

Bulimia Nervosa Treatment: A Systematic Review of Randomized Controlled Trials

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ABSTRACT

Objective: The RTI International-University of North Carolina at Chapel Hill Evidence-based Practice Center systematically reviewed evidence on efficacy of treatment for bulimia nervosa (BN), harms associated with treatments, factors associated with treatment efficacy, and differential outcome by sociodemographic characteristics.

Method: We searched six major databases published from 1980 to September 2005 in all languages against a priori inclusion/exclusion criteria; we focused on eating, psychiatric or psychological, and biomarker outcomes.

Results: Forty-seven studies of medication only, behavioral interventions only, and medication plus behavioral interventions for adults or adolescents met our inclusion criteria. Fluoxetine (60 mg/day) decreases the core symptoms of binge eating and purging and associated psychological features in the short term. Cognitive behavioral therapy reduces core be-

havioral and psychological features in the short and long term.

Conclusion: Evidence for medication or behavioral treatment for BN is strong, for self-help is weak; for harms related to medication is strong but either weak or nonexistent for other interventions; and evidence for differential outcome by sociodemographic factors is nonexistent. Attention to sample size, standardization of outcome measures, attrition, and reporting of abstinence from target behaviors are required. Longer follow-up intervals, innovative treatments, and attention to sociodemographic factors would enhance the literature. © 2007 by Wiley Periodicals, Inc.

Keywords: bulimia nervosa; eating disorders; clinical trials; evidence based review; purging; eating disorder inventory; cognitive behavioral therapy; behavioral intervention trials; second-generation antidepressants

(*Int J Eat Disord* 2007; 40:321–336)

Introduction

Bulimia nervosa (BN) is characterized by recurrent episodes of binge eating in combination with some form of inappropriate compensatory behavior. Binge eating is the consumption of an abnormally large amount of food coupled with a feeling of

being out of control. Compensatory behaviors (aimed at preventing weight gain) include self-induced vomiting; the misuse of laxatives, diuretics, or other agents; fasting; and excessive exercise. A recent review estimated the prevalence of BN to be 1% for women and 0.1% for men across Western Europe and the United States.¹ The prevalence of subthreshold BN was considerably higher: 1.5% for full syndrome and 5.4% for partial syndrome. We (the RTI International-University of North Carolina at Chapel Hill Evidence-based Practice Center; RTI-UNC EPC) conducted an evidence-based review of randomized controlled trials (RCTs) for BN. Here, we present those results, identify gaps and shortcomings in the literature, and provide recommendations for future research.

Method

Four key questions guided the review of the BN treatment literature:

1. What is the evidence for the efficacy of treatments or combinations of treatments for BN?

Accepted 2 January 2007

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Supported by 290-02-0016 from Agency for Healthcare Research and Quality and by RTI International-University of North Carolina Evidence-based Practice Center.

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Published online 16 March 2007 in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/eat.20372

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TABLE 1. Criteria for searches on treatment of bulimia nervosa

Category	Criteria
Study population	Humans. All races, ethnicities, and cultural groups. 10 years of age or older.
Study settings and geography	All nations.
Time period	Published from 1980 through September 2005.
Publication criteria	Included: • All languages. • Articles in print. Excluded: • Articles in gray literature or nonpeer-reviewed journals or unobtainable during the review period.
Admissible evidence (study design and other criteria)	Original research studies that provide sufficient detail regarding methods and results to enable use and adjustment of the data and results. Bulimia nervosa must be diagnosed according to DSM III-R, DSM IV, or ICD-10 criteria. Eligible study designs include randomized controlled trials (RCTs). Double-blinded, single-blinded, and cross-over designs (we report data for the portion of the trial completed before the first cross-over). Initiated with 30 or more patients and followed for a minimum of 3 months.

DSM, Diagnostic and Statistical Manual, third version (revised) or fourth version; ICD, International Classification of Diseases.

2. What is the evidence of harms associated with the treatment or combination of treatments for BN?
3. What factors are associated with efficacy of treatment among patients with BN?
4. Does the efficacy of treatment for BN differ by sex, gender, age, race, ethnicity, or cultural group?

The complete methodology for this review, supported by the Agency for Healthcare Research and Quality (AHRQ), is presented in Bulik et al. (this volume) and in the full evidence report on management of eating disorders (available at www.ahrq.gov/clinic/tp/eatdistp.htm), which also covered treatment of anorexia nervosa and of binge eating disorder and epidemiology and outcomes of all three disorders. Specifically for the BN review, we first generated a list of article inclusion and exclusion criteria, limiting our review to human studies that included participants aged 10 years and older and to those published from 1980 to the present (Table 1). We excluded data that combined eating disorders and that came from study populations without a primary diagnosis of BN. We examined three sets of outcome measures: eating, psychiatric and psychological, and biomarkers.

Inclusion and Exclusion Criteria

Our a priori inclusion and exclusion criteria (Table 1) were broad but excluded data that combined eating dis-

orders because we could then not separately examine BN outcomes. Outcome categories included eating, psychiatric and psychological, and biomarker measures.

Results

We identified 47 studies reported in 58 publications addressing treatment efficacy for BN. Primary outcome measures included reduction of and abstinence from binge eating and purging, as these are the core behavioral features of BN. Secondary outcomes included reductions in the psychological features of BN (e.g., body dissatisfaction, bulimia, drive for thinness). Additional psychiatric outcomes include reductions in depression and anxiety. Biomarker outcomes included changes in body mass index (BMI).

We do not discuss here the 10 studies with a quality rating of "poor."²⁻¹¹ The most frequent deficiencies contributing to a poor rating included some combination of the following: a fatal flaw in the approach to randomization or the approach not being described, assessors not being blinded or their blinding status not being described, adverse events not being reported, outcomes not being reported using an intention-to-treat approach, the statistical analysis not including a power analysis or not stating whether one was conducted, and concerns in relation to the external validity of the findings (the study population was not representative of the US population or the information provided was insufficient to determine representativeness).

Medication Trials for Bulimia Nervosa

We rated two medication trials as good^{12,13} and 10 as fair.¹⁴⁻²³ The medications studied included second generation antidepressants,^{13-17,19,21,22,24} tricyclic antidepressants,²³ an anticonvulsant,^{18,25} monoamine-oxidase inhibitors (MAOIs),²⁰ and a 5HT3 antagonist (Table 2).¹²

The total number of participants in these 12 trials was 1,430. The number of participants per trial ranged from 26 to 398. Based on studies that reported participants' sex, the study population included 1,364 women and 21 men. The age of participants ranged from 16 to 55. Two trials reported participants' race; in these, 521 individuals were reported as white and 27 as nonwhite.

Fluoxetine. Six trials compared fluoxetine to placebo in outpatient and inpatient settings. The mean age of participants was mid-twenties; no studies of fluoxetine focused exclusively on adolescents.

TABLE 2. Results from medication trials for bulimia nervosa

Source, Treatment, Sample Size, Quality Score	Study Location and Setting, Percentage Female, Age	Significant Differences Between Groups
Beumont et al., ¹⁴ fluoxetine vs. placebo, enrolled: 67, dropouts: 40%, fair	Australia: outpatient; female: 100%; age mean (SD)—fluoxetine: 24.2 (4.5), placebo: 25.1 (5.8)	At endpoint: Fluoxetine associated with lower restraint, weight concern, and shape concern at week 8. Change over time: Significant difference on weight measure at 8 weeks with weight decreasing in fluoxetine group and increasing in placebo group. Fluoxetine group regained weight above baseline at followup; placebo group did not.
Fichter et al., ¹³ fluoxetine vs. placebo, enrolled: 39, dropouts: 0%, good	Germany: inpatient; female: 98%; fluvoxamine: 93%; placebo: 88%; age mean— fluoxetine: 26.5, placebo: 24.6	At endpoint: No differences on any measures. Change over time: No differences on any measures.
Fluoxetine BN Collaborative Study Group, ¹⁶ fluoxetine (20 mg) vs. fluoxetine (60 mg) vs. placebo, enrolled: 387, dropouts: 30%, fair	US and Canada: outpatient; female: 100%; age mean (SD)—fluoxetine (20 mg): 27.4 (7.2), fluoxetine (60 mg): 26.4 (6.2), placebo: 27.7 (8.0)	At endpoint: Fluoxetine (60 mg) associated with greater reductions in binge eating and vomiting than fluoxetine (20 mg) or placebo. Fluoxetine (60 mg and 20 mg) associated with greater reductions in vomiting, weight, drive for thinness, bulimic intensity, carbohydrate craving, body dissatisfaction, and food and diet preoccupation than placebo. Fluoxetine (60 mg) associated with greater reductions in depressed mood, drive for thinness, oral control, and bulimia scores than placebo. Change over time: Not reported
Goldstein et al., ¹⁷ fluoxetine vs. placebo, enrolled: 398, dropouts: 43%, fair	US: outpatient; females: 96%; age range—fluoxetine: 17–63, placebo: 17–61	At endpoint: Fluoxetine associated with greater median percentage reduction in vomiting (at weeks 1–10, 13, 16, and endpoint) and binge eating (at weeks 1–9, 13, 16, and endpoint); greater reduction in total bulimia symptoms, drive for thinness global symptoms scores, and weight; greater treatment response ($\geq 50\%$ improvement in bulimic episodes). Change over time: Not reported
Kanerva et al., ¹⁹ fluoxetine vs. placebo, enrolled: 50, dropouts: 8%, fair	Finland: outpatient; female: 100%; age mean: 25.2	At endpoint: Not reported Change over time: Fluoxetine associated with greater reduction in depressed and anxious mood, bulimia and food preoccupation over 8 weeks. Difference in weight with decrease in fluoxetine group and increase in placebo group.
Romano et al., ²¹ fluoxetine vs. placebo, enrolled: 150, dropouts: 87%, fair	US: outpatient; female: 98%; age mean (SD)—fluoxetine: 29.5 (7.0), placebo: 30.0 (9.3)	At endpoint: Not reported Change over time: Fluoxetine group had smaller mean increases in vomiting, binge eating, total ED behavior, ritual, preoccupation and symptom severity. Relapse occurred less frequently in the first 3 months of 52-week extended treatment period.
Fichter et al., ^{15,26} fluvoxamine vs. placebo, enrolled: 72, dropouts: 33%, fair	Germany: outpatient; female: 100%; age mean (SD)—fluvoxamine: 25.2 (4.9), placebo: 23.7 (5.1)	At endpoint: Fluvoxamine associated with higher binge abstinence rate, reduced clinical severity, and lower relapse rate. Change over time: Fluvoxamine superior in limiting increases in bulimic behavior (urge to binge, vomiting), global ED symptoms (SIAB total), EDI bulimia scores, fear of losing control, obsessive-compulsive symptoms, and, global severity during 12 week post-discharge relapse prevention phase.
Pope et al., ²² trazadone vs. placebo, enrolled: 46, dropouts: 9%, fair	US: outpatient; female: 100%; age mean (SD): 26.0	At endpoint: Trazadone associated greater percent decrease in binge and vomit frequencies and decrease in fear of eating and increase in self-esteem. Change over time: Not reported

TABLE 2. continued

Source, Treatment, Sample Size, Quality Score	Study Location and Setting, Percentage Female, Age	Significant Differences Between Groups
Hoopes et al.; Hedges et al., ^{18,25} topiramate vs. placebo, enrolled: 68, dropouts: 41%; fair	US: outpatient; female: 97%; age mean (SD)—topiramate: 29.0 (9.7), placebo: 29.6 (8.1)	At endpoint: Topiramate associated with greater percentage reduction in weekly number of binge and purge days, carbohydrate craving score, bulimic intensity, lower mean global symptoms and symptom intensity; and greater mean weight reduction. Change over time: Larger percentage of topiramate group achieved moderate (>50% reduction) or marked (>75% reduction) improvement in weekly binge/purge days. Change over time: Topiramate superior to placebo in reducing uncontrolled eating, body dissatisfaction, dieting, food preoccupation, and anxious mood, and in increasing patient-rated percent improved.
Kennedy et al., ²⁰ brofaromine vs. placebo, enrolled: 36, dropouts: 21%; fair	Canada: outpatient; female: 100%; age mean (SD)—brofaromine: 27.6 (6.7), placebo: 25.9 (6.4)	At endpoint: Brofaromine associated with greater reduction in vomiting episodes. A greater percentage of brofaromine group lost >1 kg of weight. A greater percentage of placebo group gained >1 kg of weight. Change over time: Not reported
Faris et al., ¹² ondansetron vs. placebo, enrolled: 26, dropouts: 4%; good	US: outpatient; female: 100%; age mean (SD): 29.1 (6)	At endpoint: Ondansetron associated with lower binge/purge frequency at week 4. Change over time: Ondansetron superior in reducing binge/vomit frequency and time spent engaging in BN behaviors and in increasing normal meals over 4 weeks.
Walsh et al., ²³ desipramine vs. placebo, enrolled: 78, dropouts: 19%; fair	US: outpatient; female: 88%; age mean (SD)—sibutramine: 35.2 (9.0), placebo: 36.6 (10.2)	At endpoint: Desipramine associated with fewer binge and vomiting episodes per week, fewer ED symptoms and body shape concerns, lower BMI, fewer symptoms of depression, global symptoms, and obsessive/compulsiveness, less hostility and trait anxiety. Change over time: Not reported

BMI, Body mass index; BN, bulimia nervosa; ED, eating disorder; kg, kilogram; mg, milligram; SIAB, structured interview for anorexia nervosa and bulimic syndromes, SD, standard deviation; US, United States; vs., versus.

Overall, fluoxetine (60 mg/day) administered for between 8 and 16 weeks led to significant reductions in binge eating in most^{14,16,17,21} but not all studies.^{13,19} Fluoxetine (60 mg/day) also performed significantly better than fluoxetine (20 mg/day) in decreasing binge eating.¹⁶ No effect of fluoxetine (60 mg/day) compared with placebo was observed in the one study in which patients were already receiving intensive inpatient psychotherapy.¹³ Fluoxetine (60 mg/day) was superior to placebo in decreasing purging behavior,^{14,16,17,21} although not in the inpatient setting.¹³ All six fluoxetine trials either failed to report abstinence rates or did not report whether abstinence rates differed significantly between drug and placebo groups.

With reference to eating-related attitudes, fluoxetine (60 mg/day) was associated with significant improvements in measures of restraint, weight concern, and food preoccupation and with eating disorders inventory (EDI) subscale scores of bulimia, drive for thinness, and body dissatisfaction.^{14,16,17,21} Again, the exception was one study conducted in an inpatient setting.¹³

Fluoxetine had mixed results on depression and anxiety. Some studies showed greater efficacy than placebo in decreasing depression scores,^{16,19} whereas others did not.^{13,14,17,21}

Romano et al. explored the efficacy of fluoxetine (60 mg/day) versus placebo in preventing relapse of BN over 52 weeks.²¹ Relapse rates were significantly lower for those receiving fluoxetine (33%) than for those receiving placebo (51%). However, dropout was substantial (83% and 92% in the fluoxetine and placebo groups, respectively).

Drop-out rates in fluoxetine arms of these trials ranged from zero (in an inpatient study) to 83%. In one study, dropout was greater in the fluoxetine than in the placebo group,¹⁴ in three studies placebo had greater attrition,^{16,17,21} and one inpatient study reported no dropout in either group.¹³

Fluvoxamine. To compare maintenance of therapeutic gains and prevention of relapse of BN after inpatient treatment, Fichter et al. compared fluvoxamine (average dose 182 mg/day) with placebo

for 19 weeks with medication started before discharge.¹⁵ Patients treated with fluvoxamine reported fewer urges to binge, lower frequency of vomiting, and lower depression scores than those receiving placebo. Both groups gained weight, with no differences between groups. Although fluvoxamine was associated with a lower relapse rate, attrition was higher relative to placebo (51% vs. 14%, respectively).

Trazodone. In a 6-week trial of trazodone (400 mg) versus placebo, trazodone led to significantly greater decreases in the frequency of binge eating and vomiting and in fear of eating.²²

Tricyclic Antidepressants. In a 6-week trial, desipramine (200–300 mg/day) was significantly more effective than placebo in decreasing binge eating, vomiting, and scores on the eating attitudes test (EAT) and body shape questionnaire (BSQ).²³ Drop-out was 23% and 16% in the desipramine and placebo groups, respectively. Abstinence rates from binge eating and purging did not differ between groups. Both self-reported depression and anxiety were significantly decreased in the desipramine group compared with the placebo group; clinician-rated depression did not differ significantly. Anecdotally, the desipramine group lost significantly more weight than the placebo group, who tended to gain weight.

Anticonvulsants. A 10-week trial of topiramate (mean dose 100 mg/day) led to significantly greater reductions than placebo in number of binge/purge days and in body dissatisfaction, drive for thinness, and EAT scores.^{18,25} Abstinence rates from binge eating and purging were 23% for topiramate and 6% for placebo (not significantly different). Drop-out was 34% from topiramate and 47% for placebo. Topiramate was associated with significant reductions in anxiety and participants on topiramate lost significantly more weight than the placebo group, who tended to gain weight.

MAOI. One 8-week trial of brofaromine (mean dose 175 mg/day) revealed no differences between the active drug and placebo on binge eating or psychological features of the eating disorder.²⁰ Brofaromine did lead to significant reductions in vomiting frequency. No differences between groups were observed in abstinence from binge eating and vomiting, depression or anxiety scores, weight change, or attrition (21% brofaromine and 24% placebo).

5HT₃ Antagonist. In a 4-week trial of ondansetron versus placebo (self-administered upon urge to binge or vomit), the active drug led to significantly greater decreases than placebo in binge and vomit frequencies and time spent engaging in bulimic behaviors, and to significant increases in normal meals.¹² No differences in weight change emerged

between groups. One patient dropped out from ondansetron, but none from placebo.

When reported, abstinence rates in medication-only trials suggest that medication treatment leads to abstinence in a minority of individuals. This finding indicates that although bulimia symptoms improved, they nonetheless persisted. Drop-out rates in medication trials ranged from zero to 51%. No drug showed substantially greater attrition than others.

Medication Plus Behavioral Intervention Trials

A total of six combination studies were reviewed (**Table 3**). Two were rated as good^{29,33} and four as fair.^{30–34} The total number of individuals enrolled was 1,895. The number of participants in the trials ranged from 71 to 120. No men participated. Age ranged from 18 to 46. Three trials reported race or ethnicity of participants: 272 individuals were white, 7 non-white, 2 Hispanic, 8 African American, and 7 Asian.

Second-Generation Antidepressants and Cognitive Behavioral Therapy. Three trials used fluoxetine as the drug intervention. Comparing fluoxetine (60 mg/day) to CBT only and to fluoxetine (60 mg/day) plus CBT in a 12-week trial, Goldbloom et al. used intention-to-treat analyses and found no difference across groups on eating-related measures.²⁷ In completers, all three interventions led to significant improvement in core bulimic symptoms; however, both combined treatment and CBT alone led to greater decreases than fluoxetine alone in objective and subjective binges and vomiting episodes. Abstinence rates, depression scores, and weight did not differ across groups. Dropout was highest in combined treatment (55%) versus fluoxetine (39%) and CBT only (35%).

Walsh et al.³³ compared fluoxetine (60 mg/day) with placebo, each with or without self-help in the form of a cognitive-behavioral self-help book.³⁵ Fluoxetine (either alone or with self-help) was associated with significantly decreased objective binge episodes, vomiting, restrained eating, and depression. The self-help book had no independent effect. No differences emerged on weight change. Dropout was high: 54% in fluoxetine plus guided self-help to 88% in placebo plus guided self-help.

Using the same design, Mitchell et al. found fluoxetine to be associated with a significantly greater decrease than placebo in vomiting episodes but not binge eating episodes.²⁸ No significant differences emerged in abstinence rates or depression and self-help had no independent effect. Dropout was low: none in fluoxetine only and fluoxetine plus self-help, 5% in placebo only and placebo plus self-help.

TABLE 3. Results from medication plus behavioral intervention trials for bulimia nervosa

Source, Treatment, Sample Size, Quality Score	Study Location and Setting, Percentage Female, Age	Significant Differences Between Groups
Goldbloom et al., ²⁷ fluoxetine vs. CBT vs. fluoxetine + CBT, enrolled: 76, dropouts: 43%, fair	Canada: outpatient; female: 100%; age mean (SD): 25.8 (5.5)	At endpoint: At treatment completion, CBT alone and fluoxetine + CBT associated with greater percent reduction in vomiting frequency, compared to fluoxetine alone. At 4 weeks post-treatment, fluoxetine + CBT associated with fewer objective binge and vomit weekly episodes compared to fluoxetine alone. CBT associated with fewer subjective binge episodes compared to fluoxetine alone. Note: no significant differences in ITT analyses. Change over time: Not reported
Mitchell et al., ²⁸ fluoxetine vs. placebo vs. self-help + placebo vs. fluoxetine + self-help, enrolled: 91, dropouts: 2% fair	US: outpatient; female: 100%; age, mean (SD) (range): 26.6 (7.1) (18–46)	At endpoint: Fluoxetine, alone and with self-help, associated with greater percentage reduction in vomiting and greater clinician-rated and patient-rated clinical improvement, compared to self help plus placebo or placebo alone, at endpoint (16 week treatment period). Self-help manual plus placebo or fluoxetine associated with greater percentage reduction in vomiting compared to placebo or fluoxetine with no self-help manual, at 4-week time point (after 2 weeks active treatment). Change over time: Not reported
Walsh et al., ²⁹ fluoxetine vs. placebo vs. guided self-help vs. fluoxetine + guided self-help, enrolled: 91, dropouts: 69%, good	US: outpatient; female: 100%; age mean (SD): 30.6 (7.8)	At endpoint: Fluoxetine associated with fewer objective bulimic and vomiting episodes and fewer vomiting days per month, less restraint, less depressed mood, and a lower general symptom index compared to placebo. Fluoxetine only and placebo groups had greater decrease in bulimic episodes than self-help groups. Change over time: Not reported
Agras et al., Agras et al., ^{30,31} desipramine (16 weeks) vs. desipramine (24 weeks) vs. desipramine + CBT (16 weeks) vs. desipramine + CBT (24 weeks) vs. CBT alone (24 weeks), enrolled: 71, dropouts: 25% fair	US: outpatient; female: 100%; age mean (SD): 29.6 (8.9)	At endpoint: Not reported Change over time: Desipramine + CBT superior to medication alone in reducing binge and purge frequency at 16 and 32 weeks, and in reducing diet preoccupation over 16 weeks. Desipramine + CBT superior to CBT alone in reducing hunger disinhibition over 24 weeks, and superior to medication alone in reducing diet preoccupation at 16 weeks. CBT alone superior to desipramine alone for 16 or 24 weeks in reducing binge and purge frequency at 16 weeks. CBT alone or in combination with desipramine for 24 weeks, superior to desipramine for 16 weeks in reducing binge frequency at 1 year followup. Desipramine + CBT for 24 weeks superior to desipramine for 16 weeks in reducing binge frequency, hunger, disinhibition, and diet preoccupation at 1 year followup.
Mitchell et al., ³² IPT vs. fluoxetine (16 weeks) or vs. fluoxetine (8 weeks) followed by desipramine (8 weeks), enrolled: 62, dropouts: 40% fair	US: outpatient; female: 100%; age mean (SD)—IPT: 28.0 (7.3), fluoxetine: 27.1 (6.3)	At endpoint: No differences on any measures Change over time: Not reported

TABLE 3. continued

Source, Treatment, Sample Size, Quality Score	Study Location and Setting, Percentage Female, Age	Significant Differences Between Groups
Walsh et al.; Wilson et al., ^{33,34} CBT + placebo vs. CBT + medication (desipramine only or desipramine followed by fluoxetine) vs. Supportive therapy + placebo vs. Supportive therapy + medication vs. Medication alone, enrolled: 120, dropouts: 34%, good	US; outpatient; female: 100%; age mean (SD)—CBT + placebo: 25.8 (4.4), CBT + meds: 26.1 (5.7), supportive therapy + meds: 28.0 (5.3), supportive therapy + placebo: 26.9 (4.3), meds only: 24.3 (4.5)	At endpoint: Not reported Change over time: CBT groups combined superior to supportive therapy groups combined in reducing binge and vomit episode frequencies. Behavioral interventions plus medication superior to behavioral interventions alone in reducing binge frequency, EAT scores, depressed mood, weight, and in increasing remission rate. CBT plus medication superior to medication alone in reducing binge and vomit frequencies, EAT scores, body image, and increasing remission rate by self-report. Medication alone superior to CBT alone in reducing BMI and weight. Medication alone superior to supportive therapy plus medication in reducing binge and vomit frequency.

BMI, body mass index; BN, bulimia nervosa; CBT, cognitive behavior therapy; EAT, Eating Attitudes Test; IPT, interpersonal psychotherapy; ITT, intention-to-treat; SD, standard deviation; US, United States; vs., versus.

Tricyclic Antidepressants and CBT. One complex trial compared desipramine treatment of different durations with or without CBT (16 vs. 24 weeks) with CBT only.³⁰ The overall drop-out rate was 25%. The 16-week combined treatment was better than desipramine alone only for decreasing binge eating and purging. Longer combined treatment was significantly better than desipramine alone on binge eating, vomiting, dieting preoccupation, and hunger. Abstinence rates and weight change did not differ across groups. At 1-year follow-up, the combined 24-week intervention and CBT alone were both better than the 16-week drug-only treatment in decreasing binge eating and vomiting. The 24-week combined treatment was also superior to 16-week drug-only treatment in decreasing binge frequency, dietary preoccupation, disinhibition, and hunger.³¹ In all but the medication-only group, between 78% and 100% of individuals who were abstinent at the end of treatment remained abstinent at follow-up.

Multiple Drugs and CBT. In a five-group 16-week comparison, Walsh et al. examined CBT plus medication, CBT plus placebo, supportive therapy plus medication, supportive therapy plus placebo and medication only.^{33,34} The overall drop-out rate was 34%. They started patients on desipramine (mean dose 188 mg/day) and switched nonresponders to fluoxetine (60 mg/day) after 8 weeks. Analyses combining all arms of the study that included CBT versus all arms of the study that included supportive therapy indicated that CBT was superior to supportive therapy in reducing binge and vomit episode frequencies. Behavioral interventions plus medication were superior to behavioral interven-

tions alone in reducing binge frequency, EAT scores, depressed mood, weight, and in increasing remission rate.

CBT plus medication was superior to medication alone in reducing binge and vomit frequencies, EAT scores, body image, and increasing remission rate by self-report. Medication alone was superior to CBT alone in reducing BMI and weight. Medication alone was superior to supportive therapy plus medication in reducing binge and vomit frequency. Medication led to significantly greater decreases in depression scores. CBT was associated with greater likelihood of remission.

Mitchell et al. randomized patients who did not respond to CBT to either interpersonal psychotherapy (IPT) or fluoxetine (60 mg/day); patients who did not achieve abstinence on fluoxetine could then be switched to desipramine.³² The two groups did not differ in abstinence. Overall, the sequential second-level treatment (i.e. IPT or fluoxetine) was associated with high dropout.

Similar to drug-only studies, abstinence rates from combination studies suggest that although symptoms improve, they still persist. Attrition rates ranged from zero to 55%. Specific findings suggest that dropout rates were higher in combined treatment and in sequential treatments than in either medication or behavior therapy alone.

Behavioral Interventions for Bulimia Nervosa

Behavioral intervention trials included CBT,^{24,36–45} dialectical behavior therapy (DBT),⁴⁶ and nutritional and stress management (Table 4).⁵² Of the 19 behavioral intervention studies published in 24

articles,^{5–10,24,36–52} we rated 3 as good,^{37,38,46} 10 as fair,^{24,36,40–45,52} and 6 as poor.^{5–10} We also identified five trials of various self-help methods^{11,53–56} (four rated as fair,^{53–56} one as poor),¹¹ and three studies of “other” interventions including active light,⁵⁷ guided imagery,⁵⁸ and crisis prevention⁵⁹ (all three rated as fair).

The total number of individuals enrolled was 1,462. The number of participants per trial ranged from 31 to 220. Of those that reported sex, 1,064 women and two men participated. Age range across all trials was 17 to 64 years. Six trials reported race and ethnicity of participants: in all, 410 patients were white; 22 nonwhite; 28 Hispanic; 26 Asian, Maori, or Pacific Islander; 10 African American; and 1 Native American. In no instance were results analyzed specifically by race or ethnicity group.

Cognitive–Behavioral Therapy. In comparisons of individually administered CBT and IPT tailored for BN, CBT was associated with a significantly greater probability of remission than IPT³⁷ and with greater decreases in vomiting and restraint^{37,41} and binge eating³⁷ at the end of treatment. In one study at 1-year follow up, these differences were no longer apparent.⁴¹ However, when administered in group format, both treatments led to significantly greater decreases than waiting list control on days binged, psychological features of the eating disorder, disinhibition, and restraint, although no differences were observed between CBT and IPT.⁴⁴

When compared directly, both group and individual administration of CBT showed decreases in objective and subjective binge episodes, vomiting, laxative use, overexercise and EDI bulimia, drive for thinness, and body dissatisfaction subscale scores.³⁹ Group CBT was associated with greater decreases in anxiety; individual CBT was associated with significantly higher rates of abstinence.

In studies that attempted to dismantle CBT to determine the “active” ingredients of this multimodal intervention, the cognitive component emerged as critical to therapeutic outcome. Complete CBT, including both cognitive and behavioral components, led to better eating-related outcomes than behavioral therapy components alone,⁴¹ to lower relapse rates than exposure with response prevention (ERP),⁴⁰ and to greater abstinence than a self-monitoring-only intervention.³⁶ ERP is a treatment in which patients are exposed to either high-risk binge or high-risk purge cues and the “response”—either binge eating or purging is prevented until certain criteria are met. Two studies examined the additive efficacy of ERP to a core of cognitive or

cognitive–behavioral therapy. Agras et al. found no additive benefit of ERP to CBT.³⁶ Similarly, Bulik et al. found no evidence of added efficacy when augmenting cognitive therapy with ERP.³⁸

In other comparisons, cognitive therapy performed better than support only; adding a cognitive component to nutritional counseling led to a significantly greater decrease in drive for thinness than nutritional therapy alone.⁴⁷ CBT was superior to nutritional counseling alone in improving core binge eating, vomiting, laxative use, and body dissatisfaction. CBT also led to significantly greater decreases than supportive-expressive therapy (a nondirective psychodynamically oriented treatment) in EDI bulimia, EAT scores, food preoccupation, eating concerns, and depression.²⁴ Exercise therapy was superior to CBT at 18-month follow-up in improving drive for thinness, laxative abuse, and binge eating.⁴³

Overall, dropout from CBT delivered individually or in group format ranged from 6% to 37%. Typical rates were about 25% of individuals randomized.

Other Behavioral Interventions. Both nutritional and stress management led to significant decreases in binge eating and vomiting; abstinence from binge eating was greater in nutritional management than stress management, although abstinence from vomiting did not differ. Stress management was associated with greater reductions in trait anxiety.⁵² In addition, another study showed that patients receiving DBT had significantly greater decreases in binge eating and purging than did those on a waiting list and that abstinence was greater at the end of treatment in the DBT than in the waiting list group.⁴⁶

Self-Help Trials. **Table 5** presents self-help trials for BN. In a direct 18-week comparison of guided self-help (manual including visits with non-specialists in eating disorders to check on progress) with group CBT, both treatments significantly decreased binge eating, vomiting, laxative use, EDI bulimia, drive for thinness, and body dissatisfaction.⁵³ At 1-year follow-up, individuals in the self-help group showed greater reductions in vomiting and EDI bulimia. CBT was associated with greater reductions in drive for thinness over the treatment period and at follow-up. Both treatments significantly improved depression, with no differences between groups at the end of treatment; however, at 1-year follow-up, individuals in the self-help group had lower depression scores. Of those who completed treatment, a significantly greater number of individuals in the self-help group than in the CBT group were in remission for more than 2 weeks at the end of treatment (74% vs. 44%). No significant change was seen in weight, although those in the

TABLE 4. Results from behavioral intervention trials for bulimia nervosa

Source, Treatment, Sample Size, Quality Score	Study Location and Setting, Percentage Female, Age	Significant Differences Between Groups
Agras et al.; Wolk and Devlin, ^{37,47} CBT vs. IPT, enrolled: 220, dropouts: 26%, good	US and UK: outpatient; female: NR; age mean (SD)—CBT: 28.3 (7.0), IPT: 27.9 (7.5)	At endpoint: CBT associated with higher percent remitted and percent recovered at end of treatment (ITT analysis). In completers-only analysis, CBT associated with fewer objective binges and purges; less eating restraint; and less weight, shape, and eating concerns at the end of treatment. Stages of change predicted improvement in IPT but not CBT. Change over time: Not reported
Cooper and Steere, ⁴⁰ cognitive therapy vs. exposure plus binge and purge response prevention, enrolled: 31, dropouts: 13% fair	UK: outpatient; female: 100%; age mean (range): 23.8 (18–33)	At endpoint: Relapse rate lower in cognitive therapy group among those who were abstinent from binge-eating at end of treatment and at 12 month followup. Change over time: Cognitive therapy superior to exposure therapy in reducing vomiting and depression between baseline and 12 month followup.
Fairburn et al.; Fairburn, Jones et al.; Fairburn, Peveler et al., ^{41,48,49} CBT vs. BT vs. IPT, enrolled: 75, dropouts: 20% fair	UK: outpatient; female: 100%; age mean (SD)—CBT: 45.6 (9.6), IPT: 44.9 (9.6)	At endpoint: Not reported Change over time: Over 18 week treatment period, CBT superior to BT and IPT in reducing eating restraint, weight concerns, and overall eating disorder psychopathology; CBT superior to IPT in reducing vomiting; and CBT superior to BT in reducing shape concerns. Over 12-month followup, CBT superior to BT in improving abstinence.
Wilfley et al., ⁴⁴ group CBT vs. group IPT vs. waiting-list control, enrolled: 56, dropouts: 14%, fair	US: outpatient; females: 100%; age mean (SD): 44.3 (8.3)	At endpoint: Not reported Change over time: Group CBT and group IPT superior to waiting list in reducing binge frequency, and disinhibition over 16 weeks. Group IPT superior to waiting list in reducing restraint over 16 weeks.
Wilson et al., ⁴⁵ CBT vs. IPT enrolled: 220, Dropouts: post-treatment: 30%; followup: 41%, fair	US: outpatient; female: NR; age mean (SD)—CBT: 28.3 (7.0), IPT: 27.9 (7.5)	At endpoint: CBT showed greater mean reduction in eating restraint by treatment week 6, greater improvements in self-efficacy by treatment week 10, and a higher percentage reduction in binge eating at post-treatment. Change over time: CBT superior in early (by week 6) improvement (reduction in frequency of vomit episodes).
Garner et al., ²⁴ CBT vs. supportive-expressive therapy, enrolled: 60, dropouts: 17%, fair	Canada: outpatient; female: 100%; age mean (SD)—CBT: 23.7 (4.4), supportive-expressive: 24.6 (4.0)	At endpoint: Not reported Change over time: Over 18 week treatment period, CBT superior in reducing dieting, food preoccupation, eating concerns, restraint, attitudes toward shape, bulimia behaviors, depressed mood, global symptoms, and symptoms of borderline personality disorder and dysthymia; and in improving self-esteem.
Hsu et al., ⁴² CT vs. NT vs. CT+NT (CNT) vs. group, support (control), enrolled: 100, dropouts: 27%, fair	US: outpatient; female: 100%; age mean (SD): 24.5 (6.4)	At endpoint: Not reported Change over time: CNT superior to NT alone and to group support in binge/purge abstinence and in reducing drive for thinness and bulimia nervosa symptoms. CT superior to NT in reducing bulimia nervosa symptoms and CT superior to group support in reducing drive for thinness.
Sundgot-Borgen et al., ⁴³ exercise vs. CBT vs. nutrition counseling vs. waiting-list controls vs. healthy controls, enrolled: 64, dropouts: 9%, fair	Norway: outpatient; female: 100%; age mean (SD)—exercise: 23 (2.3), CBT: 22 (2.7), nutrition: 22 (2.9), wait-list control: 23 (3.2), healthy control: 22 (4.1)	At endpoint: Body dissatisfaction lower in CBT than nutritional counseling group at post treatment. Laxative use lower in exercise than CBT group at post treatment. Vomit frequency, bulimia symptoms, and body dissatisfaction lower in CBT than nutritional counseling group at 6 month followup. Drive for thinness and laxative abuse lower in exercise than CBT group, at 6 month followup. Binge episodes lower in exercise than in CBT at 18 month followup. Change over time: Not reported
Chen et al., ³⁹ individual CBT vs. group CBT, enrolled: 60, dropouts: 27%, fair	Australia: outpatient; female: 100%; age mean (SD): 25.8 (7.2)	At endpoint: Higher rate of abstinence in individual CBT than group CBT at end of treatment. Change over time: Group CBT superior to individual CBT in reducing state anxiety.

TABLE 4. continued

Source, Treatment, Sample Size, Quality Score	Study Location and Setting, Percentage Female, Age	Significant Differences Between Groups
Agras et al., ³⁶ waiting-list (control) vs. self-monitoring vs. CBT vs. CBT+ response prevention, enrolled: 77, dropouts: 13%, fair	US: outpatient; female: 100%; age mean (SD): 29.2 (8.6)	At endpoint: CBT associated with higher abstinence rate than waiting list at end of treatment and higher than to self-monitoring and response prevention at 6-month followup. Change over time: CBT alone superior to waiting-list in reducing purging frequency, increasing purging abstinence and decreasing depressed mood, by end of treatment. CBT alone and CBT+ response prevention superior to waiting-list in reducing depressed mood by end of treatment.
Bulik et al.; Bulik et al.; Carter et al., ^{38,50,51} 8 weeks CBT followed by B-ERP vs. P-ERP vs. relaxation training, enrolled: 111, dropouts: 5%, good	New Zealand: outpatient; female: 100%; age mean (SD): 26.5 (6.1)	At endpoint: B-ERP associated with less drive for thinness, lower clinician-rated food restriction, body dissatisfaction, and depressed mood, lower subjective distress than relaxation training at 3 year followup. P-ERP associated with fewer eating disorder psychological and behavioral measures than relaxation training at 3 year followup. B-ERP associated with less food restriction, higher GAFS score than relax training at 12 month followup. Change over time: Relaxation superior to B-ERP in reducing depressed mood and clinician-rated body dissatisfaction from post-treatment to 2 year followup. Relaxation superior to P-ERP in reducing eating disorder psychological and behavioral traits and depressed mood from post-treatment to 3 year followup.
Laessle et al., ⁵² nutritional management vs. stress management, enrolled: 55, dropouts: 13%, fair	Germany and Australia: outpatient; female: 100%; age mean (SD): 23.8 (3.8)	At endpoint: No differences on any measures. Change over time: Nutritional management superior to stress management in increasing calorie consumption and decreasing binge frequency over first 3 weeks of treatment, and in increasing binge abstinence rate through 6 and 12 months. Stress management superior to nutrition management in reducing trait anxiety over 3 months of treatment.
Safer et al., ⁴⁶ DBT vs. waiting-list control, enrolled: 31, dropouts: 6%, good	US: outpatient; female: 100%; age mean (SD): 34 (11)	At endpoint: DBT superior in post-treatment abstinence rate. Change over time: DBT superior in reducing the number of binge and purge episodes measured in last 4 of 20 weeks of treatment.

B-ERP, exposure with response prevention to pre-binge cues; BT, behavioral therapy; CBT, cognitive behavioral therapy; CNT, cognitive nutritional therapy; CT, cognitive therapy; DBT, dialectical behavior therapy; GAFS, Global Assessment of Functioning Scale; IPT, interpersonal psychotherapy; ITT, intention-to-treat; NR, not reported; NT, nutritional therapy; P-ERP, exposure with response prevention to pre-purge cues; SD, standard deviation; UK, United Kingdom; US, United States; vs., versus.

self-help condition weighed significantly more at 1 year.

In addition, Carter et al.⁵⁴ found that both CBT-based and nonspecific self-help approaches led to significant decreases in objective binge episodes and purging; the waiting list did not. CBT-based self-help was associated with greater reductions in reducing intense exercise than nonspecific self-help or waiting list.

Durand and King⁵⁵ compared general practitioner (GP)-supported CBT-based self-help⁶⁰ with specialist outpatient treatment. The duration of treatment was at the clinician's discretion. Patients in both groups reported significant decreases in depression and scores on the bulimic investigatory test Edinburgh (BITE) and eating disorders examination (EDE) total; however, binge eating and vomiting did not drop significantly. Dropout rates were similar across groups (24% in the GP group and 18% in specialist care).

A study by Thiels et al.⁵⁶ compared 16 weeks of CBT only with guided self-change using a manual. Guided self-change included 16 sessions with a therapist encouraging use of the manual and addressing motivation, obstacles, and emergent crises. Significant decreases occurred in overeating, vomiting, BITE scores, EAT scores, and depression for both groups combined. Only on BITE scores did the CBT group perform significantly better than the guided self-change group. Dropout was 13% in CBT and 29% in guided self-change.

Additional Interventions for Bulimia Nervosa. Table 6 presents other interventions for BN. First, in a small 8-week trial of 10,000 lux white light (active light) versus 50 lux red light (control), individuals in the active light group showed significantly greater decreases in binge eating than individuals in the control group.⁵⁷ Mood improved in both groups but no additional differences were observed for any other eating disorder, psychological, or biomarker

TABLE 5. Results from self-help trials for bulimia nervosa

Source, Treatment, Sample Size, Quality Score	Study Location and Setting, Percentage Female, Age	Significant Differences Between Groups
Bailer et al., ⁵³ guided self-help vs. group CBT, enrolled: 81, dropouts: 31%, fair	Austria: outpatient; female: NR; age mean (SD)—self-help: 23.3 (4.1), CBT: 24.2 (4.9)	At endpoint: Higher meal frequency in self-help at post-treatment. Lower vomit frequency, depressed mood, laxative use, and bulimia symptoms, and higher BMI in self-help, at 1-year followup. Change over time: Self-help superior to CBT in reducing bulimia symptoms over 18 weeks. CBT superior to self-help in reducing drive for thinness over treatment and followup periods.
Carter et al., ⁵⁴ CBT-based self-help vs. nonspecific self-help vs. waiting-list control, enrolled: 85, dropouts: 24%, fair	Canada: outpatient; female: 100%; age, mean (SD): 27 (8)	At endpoint: No differences on any measures. Change over time: CBT-based self-help superior to nonspecific self-help and to waiting-list control in reducing intense exercising.
Durand and King, ⁵⁵ General practice physician-based self-help vs. specialist-based self-help, enrolled: 68, dropouts: 21%, fair	UK: outpatient; female: 100%; age mean (SD)—general practice-based: 28.3 (6.5), specialist-based: 24.5 (5.2)	At endpoint: No differences on any measures. Change over time: No differences on any measures.
Thiels et al., ⁵⁶ CBT vs. guided self-change, enrolled: 62, dropouts: 21%; fair	Germany: outpatient; females: NR; age mean (SD)—CBT: 28.7 (9.1), guided self: 27.5 (6.9)	At endpoint: Lower BITE scores in guided self-change group. Change over time: No differences on any measures.

BITE, bulimic investigatory test Edinburgh; BMI, Body mass index; CBT, cognitive behavioral therapy; NR, not reported; SD, standard deviation; UK, United Kingdom; vs., versus.

measured outcome. The investigators did not provide long-term follow-up data. Given the size of this trial and the absence of follow-up, results should be viewed as preliminary.

Second, Individuals who were abstinent after a trial of CBT were randomized either to a crisis prevention group in which they were able to contact their clinician to receive up to eight additional visits over 17 months if they felt their condition was deteriorating or to a control follow-up-only group.⁵⁹ The percentage of individuals who resumed binge eating and purging did not differ over the 17-month interval; however, none of the individuals in the crisis prevention group used any of their available calls despite the reappearance of bulimic symptoms.

Third, in a 6-week trial of patients in a guided imagery group and a control journaling group, guided imagery led to a significantly greater decrease in measures of binge eating, purging, EDI bulimia, drive for thinness, and body dissatisfaction. At the end of treatment, 21% of individuals in guided imagery and no individuals in the control condition were abstinent. Dropout rates were comparable across groups.⁵⁸

Harms of Treatments for Bulimia Nervosa

Common side effects associated with the use of second-generation antidepressants in the studies we

reviewed paralleled those typically seen with these medications in other disorders and include the following: for fluoxetine, insomnia, nausea, asthenia, tremor, dizziness, rhinitis, sweating, urinary frequency, and sexual dysfunction; for fluvoxamine, nausea, dizziness, and drowsiness.⁶¹ Side effects of brofaromine were nausea, sleep disturbance, and dizziness. No hypertensive crises were reported brofaromine, although this danger should always be considered when administering MAOIs to patients who experience uncontrollable eating episodes.

Factors Associated with Treatment Efficacy

Regarding medication trials, Walsh et al. reported that patients with greater concern for body shape and weight and longer duration of illness had more favorable treatment responses.²³ The Fluoxetine BN Collaborative Study group found that heavier patients had higher response rates in each treatment group.¹⁶ For behavioral interventions, two factors were consistently associated with poor outcome: high frequency of binge eating^{34,38,40,51,62} and longer duration of illness.^{40,62}

Evidence was mixed or contradictory for other factors. Higher body dissatisfaction was associated with both poorer³⁸ and better outcome.⁴⁹ A history of obesity was reported as a positive prognostic indicator³⁸ and as a predictor of dropout.²⁴ Better outcomes or more rapid response were associated

TABLE 6. Results from other trials for bulimia nervosa

Source, Treatment, Sample Size, Quality Score	Study Location and Setting, Percentage Female, Age	Significant Differences Between Groups
Braun et al., ⁵⁷ bright light therapy vs. dim light/placebo, enrolled: 220, dropouts: 26%, fair	US: outpatient; female: 100%; age mean (SD)—bright light: 30.5 (7.3), placebo: 30.5 (8.6)	At endpoint: No differences on any measures. Change over time: Bright light superior to dim light (placebo) in reducing binge frequency over 3 week treatment.
Mitchell et al., ⁵⁹ crisis prevention vs. usual followup, enrolled: 31, dropouts: 13%, fair	US: outpatient; female: NR; age, mean (SD)—crisis prevention: 28.8 (8.6), followup: 29.8 (9.4)	At endpoint: No differences on any measures. Change over time: No differences on any measures.
Esplen et al., ⁵⁸ guided imagery vs. control (eating behavior journaling therapies), enrolled: 75, dropouts: 20%, fair	Canada: outpatient; female: 97%; age mean (SD)—guided imagery: 27.2 (6.3), control: 26.1 (5.8)	At endpoint: Higher abstinence rate in guided imagery than in control group. Change over time: Guided imagery superior to control in reducing binge and purge frequencies, drive for thinness, bulimia symptoms, and body dissatisfaction over 6 week treatment period.

NR, not reported; SD, standard deviation; US, United States; vs., versus.

with higher baseline depression, lower severity of binge eating,⁴⁴ and greater attitudinal disturbance at baseline.⁴⁹ Positive response was reported to be associated with a history of obesity, a history of alcoholism, and high scores for self-directedness³⁸ and self-control.⁴² Poorer outcomes were associated with greater food restriction, higher depression, higher drive for thinness and bulimia scores on the EDI, and greater cue reactivity,³⁸ low self-esteem,⁴⁹ and precontemplation stage of change.⁴⁷

Higher EDI perfectionism scores, higher Dimensional Assessment of Personality Pathology (DAPP) compulsivity scores, higher DAPP intimacy problem scores, and lower cognitive behavior knowledge scores⁵⁴ were all associated with positive response to self-help. Finally, higher soothing receptivity and ability to tolerate aloneness were associated with more positive outcomes in guided imagery therapy.⁵⁸

Treatment Efficacy by Subgroups

In no instance did the investigators analyze results separately by sex, gender, race, or ethnicity. Thus, no information exists regarding differential efficacy of medication, medication plus behavioral interventions or behavioral interventions for bulimia nervosa.

Conclusion

Strength of Evidence Base

For our key questions, we found the strength of the evidence to be generally moderate to strong (Table 7). For treatment efficacy, we judged the evidence for evaluating both medication and behav-

ioral interventions as strong, although we gave the evidence concerning self-help and other interventions only a weak rating. The evidence for evaluating harms was strong with respect to medications but either weak or nonexistent for all other interventions. For factors associated with or influencing therapeutic outcome, we rated the evidence as moderate. Finally, for differences in treatment outcome by age, sex, gender, race, ethnicity, or cultural group, the literature was nonexistent (IV).

Summary of the evidence

Good evidence indicates that fluoxetine (60 mg/day) reduces core bulimic symptoms of binge eating and purging and associated psychological features of the eating disorder in the short term. The 60 mg dose performs better than lower doses and may contribute to decreased relapse at 1 year; however, patients do not tend to remain on the drug. Preliminary evidence based on either single or a few trials exists for other second-generation antidepressants (trazodone and fluvoxamine), an anti-convulsant (topiramate), and a tricyclic antidepressant (desipramine). Replication for all of these medications is required. Preliminary evidence exists that an MAOI (brofaromine) is associated with decreased vomiting in the treatment of BN, although diet should be closely monitored.

In addition, evidence for CBT is strong. Although IPT is also as effective, at 1-year follow-up as CBT, based on one fair-rated study, symptomatic change appears to be more rapid with CBT. Therefore, using CBT should decrease the amount of time that patients are exposed to BN symptoms. DBT and

TABLE 7. Strength of evidence concerning treatment key questions for bulimia nervosa treatment

Treatment Outcomes	Harms of Treatment	Factors Associated with Efficacy	Differences by Sociodemographic Factors
Strong	Strong	Medication and Medication plus Behavioral Interventions Weak	Nonexistent
Strong	Nonexistent	Behavioral Interventions Moderate	Nonexistent
Weak	Nonexistent	Self-help Weak	Nonexistent
Weak	Nonexistent	Other Weak	Nonexistent

guided imagery both show preliminary promise for individuals with BN.

Studies that combined drugs and behavioral interventions provide only preliminary evidence regarding the optimal combination of medication and psychotherapy or self-help. Although some preliminary evidence exists for incremental efficacy with combined treatment, given the variety of designs used and lack of replication, evidence remains weak.

Shortcomings of the literature

This literature has several serious deficiencies. Attrition from clinical trials is especially problematic in BN treatment trials with dropout rates commonly including over half of the original sample whether in medication alone or in combination treatment. High attrition compromises the integrity of outcome data; differential attrition between treatment intervention groups and comparison (e.g., usual-care or placebo) groups is even more damaging. In light of high attrition, investigators often reported only completer analyses, a practice that potentially biases results.

Additional weaknesses of the BN treatment literature include insufficient rigor with respect to statistical design and analysis in both the planning and conduct of trials, poor or unclear randomization procedures, inadequate allocation concealment, inappropriate statistics for repeated measures designs, incomplete statistical reporting (e.g., absence of degrees of freedom), and inattention to the effects of differential treatment duration. Use of an excessive number of diagnostic and outcome assessment measures can lead to spurious results and renders comparisons across studies difficult.

No consensus definitions exist for stage of illness, remission, recovery, and relapse for BN. Developing standardized definitions of these terms for BN and the means to evaluate them are high priorities for future research. Researchers often report outcomes

such as percentage reduction in binge days, binges, or amount of time spent binge eating. Although these measures may be meaningful, this information is misleading because individuals with high weekly purging can reduce this behavior by even as much as 50% but still be highly symptomatic. Future studies should report abstinence from binge eating and compensatory behavior or absence of binge days for a specified duration of time (at least 1 month but preferably longer). In part this reflects the need for greater attention to distinguishing between statistically significant and clinically meaningful differences.

Adolescent and adult patients with BN often receive the same treatment, but researchers make no effort to explore differential outcome by age group. Future trials should investigate treatment response in different age groups. Similarly, although males suffer from eating disorders, they are underrepresented in clinical trials of BN. When included, their numbers are usually too small to be analyzed separately or compared to females. In addition, although the most recent literature has improved in reporting race and ethnicity, no studies have examined whether treatment efficacy differs by race or ethnic background. To remedy this shortcoming, researchers must collect adequate epidemiologic data to provide critically needed information about the frequency with which eating disorders occur across racial and ethnic groups. Such data would provide guidance for planning targeted recruitment in clinical trials and enable researchers to set priorities for approaches to incorporating race and ethnicity into both treatment and outcomes studies. In addition, further exploration of sociocultural factors (e.g., stigma) may also assist with understanding both underdetection and underrepresentation of racial and ethnic minorities in research studies.

Medication trials for BN paid appropriate attention to harms. By contrast, behavioral intervention trials usually failed to report harms, and they often completely overlooked the fact that their interven-

tions may have adverse effects on patients. All studies should report adverse events associated with interventions.

Future Research Needs

Additional studies are required to determine the long-term efficacy of relatively brief medication trials, the optimal duration of medication treatment, the optimal strategy for maintenance of treatment gains, and drug augmentation effects. In addition, work to identify and test novel medications that decrease the urge to purge (e.g., with antiemetics) or reduce the extent to which binge eating and purging are experienced as reinforcing is warranted. Medication trials should focus on achieving abstinence from binge eating and purging, not merely reducing the frequency with which these behaviors occur; improving retention in medication trials is critical.

Additional studies combining medications and behavioral interventions will fill a significant gap. Future studies should further explore how best to combine treatment for patients who do not respond to CBT or fluoxetine alone.

We should actively seek to enhance psychotherapeutic interventions that address the core pathology of BN and that are both efficacious and acceptable to the patients. New behavioral interventions that target motivation to change and encourage retention in treatment are required. Further dismantling of complex therapies such as CBT to determine the active therapeutic components is also warranted.

Other fields are benefiting from the application of new information technologies to the treatment of illness. Adequately powered clinical trials that include the use of email, the Internet, personal digital assistants, text messaging, and other technological advances to enhance treatment will add to future treatment development. These approaches may be well suited to disorders marked by shame, denial, and interpersonal deficits and where availability of specialty care is limited.

In sum, rigorous continued research with a large number of participants and long-term follow-up are needed. Researchers are recommended to investigate both symptom reduction as well as abstinence rates from binge eating and purging. With continued research and dissemination, we will hopefully determine the short and long term effectiveness of medication and therapy trials, the optimal duration of treatment, and the optimal strategy for maintenance of treatment gains.

The authors thank Jennifer Best, PhD, Gerald Gartlehner, MD, MPH, Jennifer McDuffie, PhD, Hemal Shroff, PhD, T.J. Raney, PhD, Lauren Reba, BA, Adrienne Rooks, BA, and Loraine Monroe for their assistance with this project.

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