Relationship Between Clinician Language and the Success of Behavioral Weight Loss Interventions

A Mixed-Methods Cohort Study

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Little is known about how clinicians can discuss weight and weight treatment in ways that are well received and effective. This study analyzed recordings of physicians' conversations with their patients regarding a 12-week behavioral weight loss intervention and examined the relationship between linguistic and paralinguistic features and patients' subsequent attendance in the program and their weight loss outcomes.

Background: International guidelines recommend that primary care clinicians recognize obesity and offer treatment opportunistically, but there is little evidence on how clinicians can discuss weight and offer treatment in ways that are well received and effective.

Objective: To examine relationships between language used in the clinical visit and patient weight loss.

Design: Mixed methods cohort study.

Setting: 38 primary care clinics in England participating in the Brief Intervention for Weight Loss trial.

Participants: 246 patients with obesity seen by 87 general practitioners randomly sampled from the intervention group of the randomized clinical trial.

Measurements: Conversation analysis of recorded discussions between 246 patients with obesity and 87 clinicians regarding referral to a 12-week behavioral weight management program offered as part of the randomized clinical trial. Clinicians' interactional approaches were identified and their association with patient weight loss at 12 months (primary outcome) was examined. Secondary outcomes included patients' agreement to attend weight management, attendance, loss of 5% body weight, actions taken to lose weight, and postvisit satisfaction.

Results: Three interactional approaches were identified based on clinicians' linguistic and paralinguistic practices: creating a sense of referrals as "good news" related to the opportunity of the referral ($n = 62$); "bad news," focusing on the harms of obesity ($n = 82$); or neutral ($n = 102$). Outcome data were missing from 57 participants, so weighted analyses were done to adjust for

missingness. Relative to neutral news, good news was associated with increased agreement to attend the program (adjusted risk difference, 0.25 [95% CI, 0.15 to 0.35]), increased attendance (adjusted risk difference, 0.45 [CI, 0.34 to 0.56]), and weight change (adjusted difference, −3.60 [CI, −6.58 to −0.62]). There was no evidence of differences in mean weight change comparing bad and neutral news, and no evidence of differences in patient satisfaction across all 3 approaches.

Limitations: Data were audio only, so body language and nonverbal cues could not be assessed. There is potential for selection bias and residual confounding.

Conclusion: When raising the topic of excess weight in clinical visits, presenting weight loss treatment as a positive opportunity is associated with greater uptake of treatment and greater weight loss.

The rapid increase in the prevalence of obesity (1) calls for public health interventions to prevent obesity, but weight loss interventions are needed to prevent people who already have obesity from developing type 2 diabetes, cardiovascular disease, cancer, and other associated conditions. International guidelines urge clinicians to intervene opportunistically, given evidence that doing so is effective and welcomed by patients (2–7). In high-income countries, where the prevalence of obesity is highest, most people with obesity are trying to lose weight; offering effective interventions will improve weight loss and thereby health (8, 9). However, primary care records show that each year intervention occurs with only around 5% of people with obesity, and this is mainly recorded as advice to lose weight rather than the offer of treatment to support weight loss (10).

When asked to account for this failure to follow guidelines, clinicians report concern that they will offend patients (11–13), a lack of confidence that interventions will be effective (14), and that they do not know what to say. Reinforcing these concerns, patients report that tones of voice and language used by clinicians have created negative feelings and undermined motivation to lose weight (15–18). A key difficulty is that existing data rely on retrospective reports of clinical visits (also called consultations in the United Kingdom). Consequently, guidelines rely on general advice, such as be "respectful" (4). Although studies have highlighted the need for research examining the effect of language on patient outcomes (19), these prior studies have not systematically examined real-time recordings of clinical visits in which clinicians offer weight management support to patients with obesity and the effects of the language used. We do so here.

We use conversation analysis, a method for the empirical analysis of social interaction (20, 21). Conversation analysis is detailed and specific, focusing on both linguistic (words and grammatical design) and paralinguistic features (pitch, intonation, timing, speed, volume, and vocal tone) of interaction and identifying patterns in talk, including how conversational features shape and affect responses (22). This method is commonly used to study clinical interaction (23) and develop guidelines (24) and training (25, 26) and can be used to develop context-specific coding schemes to examine associations between real communication practices and patient actions (27–29). Specifically, in this article we aim to identify an association between the language used in the visit and agreement to attend weight management, attendance, weight loss from baseline (primary outcome), loss of 5% body weight, actions taken to lose weight, and postvisit satisfaction.

Identifying strategies for communicating a referral in ways that are likely to be well received, encourage action, and support weight loss could alleviate both clinician and patient concerns, supporting more positive and more effective conversations.

Methods

Study Design, Population, and Data Collection

Our cohort study was embedded in a parallel, 2-group randomized controlled trial where 137 primary care physicians (known in the United Kingdom as general practitioners [GPs]) randomly assigned 1882 consecutively attending patients with obesity to 1 of 2 very brief opportunistic interventions aiming to motivate weight loss: very brief advice (control group) or offer of referral to weight management programs (intervention group). The parent trial, called BWeL (Brief Intervention for Weight Loss), was prospectively registered (ISRCTN: 26563137). Approval was granted by the National Health Service (NHS) Research Ethics Service (reference no. 13/SC/0028). Full details on trial processes are available in the trial protocol and results articles (30, 31).

Researchers weighed, measured, and estimated the body fat of each consenting patient waiting to see a GP in 57 participating practices with a Tanita SC-240MA Body Composition Analyzer. They then sought informed consent from all patients who were at least 18 years old, had a body mass index of 30 kg/m^2 or greater (or ≥25 kg/m^2 if Asian), and had increased body fat percentage defined by age- and sex-specific cutoffs. Enrollment occurred from 4 June 2013 to 23 December 2014. Researchers excluded people who had undergone bariatric surgery, were pregnant or planning pregnancy within 12 months, were currently enrolled in or had completed a weight management program within 3 months, had attended to discuss weight loss, and could not speak English. Clinicians could also exclude people during the visit if opportunistic intervention was considered inappropriate (for

reasons relating to emotions in the visit; preexisting conditions, like eating disorders; or other exceptional reasons).

We focus here on the intervention group, where GPs endorsed, offered, and facilitated a referral to an effective behavioral weight management program (Slimming World or Rosemary Conley) for 12 weeks (32). The behavioral weight management programs were available free of charge. They comprised weekly sessions lasting 1 hour each and included group-based behavioral support relating to diet and physical activity. Very brief opportunistic GP-delivered interventions were delivered at the end of the GP visit when referral was discussed. General practitioners were trained to deliver standard content but were encouraged to use their own interactional approach.

Of 940 patients in the intervention group, half were randomly selected to have their visit recorded. Patients had the option to decline recording or to request deletion later. The audio recorder was visible and switched on by the GP at the beginning of the intervention discussion. Some GPs did not record, some recordings were unusable, and many of these recordings were not uploaded by the research team. The remaining 246 recordings were available for these analyses and provided a robust sample size for conversation analysis. Figure 1 is a consort diagram documenting the available recordings.

Immediately after the visit, participants rated the intervention on a 5-point Likert scale from "very unhelpful" to "very helpful" and "very inappropriate" to "very appropriate." At 3 and 12 months, patients reported whether and what actions they had taken to lose weight, and at 12 months were weighed using the same body composition analyzer. The window for each assessment timepoint was plus or minus 2 weeks.

Conversation Analysis and Interactional Coding

The lead author used conversation analysis to examine the linguistic and paralinguistic features of the intervention. Recordings were transcribed using the Jefferson system (33), which uses symbols representing what is said and the way in which interaction is built and delivered, including action, word choice, turn design, pitch, pace, volume, and timing (transcription key, Supplement Table 1, available at Annals.org). Three of the authors (C.A., H.W., and E.S.) used recordings and transcripts to map the referral sequences systematically. Mapping entailed breaking conversations into structures of social action, identifying the interactional actions achieved, in what sequence they were delivered, and examining variation in delivery. Mapping demonstrated that clinicians presented referrals in the form of a "news delivery sequence" (34), exemplified in Supplement Table 2 (available at Annals.org). Clinicians used the established sequential, linguistic, and paralinguistic

features that characterize "news" (34–36). We identified the linguistic and paralinguistic features clinicians used in each news delivery and the sequence in which they occurred. News is often delivered with a "valence," that is, aspects of tone, timing, and sequence that together indicate the type of news that is being delivered (for example, good or bad news) (34, 37). Three of the authors (C.A., H.W., and E.S.) identified patterns of valence and the common interactional features clinicians used to achieve this. Conversation analysis showed linguistic, paralinguistic, and sequential features that together make up 3 interactional approaches: presenting referral positively as "good news," negatively as "bad news," and neutrally. These principally followed Maynard's established characteristics of news delivery in clinical settings, with context-specific additions relating to how weight was discussed. These were asserted most strongly at the start of an interactional sequence, where GPs explain that an offer of referral is available. Our conversation analysis resulted in a coding framework adapted from Maynard and Freese's news delivery features (35, 37). Development was led by 2 authors (C.A. and H.W.), in discussion with a third author (E.S.). We used the "next turn proof procedure" (38), through which speakers display their reaction and orientation to the prior turn at talk, to identify how patients responded to each delivery approach. We discussed the ongoing analysis with other analysts during "data sessions" (39). All authors were blinded to patient outcomes throughout the conversation analysis and coding.

We followed established conversation analysis coding processes (40, 41). One author (C.A.) coded all interactions into 1 of these 3 interactional approaches. Twenty, selected at random, were coded again by another author (H.W.) to confirm the coding criteria were sufficient to support consistent coding and to verify adherence to the framework. The 2 authors (C.A. and H.W.) agreed in 18 of 20 instances, considered reasons for disagreement, and iterated the coding scheme to add clarity, discussing iterations with a third author (E.S.). We prioritized consensus over formal agreement statistics (42) given the observational nature of this study and the need to adapt the coding scheme to sufficiently capture the details of how news was delivered in this context. Where classification was not straightforward, 2 conversation analysts (C.A. and H.W.) discussed these interactions with reference to the coding scheme, attending particularly to paralinguistic features, to agree on final classification.

Previous analysis showed that GPs typically started these interventions by talking about weight management referrals, and patients displayed positivity or negativity toward a referral just after GPs have done this (43). General practitioners' actions after initial responses did not change these (44). Therefore, we coded only GP action before these responses, which could generate this positive or negative reception (43) (illustrated in Supplement Table 2).

Outcome Measures

The primary outcome was weight change from baseline at 12 months. The secondary outcomes were agreement to attend the weight management program (expressed in the visit), patient-reported satisfaction after the visit, attendance at the weight management program in the 12 months since baseline, loss of 5% or more of body weight at 12 months, and taking effective action at 12 months (attending this or any behavioral weight loss program, taking weight loss medication, or following a meal replacement weight loss program). We also examined patient satisfaction with the weight loss intervention. Ratings of appropriateness and helpfulness were correlated (Cronbach α, 0.65), so we analyzed the mean (coded 1 to 5) to simplify and avoid multiple testing, classifying means greater than 3 as "satisfied."

Statistical Analysis

We preregistered an analysis plan for this secondary analysis (45) but changed approach at the request of the statistical editor. We performed analyses to account for missingness, using inverse probability weighting of a complete-case analysis (46). To generate stabilized weights, we used robit regression with 4 degrees of freedom, using multivariable fractional polynomials to transform continuous variables. We first calculated weights using a model including complete variables that we thought may predict missing data at 12 months: sex, ethnicity, age, and weight at baseline. We then imputed missing values of an area-based measure of socioeconomic status called Index of Multiple Deprivation (IMD) as the method (as suggested by Seaman and White for variables that are less than 2% missing). We used robit regression (46, 47) to calculate probabilities (and thereby weights) with a further model including IMD as well as sex, age, ethnicity, and weight. We derived stabilized weights by dividing this second weight by the first. We examined weights for extreme values, both visually and by comparing the sum of the top 10% of weights to the sum of the overall weights.

We modeled the association between delivery and change in body weight at 12 months with a mixed-effects generalized linear regression model. This was adjusted for age, sex, ethnicity, weight at baseline, and IMD, and we used practice as a random effect. We weighted observations according to the stabilized weights derived above. We also performed sensitivity analyses, using GP as the random effects term, instead of practice, and modeling without a random effect term (Supplement Table 3, available at Annals.org). We used the Stata command meglm (StataCorp) for mixed-effects linear models, followed by the margins command to estimate results as risks and risk differences.

Patient and Public Involvement

Two patient representatives were involved in the BWeL Trial Steering Committee. During this study, 42 people with obesity provided input, including commenting on our results. The group confirmed that communication patterns that our analyses identified as effective would, in their experience, be welcomed by people with obesity.

Role of the Funding Source

The funding source had no role in the design, conduct, or analysis of this study or in the decision to submit this manuscript for publication.

Results

Study Population

Of 246 participants seen by 87 GPs across 38 primary care practices in England included in this conversation analysis (Figure 1), about half the participants were women, 6% were from minority ethnic groups, and the mean age was 56 years (Table 1). In total, 187 of 246 (76%) patients agreed to the referral, and 112 of 246 (46%) attended; this was similar to the whole trial population where 77% agreed to and 40% attended the program. Follow-up data were missing for 57 of the 246 participants, leaving 189 weight management program referrals with complete follow-up data. Supplement Table 4 (available at Annals.org) presents population characteristics and interaction delivery type stratified by missingness.

Conversation Analysis

Recordings lasted a mean of 95 seconds, with a median of 78 seconds, and an interquartile range of 73 seconds (range, 8 to 458 seconds). We identified 3 interactional patterns in the delivery of the brief intervention: "good," "bad," and "neutral" news deliveries. We identified 62 of 246 instances of good news delivery, 82 of 246 bad news deliveries, and 102 of 246 neutral deliveries. Table 1 shows population characteristics by news delivery style in the 246 visits. The linguistic and paralinguistic features of each approach that were used to code all interactions are detailed in Table 2 and exemplified in Figures 2 to 4.

Good news comprised a short introduction or "preannouncement." General practitioners often used optimistic projections to present weight loss positively and chose words that conveyed positivity—for example, "*positively* help" (Figure 2). They often described the "benefits" of weight loss and minimized the effort a patient would have to undertake to gain these. Referrals were presented as helpful but not as necessary. It was common to minimize health problems (such as blood pressure

being described as a "*bit* borderline"). General practitioners regularly framed referrals as a "chance" or "good opportunity." General practitioners used paralinguistic features to convey excitement or eagerness when delivering news (48), including fast pace; smooth delivery; few perturbations or hesitations; hearably smiled-through delivery (33); and a "bouncy" delivery with rising and falling pitch contours, where pitch often remained higher. General practitioners rarely mentioned that patients had obesity or discussed body mass index.

In the bad news approach, GPs engaged in longer preannouncement. They often initiated discussions by asserting the patient's body mass index as a problem (Figure 3). They usually asserted themselves as knowledgeable and patients as unknowledgeable. In contrast to minimizing health issues, as in the positive approach, GPs here emphasized these problems. Weight loss was presented as a necessary solution to a medical problem. General practitioners who used this approach emphasized the actions the patient would need to undertake, stressing the burden of weight control. By emphasizing effort and medical problems, GPs presented referral negatively. General practitioners used paralinguistic features that conveyed "regret" in their telling (48). These included hesitation, disfluency, and elongated vowel sounds with falling pitch. Keywords, such as "weight," were often quieter or delivered in a "creaky voice," which reinforced negativity.

In the neutral approach, features common in both positive and negative approaches were mostly absent, and paralinguistic features similarly displayed no clear valence (Figure 4).

There was evidence from the conversation analysis next turn proof procedure (38) that good news led to more positive responses and less "conversational resistance" than bad or neutral news.

Statistical Analysis

Weight Management Program Attendance and Weight Loss

Good news was associated with greater agreement to attend and actual attendance at the weight management program compared with both the neutral and bad news approaches (Table 3). There was no evidence of difference in agreement to attend, or attendance itself, between receiving the bad and neutral news approaches.

Mean weight loss (primary outcome) from baseline was 2.9 kg (SD, 7.4). After adjustment, participants who received good news offers lost 4.79 kg (95% CI, −7.09 to −2.49 kg), significantly more weight than participants who received a neutral approach (1.19 kg [CI, −3.24 to 0.87 kg]), and were more likely to report 5% weight loss when compared with those who received the neutral approach (Table 3). There was no evidence of difference in mean weight change comparing bad and

neutral news, but patients who received bad news were significantly more likely to lose 5% of their body weight than those who received neutral news. There was no significant difference between good news and bad news in terms of mean weight change or in the proportion of people who lost 5% of their body weight.

Among the subset who enrolled in the program, mean weight losses at 12-month follow-up were 4.8 kg for 46 participants receiving good news, 5.9 kg for 26 who received bad news, and 2.9 kg for 33 receiving neutral news (Supplement Table 5, available at Annals.org).

Patient-Reported Satisfaction After the Visit

There was no evidence of a difference in satisfaction score between groups (Table 3).

Effective Weight Loss Action at 12 Months

People who received a good news approach were more likely to take effective action to lose weight compared with those who received either the neutral or bad news approaches (Table 3). There was no evidence of a difference in patients taking effective action between bad and neutral news.

Discussion

In our observational study nested in a clinical trial where clinicians offered a referral to a 12-week weight loss program, we identified 3 conversational styles used by clinicians: presenting referral offers as good news, bad news, and neutrally. Good news was responded to positively by patients and was associated with a higher likelihood of accepting the referral, and attending the weight loss program, than both neutral news and bad news. Good news was also significantly associated with greater weight loss at 12 months than neutral news but not bad news. Bad news and neutral news were responded to less positively by patients. These 2 news delivery formats were associated with similarly low uptake of treatment and similar outcomes, although bad news was associated with slightly higher likelihood of losing 5% body weight at 12 months when compared with neutral news. Reported patient satisfaction was high regardless of the delivery.

All participants received the same offer of treatment, but the way that this was communicated (as good, bad, or neutral news) was associated with a meaningful difference in whether patients accepted the treatment offered, and their subsequent weight loss at 12 months. Particular ways of communicating make certain verbal responses from conversational partners more likely, exerting a "conversational nudge," known as preference organization (49). The good news conversations

analyzed here show patterns that seemed to create a preference for patients to agree to attend the weight management program. This carried through into behavior change.

A 2020 systematic review and thematic synthesis of clinicians' perspectives on discussing weight loss with patients with obesity showed that they are reluctant to offer weight loss support because they find these conversations difficult, are unsure of what to say, and have concerns that their language may cause offense (50). A systematic review of patients' perspectives showed that patients do want to talk about weight loss with clinicians but have similar concerns about language and tone, which can demotivate weight loss attempts (7). Existing studies mainly analyze retrospective reports, which explore perceptions and experiences of conversations about weight loss but which cannot provide accurate insight into how conversations actually played out or examine the potential longer-term effects of the language used. Our study is unique in using conversation analysis to explore associations between in-visit conversational patterns and postvisit measures of both satisfaction and a subsequent behavior. Our findings are consonant with those from a randomized trial in women with dysmenorrhea, where "warm, empathic" communication reduced anxiety and increased expectations of improvement more than other styles (51). Similar results were seen in a trial of patients with osteoarthritis, where retrospective reports that the clinician relayed positive messages relating to a high likelihood of treatment success improved the benefit of treatment for knee osteoarthritis mediated by improved patient self-efficacy (52).

Existing studies of recorded conversations about weight loss in clinical settings highlight the delicacy of these conversations and suggest how difficulties may be best avoided. For example, a conversation analysis of primary care interactions in New Zealand highlighted that including positive reinforcement and emphasizing the benefits of weight loss avoided difficulties when discussing diet and exercise changes in the visit (53). The results of our conversation analysis align with this, with our addition of statistical analyses highlighting the potential longer-term implications of communicating positively during the visit. Although few studies analyze conversations where clinicians offer treatment of weight loss, 1 study analyzed recorded weight management referrals using the behavior change techniques taxonomy (54). The team found little evidence that behavior change techniques explained effectiveness. Behavior change techniques are broad categories that are not designed to capture linguistic and paralinguistic features of delivery. Our analysis showed that these interactional features, not captured by most existing approaches to understanding behavior change, are important, and conversation analysis, combined with statistical analyses, can highlight important conversational motivators of behavior change.

These results reinforce that notion that offering support, as opposed to advising on health harms, is motivating. Previous research has identified this in the context of smoking cessation (55, 56), showing that although it could be expected that warning patients would have a motivational effect, this may not be the case in practice.

Our analyses contradict some national guidelines on obesity. For example, the UK National Institute for Health and Care Excellence (NICE) guidelines advise clinicians to "discuss the effort and commitment needed to lose weight…" (4). Our analysis, however, showed that emphasizing "effort and commitment" was characteristic of the bad news style, which could generate conversational resistance and was not associated with program uptake or attendance. The UK National Institute for Health and Care Excellence guidelines also recommend that GPs discuss "the benefit of receiving long-term support." This does align with our findings, as talking about "benefits" was part of a positive, effective approach. Other than this example, the effective ways of communicating identified here are mostly absent from guidelines. This analysis adds to a growing body of conversation analysis research that shows the importance of grounding guidelines in evidence from real interactions (57–60). This work highlights that, although an approach may hypothetically seem effective, this may not match the empirical reality of how it works in practice.

There are a growing number of weight management interventions available, including behavioral, surgical, and pharmacological. Although our results here should be tested in a trial, our analyses provide a higher quality of evidence than used in existing guidelines on how to intervene. Therefore, clinicians can decide for themselves on the potential of the good news style presented here to maximize the effect of their time and benefit their patients. This approach is likely to be generalizable across a range of treatments given that people with obesity may feel negatively about themselves and their obesity (61), and most are trying to lose weight at any one time (8). Clinicians who can present treatment positively, as a better way of achieving their patients' goals, are likely to receive positive reception from patients, which may be why the good news delivery is associated with greater success.

Our data have limitations. This study is observational and subject to associated biases, such as potential for reverse causality and confounding. Clinicians may tailor delivery style on the basis of their perception of who is more likely to be engaged or successful. Only some recordings were available, but the characteristics of participants with recordings were very similar to those without. There were, however, modest-sized associations between the type of advice patients received and age and IMD score. These characteristics were not strongly associated with take-up and outcome of treatment (62) and were adjusted for. However, it is possible that other characteristics that we did not

record may explain differences in outcome and that these, not the style of delivery, explain the differences we have observed. For example, we had no data on the prior relationship between GP and patient and no data on patient comorbidities. The relatively small number of recordings could mean we have missed modest differences between news styles.

Patients have reported that clinicians' words and tone matter to them and can motivate or demotivate weight loss (63). Our analyses show that presenting treatments for obesity as good news and as an "opportunity" with a style of talk that sounds positive, and emphasizes that clinicians are pleased to help, is associated with more weight loss than other approaches.

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Figure 1. **Consort diagram.** BMI = body mass index; GP = general practitioner.

* Reasons not mutually exclusive.

† These patients were mistakenly deemed potentially eligible.

Figure 2. **Good news.** GP = general practitioner.

* Jefferson G. On the sequential organization of troubles-talk in ordinary conversation. Soc Probl. 1988;35:418-441. doi:10.2307/800595

Figure 3. **Bad news.** BMI = body mass index; GP = general practitioner; TCU = Turn Constructional Unit .

* See reference 37.

† See reference 35.

Figure 4. **Neutral approach.** GP = general practitioner.

Table 1. **Population Characteristics by News Delivery Style**

Delivery Type	All (*n* = 246)	Good (*n* = 62)	Bad (*n* = 82)	Neutral (*n* = 102)
Mean age (SD), *y*	55.9 (17.4)	55.9 (15.8)	52.1 (18.9)	59.4 (16.8)
Sex, *n (%)*				
Female	129 (52)	36 (58)	43 (52)	50 (49)
Male	117 (48)	26 (42)	39 (48)	52 (51)
Ethnicity, *n (%)*				
White	231 (94)	59 (95)	77 (94)	95 (93)
Other ethnicity	15 (6)	3 (5)	5 (6)	7 (7)
Mean baseline weight (SD), *kg*	97.3 (15.9)	99.9 (17.2)	98.0 (15.2)	95.2 (15.4)
Mean baseline BMI (SD), *kg/m²*	34.6 (5.0)	35.2 (5.4)	34.9 (5.3)	34.1 (4.5)
Mean IMD score (SD)*	15.1 (11.4)	18.3 (12.2)	15.2 (11.3)	13.1 (10.6)

IMD = Index of Multiple Deprivation.

* The IMD score is an area-based deprivation score, with the English mean being 21.7 (SD, 15.6)

and higher scores representing greater deprivation.

Table 2. **Coding Scheme**

Features	Good News	Bad News	Neutral
Linguistic	Asserts benefits of weight loss	Asserts problems of being overweight	Neither
	Patient activity burden minimized	Patient activity burden emphasized	Patient activity burden not mentioned
	Brief preannouncement	Long preannouncement	No preannouncement (topic initiation through perspective elicitation)
	Personal stance asserted toward the acceptability of referral	No personal stance asserted toward the acceptability of referral	No personal stance asserted toward the acceptability of referral
	Referral presented as a preferred course of action through framing "as an offered chance or opportunity"	Referral presented as a preferred course of action by offering a necessary solution to a clinical problem	Referral presented neither a preferred nor dispreferred course of action
	GP asserts knowledge through assessing the acceptability and effectiveness of referral	GP asserts themselves as knowledgeable and the patient as unknowledgeable	GP does not assert themselves as knowledgeable about the details of the referral
	Elaboration of news asserts benefits of weight loss	Elaboration of news asserts problems of obesity	Elaboration of news absent or defers further information giving to the trial team
	Intensifiers used to emphasize positivity	Intensifiers used occasionally when presenting the referral	Intensifiers used rarely
Paralinguistic	Fast delivery often with faster delivery toward the end of turns	Slow delivery	Steady speed with few changes
	Generally fluent, with few hesitations or delays within turns	Hesitation, disfluency, or delay during turns	–
	Keywords emphasized with pitch changes or louder volume	Keywords often quieter	Keywords delivered with few changes in pitch or volume
	"Bouncy delivery" rising and falling pitch; pitch often higher	Vowel sound elongated with falling pitch	Few marked pitch contours
	Smiley voice when delivering referral information	Some use of creaky voice around keywords	Creaky voice or smiley voice used rarely

GP = general practitioner.

Table 3. **Adjusted Results for All Outcomes***

Delivery Type	Good News	Bad News	Neutral
Weight management program referrals with complete data, *n/N* (%)	53/189 (28)	61/189 (32)	75/189 (40)
Agreement to attend program			
Adjusted proportion† agreeing to attend (95% CI)‡	0.98 (0.93 to 1.02)	0.68 (0.58 to 0.77)	0.73 (0.63 to 0.83)
Adjusted difference compared with neutral (95% CI)‡	0.25 (0.15 to 0.35)	−0.05 (−0.20 to 0.10)	–
Adjusted difference good versus bad (95% CI)‡	0.30 (0.19 to 0.40)	–	–
Program attendance			
Proportion† attending (95% CI)‡	0.83 (0.70 to 0.95)	0.43 (0.29 to 0.56)	0.50 (0.34 to 0.63)
Adjusted difference compared with neutral (95% CI)‡	0.45 (0.34 to 0.56)	−0.01 (−0.19 to 0.17)	–
Adjusted difference good versus bad (95% CI)‡	0.46 (0.29 to 0.62)	–	–
Weight change			
Adjusted weight change (95% CI), *kg*‡	−4.79 (−7.09 to −2.49)	−2.74 (−4.63 to −0.84)	−1.19 (−3.24 to 0.87)
Adjusted difference in weight from neutral (95% CI), *kg*‡	−3.60 (−6.58 to −0.62)	−1.55 (−4.7 to 1.6)	–
Adjusted difference in weight good versus bad (95% CI), *kg*‡	−2.05 (−5.21 to 1.11)	–	–
Lost 5% of body weight			
Adjusted proportion† achieving 5% loss (95% CI)‡	0.41 (0.27 to 0.55)	0.41 (0.23 to 0.52)	0.23 (0.14 to 0.33)
Adjusted proportion† achieving 5% loss compared with neutral (95% CI)‡	0.18 (0.02 to 0.34)	0.18 (0.03 to 0.32)	–
Adjusted proportion† achieving 5% loss good versus bad (95% CI)‡	0.00 (−0.17 to 0.17)	–	–
Effective action			
Adjusted proportion† taking effective action (95% CI)‡	0.83 (0.70 to 0.95)	0.43 (0.29 to 0.56)	0.50 (0.34 to 0.63)
Adjusted difference in proportion† taking effective action compared with neutral (95% CI)‡	0.33 (0.17 to 0.48)	−0.07 (−0.28 to 0.13)	–
Adjusted difference in proportion† taking effective action good versus bad (95% CI)‡	0.40 (0.22 to 0.59)	–	–
Satisfaction			
Adjusted proportion† reporting satisfaction (95% CI)‡	0.97 (0.92 to 1.03)	0.90 (0.82 to 0.99)	0.92 (0.86 to 0.99)
Difference in adjusted proportion† reporting satisfaction compared with neutral (95% CI)‡	0.05 (−0.03 to 0.14)	−0.01 (−0.12 to 0.10)	–
Difference in adjusted proportion† reporting satisfaction good versus bad (95% CI)‡	0.07 (−0.04 to 0.18)	–	–

*Data are presented as mean (SD) for continuous measures, and n (%) for categorical measures. Analysis used inverse probability weighting for missingness, adjusted for sex, ethnicity, age, weight at study entry, IMD score. In addition, for estimating weight change, we used a mixed effects model with practice as a random effects term. Weight changes measured at 12 months from study entry.

† "Proportion" = modeled risk and "difference in proportion" = modeled risk difference.

‡ Marginal predicted mean.