Role of PCP referral and weight loss in the Hopkins POWER trial

Eva Tseng a,b *, Nae-Yuh Wang a,b, Jeanne M. Clark a,b, Lawrence J. Appel a,b, Wendy L. Bennett a,b

a Division of General Internal Medicine, Department of Medicine, Johns Hopkins University School of Medicine, 733 North Broadway, Baltimore, MD, United States
b Welch Center for Prevention, Epidemiology and Clinical Research, The Johns Hopkins University, 2024 E. Monument St., Baltimore, MD, United States

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ABSTRACT

Purpose. Primary care providers (PCPs) play an important role in identifying and counseling obese patients to lose weight, but it is unknown whether PCP referral of patients into a weight loss intervention is associated with greater weight loss. The objectives are to determine if PCP referral is associated with greater 1) weight loss, 2) end of study patient–provider relationship quality, and 3) satisfaction and participation rates in the intervention.

Methods. 415 obese patients enrolled in the Hopkins POWER trial from six primary care practices in the Baltimore area. We conducted a secondary analysis of results from the trial using longitudinal mixed-effects model and generalized linear model, adjusting for clinic, sex, age, and race. The primary outcome was absolute weight change from baseline to 24 months. Secondary outcomes were patient–provider relationship quality and satisfaction and participation rates in the intervention.

Results. Participants in both PCP and non-PCP referral groups lost a similar amount of weight from baseline to 24 months. PCP referral was not significantly associated with percentage of completed coach contacts, web logs, and satisfaction with trial, but was associated with higher end of study patient–provider relationship quality (p = 0.007).

Conclusions. Our study represents the first of its kind to examine the role of PCP referral of patients into a weight loss trial. While we did not find evidence that PCP referral is associated with increased weight loss, further research is needed to determine how PCPs can use their relationship with patients to promote weight loss and enhance intervention effects.

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Introduction

Primary care providers (PCPs) play an important role in identifying and counseling obese patients to lose weight. The U.S. Preventive Services Task Force recommends that clinicians screen all adult patients for obesity and “offer intensive counseling and behavioral interventions to promote sustained weight loss for obese adults” (Preventive Services Task Force, 2003). However, physicians report barriers to conducting weight loss counseling, including lack of time and training, and many prefer referring patients into effective weight loss programs (Kushner, 1995; Forman-Hoffman et al., 2006; Bennett et al., 2014). A recent systematic review evaluating primary care based behavioral treatment of obesity found that provider-led interventions were less effective than those using trained coaches or interventionists (Wadden et al., 2014). The review highlighted the need to better understand and re-define PCP involvement in weight loss programs to fully take advantage of the PCPs’ potential impact on patients’ long-term weight loss.

The Johns Hopkins Practice-based Opportunities for Weight Reduction (POWER) Trial was identified in the systematic review for evaluating intensive behavioral counseling led by interventionists (Appel et al., 2011). The POWER trial was a randomized controlled trial evaluating the effectiveness of two behavioral weight loss interventions, remote or in-person coaching focused on nutrition and exercise, in addition to a control arm. One of the main roles of the PCPs was recommending and referring eligible patients into the study (Bennett et al., 2014).

Recruiting patients and participants into a randomized controlled trial can be extremely difficult, and evidence on the effectiveness of recruitment strategies has been limited. A Cochrane review of controlled trials on recruitment method, identified several strategies for increasing recruitment of patients to randomized controlled trials, including telephone reminders to non-responders, open-trial designs, opt-out procedures for contacting potential participants, and financial incentives (Trewick et al., 2010). To our knowledge, no prior studies have examined the role of PCP referral on the recruitment of participants into a weight loss trial.
In this secondary analysis of the POWER trial results, we examined the association between being referred into the trial by a PCP and subsequent weight loss, patient–provider relationship quality, and participation. Our study objectives are to determine if PCP referral is associated with greater 1) weight loss, 2) end of study patient–provider relationship quality, and 3) satisfaction and participation rates in the intervention. We also explored whether the associations differed among the three arms of the study. We hypothesized that participants referred by their PCP would achieve greater weight loss because PCP referral potentially represented patient–provider communication regarding the diagnosis and treatment of obesity and endorsement of the study as a way to lose weight. Additionally, we hypothesized that PCP referral would be associated with greater patient–provider relationship quality and higher participation and satisfaction rates in the intervention.

**Methods**

**The POWER trial design**

Details of the study design and main results of the trial have been published previously (Appel et al., 2011). Briefly, the Hopkins POWER trial was a 3-arm randomized controlled trial of 415 obese patients, ages 21 and older with BMI ≥ 30 kg/m², and at least one cardiovascular risk factor (hypertension, hypercholesterolemia or diabetes). The main exclusion criteria included recent weight loss of 5% or more of body weight, prior or planned bariatric surgery, and use of prescription weight loss medication within 6 months. Details regarding additional inclusion and exclusion criteria for the trial are outlined in the main trial paper (Appel et al., 2011). Based on a power calculation for the original trial to detect a between-group difference in weight change of 2.75 kg for at least one of the two comparisons (remote support vs. control and in-person support vs. control), 415 participants were randomized 1:1:1 to the three arms over 24 months. Participants attended in-person visits at baseline, 6, 12 and 24 months after randomization.

Common features of both intervention groups (remote and in-person support) included weight-loss coaches and online educational modules, including self-monitoring tools and graphs. In the remote support intervention, contact with the health coach was via telephone whereas in the in-person support intervention it was via face-to-face group and individual sessions either in-person or by telephone. The control arm met with a weight loss coach at the time of randomization along with receiving brochures and a list of weight loss websites. PCPs referred patients to the trial, encouraged their participation in the intervention, and reviewed weight loss progress reports at routine office visits with patients assigned to an intervention group. The Institutional Review Board of The Johns Hopkins University School of Medicine approved the POWER trial.

**Independent variable – PCP referral as mode of recruitment**

Participants were recruited from six primary care practices in the Baltimore metropolitan area between February 2008 and February 2009 by several methods. First, each clinic mailed letters to patients who were potentially eligible (i.e., BMI ≥ 30 kg/m² and at least one cardiovascular risk factor). Second, PCPs could directly refer patients who potentially fit the inclusion criteria. Third, participants could learn of the trial from brochures, posters and website announcements at the participating clinics. We defined the mode of recruitment according to participants' response to the telephone screening question, "How did you hear about POWER?" Study recruiters recorded up to three responses per participant. For the analysis, responses were dichotomized into "PCP referral" if "physician" was included as one of the three possible responses, versus "non-PCP referral" for all others.

**Primary Outcome: weight change over 2-year trial**

Our primary outcome for this secondary data analysis was absolute weight change from baseline to 24 months. Weight was measured in pounds using a calibrated, high-quality digital scale (Tanita BWB 800 digital scale) with the participant wearing light, indoor clothes without shoes. Measurements were taken by trained research staff who were blinded to the treatment assignment of the participant.

**Secondary outcomes: patient–provider relationship quality, participation and satisfaction in the intervention**

We assessed the secondary outcome of end of study patient–provider relationship quality using a questionnaire adapted from the validated Consumer Assessment of Healthcare Providers and Systems (CAHPS) Adult 12 month survey, 2.0 (Treweek et al., 2010). The questions were scored using a Likert response scale (1 = never to 4 = always) and asked how often their PCP seemed to know their medical history, explain things clearly, and understand their values and beliefs (Consumer Assessment of Healthcare Providers and Systems (CAHPS) surveys). For our analysis, the total score from the questionnaire was used as a continuous outcome.

Among the 277 participants randomized to the active intervention arms, we assessed the participation rate and satisfaction with the intervention and PCP's involvement. The participation rate was assessed as the percentage of completed recommended coach contacts and web logins. Satisfaction with their PCP's and coach's involvement was measured with an end of study questionnaire assessing how helpful were the telephone calls, in-person visits, website and online modules. The questions were scored on a 5-point Likert scale (0 = did not use or not at all helpful to 4 = extremely helpful). For the analysis, we added up the total score and weighted it by the number of answered questions. Additionally, we looked separately at two of the survey questions assessing participant's satisfaction with their PCP: "How helpful was your primary care provider’s involvement in the POWER study?” and “How helpful was reviewing your self-monitoring weight graph with your PCP?” The total score, weighted by the number of questions answered, was used as the outcome in the model. Finally, we calculated the total number of reports reviewed by the PCP with their patient over 24 months.

**Covariates**

For the main analysis, we separated the two interventions arms, which we contrasted with the control arm. In the stratified analysis, we combined the two intervention arms. Other covariates in the model included participants' age, gender, race and primary care clinic site.

**Statistical analysis**

We assessed the association between PCP referral and weight change from baseline to 24 months using a longitudinal mixed-effects model. For the main analysis, we used a repeated measures model for visit-specific weight, including visit indicators (6, 12, and 24 months), randomization assignment and their cross-product interaction terms, adjusting for clinic, sex, age, and race. We also included the PCP referral status indicator and its cross-product interaction terms with the visit indicators. For the main objective, we examined the regression coefficient for the interaction of PCP referral and the 24-month visit indicator. Effect modification by recruitment method on the effectiveness of the interventions at 24 months was also explored with the 3-way interaction term of PCP referral status by randomization arm by visit.

We examined effect modification by gender and diabetes status separately on the primary outcome of weight loss. The rationale was to determine if PCP referral had a greater effect on males because our earlier
Results

Of the 415 POWER trial participants, 171 (41%) reported PCP referral compared to 244 (59%) who reported non-PCP referral methods, which included, not exclusively, letters (81%), brochures (12%), friends (3%) and posters (2%). Those referred by their PCP were slightly younger (52.8 vs. 54.9 years, p = 0.04) and more likely to be female (71.4% vs. 58.2%, p = 0.001). Participants in both groups were equally distributed among the three treatment arms. There was no difference in the proportion of participants with diabetes and three co-morbid conditions (Table 1). Participants referred by their PCP tended to have a higher baseline mean (±SD) weight (105.8 ± 18.9 kg vs. 102.4 ± 17.2 kg; p = 0.06). This baseline weight difference between groups was highly significant for the in-person support arm (8.7 kg, p = 0.01) after adjusting for clinic, sex, age, and race.

Participants in both referral groups lost weight from baseline to 24 months in equal amounts after adjusting for age, race, gender and clinic site (Fig. 1). Examining the 3 arms separately, we found a statistically non-significant trend towards greater weight loss among participants referred by their PCP within the in-person support arm (between-group difference at 24 months: −2.7 kg, 95%CI −5.8 to 0.4 kg) (Fig. 1) and found no difference in the remote support arm (between-group difference: −0.3 kg, 95%CI −3.3 to 2.7 kg) or the control arm (between-group difference: 0.0 kg, 95%CI −2.6 to 2.6 kg) at 24 months. However, the overall difference among the 3 treatment arms was statistically significant (likelihood ratio test with 2 degrees of freedom = 8.4, p = 0.015), with a difference of −2.7 kg (95%CI −6.8 to 1.3 kg, p = 0.19) between in-person support and control arms, and −2.4 kg (95%CI −6.7 to 1.9 kg, p = 0.27) between in-person and remote support arms. We did not detect effect modification by recruitment method on the effectiveness of the interventions (p = 0.55).

We examined if PCP referral had a differential effect on weight loss by gender and by diabetes status (Table 2). In the combined intervention arms, men who were referred by their PCP tended to lose more weight by 24 months (between-group difference: −3.1 kg, 95%CI −8.0 to 1.7 kg). However, gender did not modify the interaction of recruitment method and the intervention effect at 24 months. Participants, with and without diabetes, had a similar degree of weight loss at 24 months, and we did not identify any interaction (Table 2). In our sensitivity analysis, 81 out of 171 participants were re-classified from the original PCP referral group into the non-PCP referral group, as they had listed multiple recruitment methods (n = 90 (22%) for PCP referral and n = 325 (78%) for non-PCP referral). Our results for the primary outcome of absolute weight loss were unchanged in the sensitivity analysis.

Participants referred by their PCP to the trial rated the quality of their relationship with their PCP higher (p = 0.007). However, among participants in the intervention arms (n = 277), PCP referral was not significantly associated with greater participation in the intervention, including percentage of completed coach contacts and web logins (Table 3). In terms of satisfaction with the intervention’s components, both referral groups had similar total satisfaction scores (p = 0.31). We did not identify differences on the two questions addressing satisfaction with the PCP’s involvement in the study (p = 0.13). Finally, the mean number of weight loss reports reviewed by PCPs was similar during the 2-year trial (2.3 vs. 2.1 reports, in the PCP and non-PCP referral groups, respectively [Table 3]).

Discussion

To better understand the role of PCPs in a primary care practice-based weight loss trial, we described the characteristics of patients referred by their PCP into the Hopkins POWER trial and assessed whether the type of enrollment (PCP referral vs. other) was associated with weight loss, patient–provider relationship quality, and satisfaction and participation rates in the trial. We found that PCPs referred patients who were heavier and female. Although the overall representation of males in the trial was higher than most studies, males were referred less often by PCPs than females. Prior research has shown that men are underrepresented in weight loss interventions (Pagoto et al., 2012; Young et al., 2012) and less likely to receive weight loss counseling (Ko et al., 2008).

We found no evidence that PCP referral was associated with significantly greater weight loss at 24 months over and above what is imparted by the study interventions, nor with greater adherence to the intervention program components. However, we found a consistent
2 kg greater weight loss among PCP vs. non-PCP referred participants within the in-person support arm at 24 months (Fig. 1). PCP-referred individuals in this arm were about 10% heavier at baseline than their counterparts, suggesting that PCPs may have been more involved and engaged with these heavier patients during the trial leading to greater weight loss. Moreover, while statistically non-significant, there was a between-group difference in weight loss of 3.1 kg between males in the intervention arms who were and were not referred by their PCP (Table 2). This finding is clinically important since men are underrepresented in weight loss interventions, and with encouragement, may be more likely to participate and be more successful at weight loss if referred by their PCP.

In our prior qualitative focus group study among PCPs with patients in the Hopkins POWER trial, several PCPs expressed that their role in the trial was influential to patients by providing endorsement and legitimacy to the weight loss program (Bennet et al., 2014). Additionally, PCPs discussed their unusual success with enrolling men, which suggests that men may be more receptive to a PCP-endorsed weight loss intervention and therefore be motivated to lose weight. Although most PCPs agreed that they wanted to maintain a peripheral role in the weight loss program, several expressed concern that their patients did not perceive them as taking an active role in the weight loss program and desired access to timely updates.

The medical literature supports that PCPs play a key role in the diagnosis of obesity and coordination of care for their overweight and obese patients. Physicians’ counseling of weight loss is associated with increased motivation for patients to lose weight and intention to change lifestyle behaviors (Jay et al., 2010; Huang et al., 2004; Post et al., 2011). Patients who discuss weight loss with their PCP are more likely to attempt weight loss (Gudzune et al., 2014; Rose et al., 2013). In our study, we used PCP referral of patients as a proxy measure of PCP counseling of weight loss since we believed that when PCPs referred patients it involved a discussion about weight loss and may have provided motivation for patients to lose weight.

While our results did not show an association between PCP referral and weight loss, we know that coordinating care for overweight and obese patients requires a collaborative effort and partnership among PCPs, weight loss coaches/interventionists, and patients. PCPs play an important role in weight loss counseling but less so in leading weight loss interventions themselves (Wadden et al., 2014). Further research is needed to examine the right amount of PCP engagement to effectively leverage their relationships with patients to enhance weight loss.

Table 2
Adjusted between-group difference in absolute weight loss between referral methods at 6 and 24 months, stratified by gender and diabetes diagnosis.

| Randomized group | Between-group difference at: | 24 months |
|------------------|-----------------------------|-----------|
|                  | 6 months | p-Value | Mean (95% CI) | p-Value | Mean (95% CI) | p-Value |
| Male             |          |         |               |         |               |         |
| Control          | 0.6 (−2.3, 3.5) | 0.68 | −1.6 (−7.5, 4.4) | 0.61 |
| Remote + in-person | −1.3 (−4.6, 1.9) | 0.42 | −3.1 (−8.0, 1.7) | 0.21 |
| Female           |          |         |               |         |               |         |
| Control          | −0.4 (−1.9, 1.2) | 0.67 | 1.0 (−1.7, 3.8) | 0.45 |
| Remote + in-person | −0.8 (−2.5, 1.0) | 0.40 | −1.5 (−3.8, 0.7) | 0.18 |
| Diabetes         |          |         |               |         |               |         |
| Control          | −0.4 (−3.2, 2.4) | 0.78 | −0.0 (−6.1, 6.2) | 1.00 |
| Remote + in-person | −1.6 (−5.0, 1.7) | 0.35 | −1.9 (−6.9, 3.0) | 0.45 |
| No diabetes      |          |         |               |         |               |         |
| Control          | −0.1 (−1.8, 1.7) | 0.94 | 0.2 (−2.5, 2.9) | 0.85 |
| Remote + in-person | 0.0 (−1.9, 1.9) | 1.00 | −1.3 (−3.7, 1.1) | 0.28 |

*adjusted for age, race, gender, clinic site.
†p for interaction: 0.81 for gender, 0.93 for diabetes diagnosis.
interventions delivered by trained coaches. Future research should focus on streamlining the referral process using the electronic medical record and keeping PCPs optimally engaged by developing accessible interventions delivered by trained coaches. Future research should focus on streamlining the referral process using the electronic medical record and keeping PCPs optimally engaged by developing accessible and efficient strategies (e.g., web-based reports on weight progress) to facilitate communication between PCPs, weight loss coaches and patients (Bennett et al., 2014).

Study limitations and strengths

The major strength of our study is that we evaluated data from a primary-care based weight loss intervention, which means that PCPs were actively involved in the trial. Unlike other weight loss trials, the Hopkins POWER trial was specifically designed to recruit participants from primary care practices and to involve PCPs in certain aspects of the trial, including recruitment, reviewing weight loss reports and encouraging patient participation.

There are several limitations to our study. First, it is possible we did not find an association between PCP referral and weight loss because the trial was designed with an active but limited role for the PCP, who reviewed on average two weight loss reports with their patients during the 24 month trial (Bennett et al., 2015). Moreover, the trial was not designed nor powered to study the effect modification of gender and diabetes status on weight loss. Second, we do not know whether PCP referral was a proxy for another measure, such as a chance appointment with the PCP during recruitment for a condition unrelated to weight, or an indicator of frequent contacts with the PCP. Because women (vs. men) and people with type 2 diabetes are more likely to attend doctor visits, they may have had more opportunity for referrals. Third, the recruitment method may be inaccurate since it was assessed by a single question on a telephone screening survey. Because primary care practices sent letters signed by their PCPs to all eligible patients, patients may have been misclassified if they reported the letter as PCP referral. Finally, we had limited information on the quality of the patient–provider relationship and are unable to assess whether there was a change in relationship quality from baseline to trial completion because we only administered the survey at the end.

Conclusions

Our study represents the first of its kind to examine the role of PCP referral of patients into a practice-based weight loss trial. Although we did not find evidence that PCP referral into a weight loss trial was associated with increased weight loss or greater participation, the intensity of PCP involvement in the POWER study was minimal. Future studies examining primary care-based weight loss programs need to assess the optimal amount of PCP engagement to augment patient adherence and weight loss success, without over-burdening the PCP or practice.

Table 3

Unadjusted secondary outcomes of patient–PCP relationship quality, and participation and satisfaction rates.

| Outcome | PCP referral | Non-PCP referral | p-Value |
|---------|--------------|------------------|---------|
| Mean % completed coach contacts (SD) | 65.8 (2.6) | 65.5 (2.2) | 0.93 |
| Mean % completed web logins (SD) | 54.7 (2.7) | 56.8 (2.4) | 0.57 |
| Mean weighted satisfaction score with intervention | 42.8 (12.3) | 44.0 (13.3) | 0.48 |
| Mean weighted satisfaction score with PCP | 5.1 (2.5) | 4.7 (2.6) | 0.31 |
| Mean # reports reviewed with PCP (SD) | 2.3 (1.7) | 2.1 (1.6) | 0.37 |
| Mean Patient-PCP relationship quality score (SD) | 29.9 (2.7) | 28.7 (4.0) | <0.001 |

a Intervention groups only: n = 114 for PCP recruitment and n = 163 for non-PCP recruitment.
b Minimum score was 0 with a maximum score of 64 and 72 for remote and in-person support groups, respectively.
c Minimum summary score was 8 with a maximum score of 32.

Conflicts of interest

The authors declare that they have no conflicts of interest relevant to this work.

Transparency document

The Transparency document associated with this article can be found, in the version.

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The original trial involved a collaboration with Healthways, Inc., a disease management company. Healthways provided coaching effort for the transtelephonic intervention and developed the website used in the intervention. Healthways provided some research funding to supplement NIH support. Under an institutional consulting agreement with Healthways, the Johns Hopkins University received fees for advisory services to Healthways during the POWER trial. Faculty members who participated in the consulting services received a portion of the University fees.

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