

# Bariatric Analysis and Reporting Outcome System (BAROS)

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**Background:** The lack of standards for comparison of results was identified by the NIH Consensus Conference panelists as one of the key problems in evaluating reports in the surgical treatment of severe obesity. The analysis of outcomes after bariatric surgery should include weight loss, improvement in comorbidities related to obesity, and quality-of-life (QOL) assessment. Definitions of success and failure should be established and the presentation of results standardized.

**Methods:** A survey among experienced bariatric surgeons was conducted to study the reporting of results. The concept of evaluating outcomes by using a scoring system was introduced in 1997 and has now been refined further. Psychologists with expertise in bariatrics were asked to recommend a disease-specific instrument to analyze QOL after surgery.

**Results:** The system defines five outcome groups (failure, fair, good, very good, and excellent), based on a scoring table that adds or subtracts points while evaluating three main areas: percentage of excess weight loss, changes in medical conditions, and QOL. To assess changes in QOL after treatment, this method incorporates a specifically designed patient questionnaire that addresses self-esteem and four daily activities. Complications and reoperative surgery deduct points, thus avoiding the controversy of considering reoperations as failures.

**Conclusions:** The Bariatric Analysis and Reporting Outcome System (BAROS) analyzes outcomes in a simple, objective, unbiased, and evidence-based fashion. It can be adapted to evaluate other forms of medical intervention for the control of obesity. This method should be considered by international organizations for the adoption of standards for the outcome assessment of bariatric treatments, and for the comparison of results among surgical series. These standards could

also be used to compare the long-term effects of surgery with nonoperative weight loss methods.

*Key words:* Bariatric surgery, morbid obesity, obesity-related comorbidities, outcome assessment, surgical results, quality-of-life, questionnaires, weight loss.

*Better statistical reporting of surgical outcomes is urgently needed for clearer assessment of outcomes.*

*Quality-of-life considerations in patients undergoing surgical treatment of obesity must be considered. . .*

National Institutes of Health Consensus Conference "Gastrointestinal Surgery for Severe Obesity" Bethesda, MD, March 25-27, 1991.

The evaluation of results in bariatric surgery is complicated by the lack of standards for comparison, the use of different parameters to report weight loss, and the multiple definitions of success and failure in the literature.<sup>1-14</sup> This was identified by the experts at the NIH Consensus Conference on Gastrointestinal Surgery for Severe Obesity as one of the key problems in analyzing case series.<sup>15</sup> Furthermore, they strongly recommended better statistical reporting of surgical outcomes. Surgeons have traditionally used weight loss as the main postoperative outcome, although it has become very clear that the improvement of medical conditions associated with obesity should be included in the final analysis.<sup>16,17</sup> Another controversial issue is how to account for reoperations due to complications or unsatisfactory weight loss in the final assessment of results, because many surgeons consider a reoperation as a failure, while others do not.<sup>18</sup>

As in other chronic diseases, quality-of-life (QOL) issues in the obese patient are increasingly important in the analysis of results after medical intervention. Unfortunately, a clear conceptual basis for QOL measures is lacking.<sup>19</sup> Moreover, although many psychometric instruments have been developed, they are usually lengthy, sophisticated, and not de-

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signed specifically for the morbidly obese patient undergoing weight reduction. Moreover, there is no consensus among investigators in the selection of the most appropriate test for this particular population.<sup>20</sup> Although many of these instruments could be useful in making a baseline preoperative assessment, one of the most serious problems in the field of bariatric surgery is the poor long-term follow-up, even in the simple reporting of weight loss.<sup>21</sup> Thus, it is illusory to expect patients to respond to lengthy and complicated questionnaires mailed to them several years after the surgery.

In response to these urgent needs, we have developed a simple, one-page analysis system that evaluates the domains discussed earlier: weight loss, improvement of medical conditions, and QOL. The scoring table uses a point scale to define five outcome groups, objectively classifying the results in term of success or failure, and avoiding the controversy regarding reoperations. After validation in clinical trials, we believe that this instrument should be considered by bariatric societies for the adoption of standards in reporting outcomes in the treatment of obesity.

## Materials and Methods

The preliminary phase of this project consisted of a survey conducted among selected members of the American Society for Bariatric Surgery (ASBS), with a response rate of 82%. The results were presented at the 13th Annual Meeting of the society in Quebec City, Canada, and later published.<sup>18</sup> Briefly, the survey included 12 questions, divided into subsections covering controversial issues in reporting the results of obesity surgery. Among the findings, percentage of excess weight was one of the most used expressions of weight loss. The majority of responders considered it necessary to evaluate the improvement of medical problems related to obesity, but there was disagreement on how this should be accomplished. Most stated that QOL needed to be analyzed, although no particular instrument was recommended. Finally, the complete lack of consensus as to the definition of success and failure after surgery was again clearly identified. None of the eight suggested definitions was selected by a significant number of responders.

### Analysis of Weight Loss and Improvement of Medical Conditions

Following the survey, the idea of creating a scoring system to standardize the reporting of outcomes in

bariatric surgery was developed further. Percentage of excess weight loss was selected because it is the most widely used in the literature, and it is easy both to calculate and to represent graphically. The scale of weight loss, divided into quartiles, follows a classification similar to that proposed by Reinhold and used by several other authors.<sup>13</sup> The analysis of improvement in medical conditions was modified from Brolin et al.<sup>22</sup> These authors considered medical disorders "resolved" when controlled without medication and "improved" when controlled by reduced doses of medication. Some of the dilemmas encountered during the development of the Bariatric Analysis and Reporting Outcome System (BAROS) were the selection criteria of obesity-related comorbidities to be included, how to diagnose and classify these according to risk and severity, and how to account for changes after weight loss. Since obesity can affect almost every organ system in the body, with different degrees of severity, a complete listing of comorbid conditions was impractical. Therefore, we elected to follow the recommendations made by the panelists convened by the American Obesity Association and the Shape Up America! Foundation.<sup>23</sup> Table 1 shows seven medical problems considered major because of their health risks, and the criteria for diagnosis proposed in the BAROS. The above-mentioned statement included a list of other conditions associated with obesity, as shown in Table 2. These conditions are usually not life-threatening; thus, we arbitrarily classified them as minor for the sake of simplicity, understanding that in some instances this may not be the case.

The numerous potential complications associated with obesity surgery were categorized as major and minor to stratify degrees of severity. We followed the protocol of the International Bariatric Surgery Registry (IBSR), which defines a major complication in the perioperative period as one that results in a hospital stay of  $\geq 7$  days and a minor complication as one that does not.<sup>24</sup> A list, not necessarily exhaustive, is included in Appendix 1 as a guideline. Complications occurring after discharge were classified as major if rehospitalization was necessary for  $\geq 1$  week.

### Quality-of-Life Assessment

After this preliminary research, a letter was sent to several psychologists active in the ASBS, requesting their help in finding or developing a simple, short, and easy-to-answer test to assess QOL after weight reduction. On the basis of previous work by Wyss

**Table 1.** Comorbid conditions classified in the BAROS as major due to increased health risks

Disease	Diagnosis	Resolution	Improvement
Hypertension	Systolic >140 mmHg Diastolic >90 mmHg	Diet/diuretic only	Controlled by medication
Cardiovascular disease	Evidence of CAD, PVD or CHF	No medication	Treatment still necessary
Dyslipidemia	Cholesterol >200 mg/dl Abnormal lipid profile*	No medication	Normalized by medication
Type II diabetes	FBS >140 mg/dl or random BS >200 mg/dl on GTT	Diet/exercise only Apneas/hour <5	No insulin necessary
Sleep apnea OHS	Formal sleep study pCO <sub>2</sub> >45 mmHg Hemoglobin >15 mg/dl	Normalized	Apneas/hour: 5–15
Osteoarthritis	Radiographic evaluation	No medication	Controlled by medication
Infertility (when applicable)	Infertility/hormonal studies	Pregnancy	Regular menses

\*Abnormal lipid profile = HDL <35 mg/dl (strongest predictor of CAD); LDL >100 mg/dl with existing CAD; LDL >130 mg/dl with two or more CAD risk factors; LDL >160 mg/dl with fewer than two risk factors; fasting triglycerides >250 mg/dl.

CAD, coronary artery disease; PVD, peripheral vascular disease; CHF, congestive heart failure; HDL, high-density lipoproteins; LDL, low-density lipoproteins; FBS, fasting blood sugar; BS, blood sugar; GTT, glucose tolerance test; OHS, obesity hypoventilation syndrome.

et al.,<sup>25</sup> self-esteem and four areas of daily activities were to be analyzed. These domains were also included in a comprehensive psychologic evaluation after gastric bypass conducted by Delin et al.<sup>26</sup> Responding to this request, in cooperation with Dr. Elizabeth Ardel from Salzburg, Austria, the Moorehead–Ardelt Quality of Life Questionnaire was developed and incorporated into the BAROS. The complete questionnaire is shown in Appendix 2.

This project was then presented during 1997 in plenary sessions at the 14th Annual Meeting of the ASBS in Chicago, Illinois, USA, and at the 2nd Congress of the International Federation for the Surgery of Obesity (IFSO) in Cancun, Mexico. Following both oral presentations, the BAROS was distributed to interested groups for field testing, which is now being conducted in several countries. The system has now been refined by modifying the scoring key, adding another outcome group (very good), and making the definition of failure more rigorous.

## Results

The BAROS, shown in Figure 1, consists of a scoring table that includes three columns with the main






**Table 2.** Other obesity comorbid conditions classified in the BAROS as minor

Idiopathic intracranial hypertension
Lower extremity venous stasis disease
Gastroesophageal reflux
Urinary stress incontinence

areas of interest: *weight loss, improvement of medical conditions, and QOL*. A maximum of three points is given in each domain to evaluate changes after medical intervention. Weight loss is analyzed in the first column. A full point is deducted from patients whose final weight is higher than before treatment, and no points are scored if the excess weight loss is between 0% and 24%. One point is assigned for a percentage of excess weight loss between 25% and 49%, two points if the weight loss reached 50% to 74% of the excess, and three points for a final percentage excess weight loss of 75% to 100%.

Changes in comorbidities related to obesity are assessed in the second column. No points are scored if these were unchanged, whereas one point is deducted if the medical problems were aggravated after the intervention. From one to three points are assigned for positive changes: medical conditions improved (one point); one major comorbidity resolved and the others improved (two points), and all major problems resolved and the others improved (three points).

The Moorehead–Ardelt Quality of Life Questionnaire incorporated into the BAROS is designed on a single page and uses simple drawings to offer five options for each of the five QOL questions: *self-esteem, physical activity, social life, work conditions, and sexual activity*. Points are added or subtracted according to the patient's response. The questionnaire is equally weighted, with the center column reflecting no changes after medical intervention, thus scoring no points. Positive changes reflected on the two columns to the right are given partial points,

WEIGHT LOSS % OF EXCESS (points)	MEDICAL CONDITIONS (points)	QUALITY OF LIFE QUESTIONNAIRE
Weight gain (-1)	Aggravated (-1)	<b>1. SELF ESTEEM</b> 
0 - 24 (0)	Unchanged (0)	<b>2. PHYSICAL</b> 
25 - 49 (1)	Improved (1)	<b>3. SOCIAL</b> 
50 - 74 (2)	One major resolved Others improved (2)	<b>4. LABOR</b> 
75 - 100 (3)	All major resolved Others improved (3)	<b>5. SEXUAL</b> 
Subtotal:	Subtotal:	Subtotal:

**COMPLICATIONS**

Minor: Deduct 0.2 point  
Major: Deduct 1 point

**REOPERATION**

Deduct 1 point

**TOTAL SCORE**



**OUTCOME GROUPS**  
**SCORING KEY**

**FAILURE** 1 point or less  
**FAIR** > 1 to 3 points  
**GOOD** > 3 to 5 points  
**VERY GOOD** > 5 to 7 points  
**EXCELLENT** > 7 to 9 points

Figure 1. Bariatric Analysis and Reporting Outcome System (BAROS).

while negative changes to the left diminish the subtotal score. Analysis of the patient's self-esteem was considered a priority; hence, the first answer has a possible maximum score of one full point, as opposed to a half point allotted to each of the other four answers. As we consider QOL an important endpoint in the assessment of severely obese patients subjected to weight reduction treatment, the maximum of three points given to this section of the BAROS is equivalent to the subtotal allocated to each of the other two main areas studied, weight loss and changes in comorbidities. It is important to mention that a patient reporting greatly diminished QOL in all areas, as reflected by a high negative score in the questionnaire, should be promptly evaluated for signs of severe postoperative depression because of the possible risk of suicide.

After the evaluation of the three domains is completed, the subtotals are added. However, before the final score is reached, points are deducted for *complications* or *reoperations* without qualifying them as failures. If a major complication required additional surgery, only one point is subtracted. Patients having one major and other minor complications are also deducted only one full point, while postoperative deaths are excluded from the analysis according to the ISBR dominant complication protocol.

The final score is used to classify five *outcome groups* and to define the concept of success or failure: more than seven points represents an excellent result, > five to seven points a very good result, > three to five points a good result, and > one to three points a fair result. A final score of one point or less signifies a failure of the treatment. Examples of the use of the BAROS to classify outcomes are shown in Table 3. The second case shows a hypothetical super-obese male who lost only 45% of his excess weight. According to some definitions of success, this could be considered a poor result or even a failure. However, his medical conditions and QOL were significantly improved, hence the appropriate outcome classification of "good result" obtained through the BAROS. In the unlikely situation of a patient suffering no obesity-related comorbidities, the system should be adapted before the outcome groups are calculated, by modifying the scoring key as shown in Table 4.

## Discussion

In several publications, Brodin and associates<sup>16,17,27</sup> discussed at length the current problems with the

analysis of results, citing, among others, the lack of life-table statistics for morbidly obese patients, the lack of uniform standards for reporting results, problems with long-term follow-up, and how to account for patients lost to follow-up in the overall assessment of results. Similar conclusions were reached in 1991 by the NIH Consensus Conference panelists, who mentioned the lack of standards for comparison as one of the key problems in evaluating reports of case series in surgery for severe obesity.<sup>15</sup>

## Weight Loss

Weight loss has been used as the main outcome measure in bariatric surgery for many decades. Since the main criterion for surgical indication has historically been based on the concept of "ideal weight" according to life insurance data, it was reasonable to try to achieve a postoperative weight closest to the desirable weight according to the tables. In the 1960s and 1970s, results were reported as mean weight loss over time, but criteria for success or failure were not established.<sup>1-3</sup>

During the following decade, many surgeons defined their own criteria for a successful operation, creating a plethora of definitions that often differed widely. For example, reporting on the short-lived gastric partitioning procedure, Pace and coworkers<sup>4</sup> considered that 82% of their patients had achieved a successful result, based on the criteria of continued weight loss of at least 2.25 kg (5 lb) per month and continued rapid satiety. In their comparison of gastric bypass versus gastric partition, Pories et al.<sup>5</sup> defined success as a loss of  $\geq 25\%$  of the preoperative weight, a definition similar to that used by MacLean and associates<sup>6</sup> in 1981. This criterion was more strict than the loss of  $>15\%$  of initial weight utilized by Freeman.<sup>7</sup>

Alternatively, other investigators used percentage of excess weight loss as the main outcome measure.<sup>8-12</sup> However, Mason<sup>12</sup> defined success as a loss of  $>25\%$  of the excess weight, while Halverson<sup>11</sup> preferred a threshold of 50% of the excess weight, a criterion 100% higher than the former.

In 1982, Reinhold<sup>13</sup> proposed an interesting but not widely accepted classification of weight loss, introducing another parameter: final weight as percentage within the ideal. He used quartiles of the percentage within ideal weight to classify his results into categories: excellent, good, fair, and poor. Failure was defined as a postoperative weight  $>100\%$  over the ideal. A year later, Lechner and Elliott<sup>14</sup> published still different criteria, considering a loss

**Table 3.** Use of the BAROS to classify outcome groups

	Preoperative	Postoperative	Points
Example 1. Female; age, 45 years; height, 165 cm (5'5"); weight, 122 kg (270 lb); BMI, 45 kg/m <sup>2</sup> ; ideal weight, 61 kg (135 lb); excess weight, 61 kg (135 lb)	100% excess	Lost 70%	2
	Type II DM	Resolved	3
	Incontinence	Resolved	
	Low self-esteem	Much better	2.5
	Activities	Improved	
		Total	7.5
	<b>Outcome score</b>	<b>Excellent</b>	
Example 2. Male; age, 45 years; height, 183 cm (6'); weight, 185 kg (410 lb); BMI, 55 kg/m <sup>2</sup> ; ideal weight, 74 kg (164 lb); excess weight, 111 kg (246 lb)	150% excess	Lost 45%	1
	Sleep apnea/OHS	Resolved	2
	Hypertension	Improved	
	Dyslipidemia	Improved	2
	Self-esteem	Better	
	Activities	Improved	
	Total	5	
	<b>Outcome score</b>	<b>Good</b>	

OHS, obesity hypoventilation syndrome.

of ≥80% of the excess weight as an excellent result, a loss of 50% to 80% as a good result, and <50% as a poor result. None of these definitions was selected by a significant number of respondents to the survey previously discussed.<sup>18</sup>

The BAROS analyzes weight loss in an objective fashion, avoiding the use of this single criterion to define success or failure. Percentage of excess weight lost over time was selected because it is widely used in the literature and is accurate in the morbidly obese. The scale, divided in quartiles as in Reinhold's classification, is easy to use, and surgeons are familiar with it. Although we recognize that this expression of weight loss is perhaps not the most stringent for the analysis of super-obese patients, several objections can be raised against such a criticism.<sup>17,27</sup>

First, the morbidly obese population constitute the large majority of surgical series. Second, super-obese patients probably have stronger genetic influences that differentiate them from other groups. Third, there is scant information in actuarial life-tables statistics in severe obesity, and there are no available data to examine the "optimal" or "appropriate" amount of weight reduction necessary for

the improvement in life expectancy in the morbidly obese. Hence, it would be unrealistic to expect the super-obese patient to reach an optimal weight "within ideal weight" or "within ideal body mass index (BMI)." Last, it is our belief that the assessment of changes in medical conditions and QOL, as included in the BAROS, are more important criteria for outcome evaluation in the super-obese than weight loss per se.

### Improvement of Medical Conditions

It has become clear that weight loss is insufficient as a single outcome in bariatric treatments. The ultimate goal of weight reduction is the improvement of medical conditions related to obesity, with the long-term aim of reducing mortality while enhancing the psychologic and socioeconomic well-being of the patient. Brolin et al.<sup>22</sup> introduced the concept of accounting for the improvement of medical problems in the outcome definition when reporting results in bariatric surgery. Their patients were divided into three outcome groups according to weight loss and improvement or resolution of comorbidities. As indicated earlier, they recommended assessing weight loss in comparison with the ideal weight as a more stringent method of evaluation than comparing it with preoperative weight, particularly in super-obese patients.<sup>27</sup>

Several problems regarding this issue were encountered while the BAROS was being developed. First, morbid obesity can affect practically every organ system in various degrees of severity. Even an

**Table 4.** BAROS modified scoring key to classify outcome groups in patients with no comorbidities

Failure	0 points or less
Fair	>0 to 1.5 points
Good	>1.5 to 3 points
Very good	>3 to 4.5 points
Excellent	>4.5 to 6 points

exhaustive list of comorbidities could not cover all possibilities. Second, defined diagnostic criteria should be used to avoid observer's bias in the preoperative assessment and in the evaluation after intervention. Third, a classification of severity according to health risks needed to be established. Finally, it was necessary to clarify the terms *resolution* and *improvement*.

We decided to use the comprehensive work performed by the development committee members convened in 1996 at the request of the Shape Up America! Foundation and the American Obesity Association.<sup>23</sup> In "Part 1: Assessment of Patient's Health Risk," they defined a comorbid condition as "any condition associated with obesity that (1) usually worsens as the degree of obesity increases and (2) often improves as the obesity is successfully treated." They included an additional four medical problems that "become comorbid conditions when they impair or diminish QOL or require chronic treatment." We arbitrarily decided to categorize these problems as minor, with the understanding that in certain circumstances any of these diseases may constitute a major medical problem. Physicians using the BAROS should use appropriate medical judgment when evaluating these particular cases. Furthermore, our definitions of *resolution* and *improvement* should be reevaluated and perhaps modified after the system has been tried in clinical settings.

### Complications and Reoperations

To further complicate the issues previously discussed, it is not clear in the evaluation of outcomes how to account for reoperations caused by complications, or by failure to lose a satisfactory amount of weight after bariatric surgery. In the survey conducted among selected members of the ASBS, half of the respondents considered a reoperation to be a failure, whereas the other half did not.<sup>18</sup> There was general agreement that the number and percentage of reoperations should be included in the report, although few supported using the reoperation rate per year, as proposed by Mason.<sup>24</sup> Another advantage of the BAROS is the objective evaluation of reoperations by deducting points from the subtotal score, without qualifying them as failures.

The assessment of complications presents a difficult problem, similar to the one encountered when comorbidities are analyzed. First, since the outcome system is intended to report both early and long-term results, late complications should be included along with perioperative events. Second, a complete

list of possible complications with different degrees of severity is impractical. Third, classifying them into major and minor complications is relatively subjective and depends on the bias of the observer, who could subconsciously downgrade the severity of a complication to diminish the deduction of points in the final analysis of the results.

To obviate these dilemmas, the BAROS incorporates the definitions of major and minor complications used by the IBSR, according to postoperative length of stay. It should be mentioned, however, that in many countries outside the U.S.A., the hospital stay is often >7 days even in the absence of complications. Once again, the surgeon's clinical judgment, impartiality, and objectivity should be exercised when this system is used to report outcomes.

### Quality-of-Life in Obesity

Two other recommendations made at the NIH Consensus Conference concerned QOL considerations after surgery and the development of standardized, reliable, and valid questionnaires with which to evaluate patients' expectations about changes and the psychosocial changes actually experienced during weight loss and maintenance.<sup>15</sup> Echoing these comments, in the ASBS Distinguished Guest Lecture at the Dallas meeting the same year, Yale<sup>28</sup> emphasized the need for more information on a variety of parameters that constitute QOL.

The first difficulty encountered in reviewing the extensive current literature on this subject is the lack of a clear, concise definition of the term *QOL*. In brief, it is the subjective value that an individual places upon satisfaction with his or her life.<sup>20</sup> More specifically, the term *health-related QOL* (HRQL) refers to the physical, psychologic, and social domains of health, seen as distinct areas influenced by a person's experience, beliefs, expectations, and perceptions.<sup>29</sup> Consequently, the concept is intrinsically subjective and difficult to quantitate. Furthermore, QOL is a dynamic personal assessment continually changing over time, which complicates the process of measurement. This is particularly important because of the frequency of weight regain years after medical intervention for weight loss, including bariatric surgery. Regaining weight carries the risk of return or aggravation of comorbidities as well as deterioration in QOL. Another complicating factor is the impossibility of separating the individual patient from the socioeconomic and environmental influences that constantly affect one's perception of well-being.

Objective assessment of health status by use of multiple instruments has been attempted. Many of them include the evaluation of functional capacity in the performance of activities of daily living (ADL), while others try to quantitate socioeconomic factors by the use of econometric techniques.<sup>30</sup> Additionally, innumerable surveys, questionnaires, and psychologic forms have been used to assess subjective aspects of QOL; several of them were designed to study the morbidly obese population before and after surgery. A thorough review of the surgical literature was published by Vallis and Ross.<sup>31</sup>

Among the most elaborate general health measures developed for these purposes, useful in the morbidly obese, are the Sickness Impact Profile (SIP), the Quality of Well-Being Scale (QWB), and the Nottingham Health Profile (NHP).<sup>20</sup> However, these instruments are not suitable for frequent evaluation of the postoperative patient because of their length and the difficulties in follow-up. For example, the SIP covers 136 items and takes ~30 min to complete; the QWB scale has 50 questions, takes 10–15 min, and requires a trained interviewer; and the NHP is self-administered and can be completed in 10 min. A recent publication from Sweden reported normal QOL after gastroplasty, using a still different survey, the 112-item Gothenburg Quality of Life Scale, to compare gastroplasty patients with a matched control group after cholecystectomy.<sup>32</sup>

Numerous measures were also developed by the Rand Corporation as part of the Medical Outcomes Study. The Rand 36-Item Health Survey (SF-36) is probably the most widely used and validated, and thus was adopted by the International Bariatric Surgery Registry.<sup>20</sup> The SF-36 is three pages long and includes 36 questions, each with three to six optional answers. It has also been used successfully as a baseline evaluation in nonsurgical treatments of obesity.<sup>33</sup> Although it takes ~10 min to complete, the response rate to the survey among IBSR members was only 53.1%. The University of Iowa Hospitals and Clinics, the site of the registry, had a 40% response rate to the even shorter form SF-12 (Kathleen Renquist, IBSR Manager, personal communication).

It thus seems obvious that a simpler, shorter survey is necessary to improve patients' response rate in this particular population, especially if a frequent and dynamic long-term assessment after medical intervention is desired. Short-form questionnaires need to be validated by appropriate psychometric techniques for reliability, consistency, robustness, and reproducibility.<sup>34</sup> The questionnaires have to be reliable (yield consistent value), valid (target what they claim to measure), responsive (detect changes

over time), and sensitive (reflect true changes in individual patients).<sup>35</sup> However, as Kral et al.<sup>30</sup> pointed out, it is difficult to strike a balance between practicality and thoroughness of evaluation when developing or selecting an instrument to evaluate the elusive concept of QOL.

Here lies one of the most difficult dilemmas in evaluating the results of obesity surgery. Do we select an elaborate, comprehensive QOL instrument and risk a poor response rate, or do we rather opt for a short and simple survey that is more likely to be answered?

The Moorehead–Ardelt QOL Questionnaire included in the BAROS covers, in a single page, five areas commonly addressed by many other instruments. The colored illustrations are designed to motivate and facilitate the completion of the test in <1 min regardless of educational level or cultural background. Additionally, the short legends under each option can be easily translated to other languages, eliminating the cross-cultural and linguistic factors that influence the reliability of this type of instrument.<sup>19</sup> This QOL measure can also be used independently of the outcome system, as shown in Appendix 3. Since medical conditions related to obesity are objectively evaluated by the BAROS in a separate domain, we believe it is unnecessary to include repetitive questions regarding comorbidities in the patient's own assessment of QOL, as most other instruments do.

While the questionnaire was designed specifically for the evaluation of changes after bariatric surgery, it can also be used after other types of interventions for weight loss. In the process of developing the outcome system, one of the objectives was to create an assessment tool that could be used in other disciplines within the bariatric field.

Consequently, the BAROS can be easily adapted to other forms of medical intervention for the control of obesity. It has been shown in the nonsurgical literature that a 10% reduction in body weight is likely to be associated with improvements in physical and psychological health.<sup>36</sup> Such a small amount of weight loss would be considered unsatisfactory after surgery; therefore, it would score low in the first domain of the BAROS. However, since the likelihood of complications after conservative treatments is diminished, and reoperations would certainly not apply, the lesser chances of point deductions would compensate for the lower weight loss in the final outcome analysis. If this assumption is validated, our outcome system could be useful for comparing conservative weight loss methods with surgical methods.

## Conclusions

In a review of the bariatric surgical literature for the past 40 years, one conclusion becomes obvious: As clearly stated by the 1991 NIH Consensus Conference panelists, better statistical reporting of results is urgently needed. The assessment of outcomes after surgical intervention for severe obesity should not be restricted to the evaluation of weight loss but should also include the improvement of medical conditions related to overweight, and the changes in QOL indicators that patients experience during the phases of weight loss and maintenance. Additionally, reporting of complications and reoperations needs to be included.

Numerous investigators have called for the development of standards for comparison and for uniform definitions of success and failure. However, we disagree with Griffen's statement in his 1993 lecture to the ASBS: "If the National Bariatric Surgery Registry only accomplish a standard method of reporting results of obesity operations it would have served its purpose well."<sup>37</sup> The Registry has many other important functions in the field of bariatric surgery, but setting standards is not one of them. Instead of criticism, the Registry, now International, needs the support of more members of the different societies to continue the prolific work that it has performed since its creation.

We prefer to agree wholeheartedly with the opinion of MacLean in the last paragraph of his lecture to the same group in 1996: "This society (ASBS) should establish definitions for success and how we should report our results uniformly. I favor a method that quantitates results in each patient."<sup>38</sup> It is our opinion that the Bariatric Analysis and Reporting Outcome System (BAROS) fulfills all the requirements previously discussed, in a simple, unbiased, surgeon-friendly and patient-friendly fashion; based on medical evidence; and objectively. After proper trials and validation in clinical settings, now in progress, we believe that the BAROS should be adopted by bariatric societies to standardize at last the reporting of outcomes.

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## Appendix 1

Early and late complications after bariatric surgery. Guidelines for using the BAROS. A major complication is defined by an event resulting in a hospital stay  $\geq 7$  days.

### I. Surgical Complications

#### A. Major

##### 1. Early

- GI leak with peritonitis or abscess, severe wound infection, dehiscence
- Intraperitoneal hemorrhage, gastrointestinal bleeding requiring transfusion
- Spleen injury requiring splenectomy/ other severe organ injury, severe ileus
- Bowel obstruction, volvulus/closed loop syndrome, acute gastric dilation

##### 2. Late

- Complicated peptic ulcer disease
- Cholelithiasis, incisional hernia, staple line disruption, gastro-gastric fistula, or band erosion requiring reoperation
- Rehospitalization for severe protein deficiency or other nutritional problems

#### B. Minor

##### 1. Early

- Seroma, minor wound/skin infection, stomal edema

##### 2. Late

- Stomal stenosis, electrolyte imbalance, persistent vomiting or nausea
- Esophagitis, Barrett's esophagus, marginal ulcer, peptic ulcer disease

### II. Medical Complications

#### A. Major

##### 1. Early

###### *Pulmonary*

- Pneumonia, severe atelectasis, respiratory insufficiency, pulmonary edema
- Pulmonary embolism, adult respiratory distress syndrome (ARDS)

###### *Cardiovascular*

- Myocardial infarction, congestive heart failure, stroke

###### *Renal*

- Acute renal failure

- Psychiatric*  
Severe postoperative depression; psychosis
- 2. Late
  - Hepatic*  
Hepatic failure, cirrhosis
  - Psychiatric*  
Anorexia nervosa, bulimia, major depression

- B. Minor
  - 1. Early
    - Atelectasis, urinary tract infection, deep venous thrombosis without embolism
    - Electrolyte imbalance, vomiting, esophagitis
  - 2. Late
    - Anemia, metabolic deficiency (vitamins/minerals/protein), hair loss

**Appendix 2**

**MOOREHEAD - ARDELT QUALITY OF LIFE QUESTIONNAIRE  
SELF ESTEEM, AND ACTIVITY LEVELS**

Please make a check  to show how your life has changed after your weight loss.

1. Compared to the time before my weight loss treatment I feel...



Much Worse  
About Myself



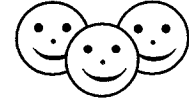
Worse  
About Myself



The Same  
About Myself



Better  
About Myself



Much Better  
About Myself

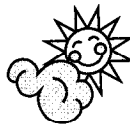
2. I am able to participate physically in activities...



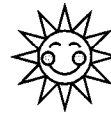
Much Less



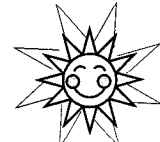
Less



The Same



More



Much More

3. I am willing to be involved socially...



Much Less



Less



The Same



More



Much More

4. I am able to work... z z z



Much Less



Less



The Same



More



Much More

5. I am interested in sex...



Much Less



Less



The Same



More



Much More

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**Figure 2.** Moorehead–Ardelt Quality of Life Questionnaire.

