 5. Mahawar KK, Small PK. Medical weight management before bariatric surgery: is
477 it an evidence-based intervention or a rationing tool? *Clin Obes.* 2016;6(6):359-60.
- 478 6. Kelley K, Clark B, Brown V, Sitzia J. Good practice in the conduct and reporting
479 of survey research. *International Journal for Quality in Health Care.* 2003;15(3):261-6.
- 480 7. NIH conference. Gastrointestinal surgery for severe obesity. Consensus
481 Development Conference Panel. *Ann Intern Med.* 1991;115(12):956-61.
- 482 8. Yermilov I, McGory ML, Shekelle PW, Ko CY, Maggard MA. Appropriateness
483 criteria for bariatric surgery: beyond the NIH guidelines. *Obesity (Silver Spring).*
484 2009;17(8):1521-7.

- 485 9. Bhasker AG, Prasad A, Raj PP, Wadhawan R, Khaitan M, Agarwal AJ, et al. OSSI
486 (Obesity and Metabolic Surgery Society of India) Guidelines for Patient and Procedure
487 Selection for Bariatric and Metabolic Surgery. *Obes Surg.* 2020;30(6):2362-8.
- 488 10. Yang W, Wang C. Metabolic Surgery Needs Stronger Endorsement in Asian T2DM
489 Patients with Low BMI. *Obes Surg.* 2021.
- 490 11. Kasama K, Mui W, Lee WJ, Lakdawala M, Naitoh T, Seki Y, et al. IFSO-APC
491 consensus statements 2011. *Obes Surg.* 2012;22(5):677-84.
- 492 12. Livingston EH. Pitfalls in using BMI as a selection criterion for bariatric surgery.
493 *Curr Opin Endocrinol Diabetes Obes.* 2012;19(5):347-51.
- 494 13. Oskrochi Y, Majeed A, Easton G. Biting off more than we can chew: is BMI the
495 correct standard for bariatric surgery eligibility? *Br J Gen Pract.* 2015;65(638):482-3.
- 496 14. Guan B, Yang J, Chen Y, Yang W, Wang C. Nutritional Deficiencies in Chinese
497 Patients Undergoing Gastric Bypass and Sleeve Gastrectomy: Prevalence and
498 Predictors. *Obes Surg.* 2018;28(9):2727-36.
- 499 15. Wang C, Guan B, Yang W, Yang J, Cao G, Lee S. Prevalence of electrolyte and
500 nutritional deficiencies in Chinese bariatric surgery candidates. *Surg Obes Relat Dis.*
501 2016;12(3):629-34.
- 502 16. Zhang W, Fan M, Wang C, Mahawar K, Parmar C, Chen W, et al. Hair Loss After
503 Metabolic and Bariatric Surgery: a Systematic Review and Meta-analysis. *Obesity*
504 *Surgery.* 2021.

- 505 17. Zhang W, Fan M, Wang C, Mahawar K, Parmar C, Chen W, et al. Importance of
506 Maintaining Zinc and Copper Supplement Dosage Ratio After Metabolic and Bariatric
507 Surgery. *Obesity Surgery*. 2021.
- 508 18. Elhag W, El Ansari W. Nutritional Deficiencies Among Adolescents Before and
509 After Sleeve Gastrectomy: First Study with 9-Year Follow-up. *Obes Surg*. 2021.
- 510 19. Bretault M, Zaharia R, Vigan M, Vychnevskaia K, Raffin-Sanson ML, Crenn P, et
511 al. Complications Requiring Intensive Nutritional Care After Bariatric Surgery Result
512 in More Long-Term Weight Loss but Has No Impact on Nutritional Deficiencies and
513 Depression-Anxiety Scores. *Obes Surg*. 2021;31(11):4767-75.
- 514 20. Gasmi A, Björklund G, Mujawdiya PK, Semenova Y, Peana M, Dosa A, et al.
515 Micronutrients deficiencies in patients after bariatric surgery. *Eur J Nutr*. 2021.
- 516 21. Mahawar KK, Bhasker AG, Bindal V, Graham Y, Dudeja U, Lakdawala M, et al.
517 Zinc Deficiency after Gastric Bypass for Morbid Obesity: a Systematic Review. *Obes*
518 *Surg*. 2017;27(2):522-9.
- 519 22. Kumar P, Hamza N, Madhok B, De Alwis N, Sharma M, Miras AD, et al. Copper
520 Deficiency after Gastric Bypass for Morbid Obesity: a Systematic Review. *Obes Surg*.
521 2016;26(6):1335-42.
- 522 23. O'Kane M, Parretti HM, Pinkney J, Welbourn R, Hughes CA, Mok J, et al. British
523 Obesity and Metabolic Surgery Society Guidelines on perioperative and postoperative
524 biochemical monitoring and micronutrient replacement for patients undergoing
525 bariatric surgery-2020 update. *Obes Rev*. 2020;21(11):e13087.

- 526 24. Mechanick JI, Apovian C, Brethauer S, Timothy Garvey W, Joffe AM, Kim J, et al.
527 Clinical Practice Guidelines for the Perioperative Nutrition, Metabolic, and
528 Nonsurgical Support of Patients Undergoing Bariatric Procedures - 2019 Update:
529 Cosponsored by American Association of Clinical Endocrinologists/American College
530 of Endocrinology, The Obesity Society, American Society for Metabolic and Bariatric
531 Surgery, Obesity Medicine Association, and American Society of Anesthesiologists.
532 *Obesity (Silver Spring)*. 2020;28(4):O1-o58.
- 533 25. Sun Y, Liu B, Smith JK, Correia MLG, Jones DL, Zhu Z, et al. Association of
534 Preoperative Body Weight and Weight Loss With Risk of Death After Bariatric Surgery.
535 *JAMA Netw Open*. 2020;3(5):e204803.
- 536 26. Eng V, Garcia L, Khoury H, Morton J, Azagury D. Preoperative weight loss: is
537 waiting longer before bariatric surgery more effective? *Surg Obes Relat Dis*.
538 2019;15(6):951-7.
- 539 27. Schiavo L, Scalera G, Sergio R, De Sena G, Pilone V, Barbarisi A. Clinical impact
540 of Mediterranean-enriched-protein diet on liver size, visceral fat, fat mass, and fat-free
541 mass in patients undergoing sleeve gastrectomy. *Surg Obes Relat Dis*. 2015;11(5):1164-
542 70.
- 543 28. Holderbaum M, Casagrande DS, Sussenbach S, Buss C. Effects of very low calorie
544 diets on liver size and weight loss in the preoperative period of bariatric surgery: a
545 systematic review. *Surg Obes Relat Dis*. 2018;14(2):237-44.

- 546 29. Samuel N, Mustafa A, Hawkins H, Wei N, Boyle M, De Alwis N, et al. Influence
547 of Pre-operative HbA1c on Bariatric Surgery Outcomes-the Sunderland (UK)
548 Experience. *Obes Surg.* 2021.
- 549 30. de Raaff CAL, Gorter-Stam MAW, de Vries N, Sinha AC, Jaap Bonjer H, Chung F,
550 et al. Perioperative management of obstructive sleep apnea in bariatric surgery: a
551 consensus guideline. *Surg Obes Relat Dis.* 2017;13(7):1095-109.
- 552 31. de Raaff CAL, de Vries N, van Wagenveld BA. Obstructive sleep apnea and
553 bariatric surgical guidelines: summary and update. *Curr Opin Anaesthesiol.*
554 2018;31(1):104-9.
- 555 32. O'Reilly E, Doherty L, O'Boyle C. How Relevant Is Pre-operative Obstructive
556 Sleep Apnoea in the Asymptomatic Bariatric Surgery Patient? *Obes Surg.*
557 2020;30(3):969-74.
- 558 33. Wolvers PJD, Ayubi O, Bruin SC, Hutten BA, Brandjes DPM, Meesters EW, et al.
559 Smoking Behaviour and Beliefs About Smoking Cessation After Bariatric Surgery.
560 *Obes Surg.* 2021;31(1):239-49.
- 561 34. David LA, Sijercic I, Cassin SE. Preoperative and post-operative psychosocial
562 interventions for bariatric surgery patients: A systematic review. *Obes Rev.*
563 2020;21(4):e12926.
- 564 35. Graham Y, Callejas-Diaz L, Parkin L, Mahawar K, Small PK, Hayes C. Exploring
565 the Patient-Reported Impact of the Pharmacist on Pre-bariatric Surgical Assessment.
566 *Obes Surg.* 2019;29(3):891-902.

- 567 36. Lee YC, Wu WL. Shared Decision Making and Choice for Bariatric Surgery. *Int J*
568 *Environ Res Public Health*. 2019;16(24).
- 569 37. Hamadi R, Marlow CF, Nassereddine S, Taher A, Finianos A. Bariatric venous
570 thromboembolism prophylaxis: an update on the literature. *Expert Rev Hematol*.
571 2019;12(9):763-71.
- 572 38. Ruiz-Tovar J, Llaveró C. Thromboembolic Prophylaxis for Morbidly Obese
573 Patients Undergoing Bariatric Surgery. *Adv Exp Med Biol*. 2017;906:9-13.
- 574 39. Imberti D, Baldini E, Pierfranceschi MG, Nicolini A, Cartelli C, De Paoli M, et al.
575 Prophylaxis of venous thromboembolism with low molecular weight heparin in
576 bariatric surgery: a prospective, randomised pilot study evaluating two doses of
577 parnaparin (BAFLUX Study). *Obes Surg*. 2014;24(2):284-91.
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580 **Legends**

581

582 **Figure 1** Types of diets recommended for liver size reduction preoperatively (n=341)

583 **Figure 2** Recommended duration of the diets for liver size reduction (n=341)

584 **Figure 3** Routine screening for T2DM (n=365)

585 **Figure 4** Core members of multidisciplinary team (MDT) (n=374)

586

587 **Table 1** Guidelines applied by the respondents to their practice (n=503)

588 **Table 2** Parameters used to determine the eligibility for BMS (n=503)

589 **Table 3** Minimum BMI that the respondents would consider for primary BMS in
590 patients with and without T2DM (n=503)

591 **Table 4** Contraindications of BMS (n=503)

592 **Table 5** Nutritional screening routinely recommend before BMS (n=425)

593 **Table 6** Nutritional deficiencies or abnormalities routinely treated before BMS (n=384)

594 **Table 7** Recommendation for glycemic control target before BMS in patients with
595 T2DM (n=365)

596 **Table 8** Other recommended screenings and tests before BMS (n=384)

597 **Table 9** Topics to discuss with the patient prior to surgery as part of the consenting
598 process (n=374)

599

600 **Supplementary File 1:** Questionnaire

601 **Supplementary File 2:** Origins of survey respondents

602 **Supplementary File 3:** Local and national bariatric metabolic and societies guidelines

603