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Referring Survivors of Endometrial Cancer and Complex Atypical Hyperplasia to Bariatric Specialists: A Prospective Cohort Study

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Abstract

Objective(s)—To describe the acceptability of bariatric referrals when offered by gynecologic oncologists to women with a history of complex atypical hyperplasia or early stage endometrial cancer and to detail compliance with referrals and weight loss attempts initiated three months after the referral.

Study Design—Obese women with complex atypical hyperplasia or early stage endometrial cancer were approached for inclusion in this prospective cohort study. Those not in the care of a bariatric specialist were offered a medical referral with or without a surgical referral. A survey was administered at inclusion and after three months.

Results—Of 121 women approached, 106 were consented. Women reported that it was acceptable for their gynecologic oncologist to discuss weight loss (91.09%) and that a 10% loss of body weight would be beneficial (86.14%). Six women were already in the care of a bariatric specialist. Of the remaining 100, 43 accepted a referral: 35 of 100 medical and 8 of 66 surgical referrals offered. At three months, 17 women complied with a referral (16 medical and 1 surgical) and 59 had initiated any weight loss attempt. On multivariate analysis, a higher initial weight ($p=0.0403$), Charlson Comorbidity Index ≥ 5 ($p=0.0278$) and shorter time from surgery to bariatric referral ($p=0.0338$) predicted acceptance of a referral.

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Conclusion(s)—Weight loss counseling is well received by these women. After being offered bariatric referral, only 17% comply, but most (59%) subsequently initiate a weight loss attempt. Referrals should be offered early in the course of cancer care to maximize acceptance.

Keywords

obesity; endometrial cancer; bariatric referrals; weight loss; survivorship

Introduction

Over two-thirds of endometrial cancer survivors are obese.^{1,2} Despite excellent cancer specific outcomes,³ early stage endometrial cancer survivors experience poor general health outcomes and high mortality rates secondary to obesity related comorbidities.^{4,5} Over time, these women are more likely to succumb to cardiovascular disease than any other cause, including cancer.⁴ Gynecologic oncologists desire to address obesity, but report having received insufficient training.^{6,7} Cancer survivors confirm that gynecologic oncologists rarely and inadequately address the issue.⁸

The Society of Gynecologic Oncology has joined ranks with other large medical organizations in calling on providers to actively address obesity with cancer survivors.⁹ With aggressive nutritional and medical management obese endometrial cancer survivors can lose weight.¹⁰ Bariatric surgery is associated with dramatic weight loss outcomes,¹¹⁻²⁰ but is under-studied in this population. Gynecologic oncologists express interest in offering medical and surgical bariatric referrals to obese cancer survivors.^{6,7} However, the acceptability of and compliance with these referrals has not been described in this setting.

Gynecologic oncologists are uniquely poised to harness the “teachable moment” provided by a cancer diagnosis and have liberal access to women during the survivorship period, a time when women are motivated but experience distinct challenges to healthy weight loss. In this prospective cohort study, we offered medical and surgical bariatric referrals to women with complex atypical hyperplasia or Stage I or II endometrioid endometrial cancers. We describe the acceptability of and compliance with these referrals and detail weight loss attempts initiated within 3 months after the bariatric referral is offered. Additionally, we explore factors associated with acceptability of and compliance with referrals and initiation of weight loss attempts.

Materials and Methods

IRB approval was obtained through the Cleveland Clinic (Protocol # 13-1528) for this prospective intervention cohort study. Women were approached between December of 2013 and September of 2014 during gynecologic oncology clinic visits at Cleveland Clinic Main Campus, Hillcrest and Fairview Hospitals. Inclusion criteria were a history of complex atypical hyperplasia or a Stage I or II endometrioid adenocarcinoma of the endometrium, age 18-65 years, a body mass index (BMI) ≥ 30 kg/m², and agreement of their gynecologic oncologist that they could be approached for enrollment. Exclusion criteria included stage III or IV, recurrent, or progressive cancer, non-endometrioid histology, poorly controlled

psychiatric or medical conditions contraindicating weight loss interventions, or an active second primary malignancy.

A.J. identified potential subjects for recruitment in advance based on the inclusion and exclusion criteria above to minimize bias. A.J. and, occasionally research nurses at the remote sites, obtained consent and A.J. coordinated bariatric referrals, administered surveys, and collected data. Women who were already in the care of a bariatric specialist were surveyed but were not offered a referral. All other women were offered a medical referral with a bariatrician who specializes in medically supervised weight loss. Otherwise, women were offered a surgical referral if they met NIH criteria for a bariatric surgery referral: ≥ 40 kg/m² or BMI ≥ 35 kg/m² with an obesity related comorbidity.²¹

After informed consent was obtained, women were asked to fill out a questionnaire. Three items asked women to rate their baseline beliefs regarding the acceptability of a bariatric referral, the health benefits of modest weight loss, and their relationship with their gynecologic oncologist on a Likert scale (Figure 1). Baseline quality of life, function and symptomatology were assessed with the validated European Organisation for Research and Treatment of Cancer Quality of life questionnaires, both the 30-item questionnaire (EORTC QLQ-30, version 3) and the endometrial cancer module (EN24). These questionnaires were administered and scored in accordance with published guidelines.²²⁻²⁴ Women who declined a referral were asked to provide reasons. A priori it was decided that these reasons would be categorized as fear of surgery, financial or insurance coverage concerns, distance from hospital, wanting to attempt weight loss independently, or not desiring weight loss.

A chart review was performed to collect baseline demographics including age and race. Distance from the hospital in minutes drive without traffic and in miles was calculated between their home address and the hospital where they were seen using google-maps.²⁵ Median household income was estimated using their residential zip code and 2010 U.S. Census Data.²⁶ Height and weight were collected and medical comorbidities were recorded using data from their clinic visit; BMI and Charlson Comorbidity Index (CCI) were subsequently calculated.²⁷ Tumor histology, stage, treatment and postoperative complications were recorded. Timing between intervention and diagnosis, surgery and last treatment (surgery, chemotherapy, hormonal therapy or radiation therapy) was calculated in days to the date the referral was offered; if treatment was ongoing, zero days were considered to have lapsed.

Three months after referral, women were contacted with an email or phone survey. Women who did not initiate a weight loss attempt were asked to identify barriers to initiating changes. A chart review verified compliance with bariatric referrals, defined as attending a visit with the bariatric specialist. Women who did not respond to the 3 month follow up survey or did not have any record of compliance with a referral or initiation of weight loss attempts on chart review were considered to have not initiated a weight loss attempt.

We planned to describe our findings after 100 women were offered referrals. Study data were collected and managed using REDCap electronic data capture tools.²⁸ Statistical analysis was performed using JMP (Version 10.0.2d1, SAS Institute, Cary NC). Univariate

analysis was performed for a relationship between demographic, treatment variables, and EORTC scores with acceptance of a referral, compliance with a referral and initiation of a weight loss attempt. Associations between categorical covariates were assessed using chi-squared tests. Group differences in means of continuous measures were evaluated with student t-tests. In addition, outcomes associated with continuous independent variables were compared using outcomes for 1st and 4th quartiles using chi-squared tests. Multivariate logistic regression models were used to assess for an association between demographic, treatment variables, and EORTC scores with acceptance of a referral, compliance with a referral and initiation of a weight loss attempt. Confounders that were significantly associated with an outcome in the univariate model ($p < 0.05$) were identified and included in the multivariate model. All tests two-tailed and were considered significant at a $p < 0.05$.

Results

The recruitment process is detailed in Figure 2. We approached 121 women – fourteen declined and one who initially consented later withdrew her consent, citing other health concerns. One-hundred-one women completed their initial surveys and Figure 1 demonstrates those results. The majority believed that a 10% weight loss would be beneficial, that it is appropriate for their gynecologic oncologist to address weight loss and felt that their gynecologic oncologist cared about their overall health.

Of the 106 women who agreed to participate, 6 were already in the care of a weight loss specialist – 3 had bariatric surgery within the past year, 2 were seeing a medical weight loss expert, and one was seeing a nutritionist and her primary care physician for weight loss. The remaining 100 women were offered referrals as is detailed in Figure 3. All 100 women were offered medical referrals and 66 qualified for and were also offered surgical referrals. Forty-three women accepted a referral: 35 medical (35%) and 8 surgical (12%). Demographics and cancer staging and treatment information for the 100 women offered referrals are detailed in Table 1. Median age was 57 (95%CI 28.68-65.00) years, weight 242.5 (95%CI 168.31-421.13) pounds, and BMI was 40.87 (95%CI 30.14-65.10) kg/m². Eight women had complex atypical hyperplasia and 92 had a history of endometrial cancer.

Fifty-seven women declined a bariatric referral. Of the 66 women offered surgical referral, 58 declined and provided the following reasons: 31 (53.45%) reported fear of additional surgery, 13 (22.41%) reported living too far away, 13 (22.41%) reported financial or insurance coverage concerns, and 20 (34.48%) wanted to attempt weight loss independently. Of the 57 women who declined medical referrals, 18 (31.58%) reported that they lived too far away, 13 (22.81%) reported financial or insurance coverage concerns, and 30 (52.63%) reported that they wanted to pursue weight loss independently. No one expressed that they did not want to lose weight.

Three months after being offered a referral, 78 women completed the follow up survey and the charts were reviewed for all 100 women. Of the 59 women who initiated weight loss attempts, 17 complied with bariatric referrals: 16 medical and 1 surgical. Six women initiated a commercial weight loss program (one of these 6 women had also complied with a medical referral). One woman reported attending community nutrition classes. Thirty-six

reported initiating self-guided weight loss attempts – 18 dieted exclusively, 7 exclusively exercised and 11 did both.

Forty-one had not initiated weight loss attempts: 19 confirmed on survey and chart review, 22 based on chart review alone. Of the 19 that confirmed that they had done “nothing” to try to lose weight on survey, 17 provided reasons why with some women providing more than one. Reasons that women cited for not initiating a weight loss attempt included being overwhelmed by other health issues (8) or non-health related issues (6), being unable to afford weight loss programs (5) and not believing that weight loss would improve their health (1). None reported that they did not want to lose weight.

Table 2 demonstrates univariate analysis of factors associated with the acceptance of a referral when it was offered. Women were more likely to accept a referral if they presented with a higher BMI ($p=0.035$), higher CCI ($p=0.025$), a lower estimated median household income ($p=0.0302$) and were approached more recently after surgery ($p=0.0030$). Comparing the 1st and 4th quartiles, 54.55% of women approached within 26 days of surgery versus 8.70% of women approached more than 967 days after surgery accepted a referral ($p=0.0006$). Women were more likely to accept a referral when approached within the first year rather than over a year after diagnosis (46.67% vs 34.55%, $p=0.0586$). Higher numbness and tingling EORTC symptom scores were associated with acceptance of a referral ($p=0.0356$). On further analysis, 21 of 37 (56.76%) diabetics accepted a bariatric referral compared to 22 of 62 (34.92%) of nondiabetics ($p=0.0332$); women with diabetes did report higher numbness and tingling scores but this did not reach statistical significance (27.45% vs 20.68%, $p=0.2965$).

Table 3 details factors which are associated with weight loss behaviors at 3 months of follow up, specifically compliance with a bariatric referral and initiation of any weight loss attempt. White women were more likely than black women to comply with a referral (19.32% vs 0%, $p=0.0285$) or initiate any weight loss attempt (62.50% vs 33.33%, $p=0.0557$). Women with complex atypical hyperplasia appeared more likely to initiate any weight loss attempts compared to those with endometrial cancer (87.5% vs 56.52%, $p=0.0662$). Women who experienced postoperative complications were less likely to comply with a referral (4.76% vs 20.83%, $p=0.0556$). Higher EORTC sexual activity scores were associated with lower compliance with referrals ($p=0.0320$). Initiation of any weight loss attempt was positively associated with high physical function ($p=0.0194$) and cognitive function ($p=0.0367$) scores but negatively associated with urologic symptom, ($p=0.0275$) hair loss ($p=0.0477$) and fatigue ($p=0.0561$) scores.

On multivariate analysis, a higher initial weight ($p=0.0403$), CCI 5 ($p=0.0278$) and proximity to surgery ($p=0.0338$) remained associated with a higher likelihood that women would accept a bariatric referral, but initial BMI, median household income, and symptoms of numbness and tingling lost significance. When we added diabetes to the multivariate analysis, time from surgery ($p=0.0134$) and initial BMI ($p=0.0217$) remained predictors of referral acceptance. High levels of reported sexual activity remained associated with a lower likelihood of referral compliance, ($p=0.0375$) but race lost significance on multivariate

analysis. Physical and cognitive function scores, urologic symptoms and hair loss were not associated with initiation of a weight loss attempts on multivariate analysis.

Comment

After a diagnosis of complex atypical hyperplasia or early stage endometrial cancer, it is highly acceptable for gynecologic oncologist to broach the topic of weight loss with women. Obese women understand that even modest weight loss will improve their health. Weight loss counseling was well received, but only 43% accepted and 17% complied with referrals; only 1 pursued a bariatric surgery. Over half (59%) however did initiate weight loss attempts within 3 months of referral. Gynecologic oncologists should routinely offer but not exclusively rely on bariatric referrals to address this issue.

Many factors associated with weight loss seeking behaviors are not modifiable, but the timing of a weight loss discussion relative to cancer diagnosis and treatment is. Women were more likely to accept a bariatric referral when it was offered early in the course of their treatment, ideally within the first year of diagnosis. Over half (54.55%) of women approached within 26 days postoperatively accepted a bariatric referral compared to 8.7% of those almost 3 years out from surgery ($p=0.0006$). On multivariate analysis, offering a referral shortly after surgical staging remained a significant predictor of referral acceptance.

The temptation to wait until later in the course of care, when women are “out of the woods,” is understandable. However, our data suggest that initiating these conversations early maximizes referral acceptance. Drawing the link between obesity and endometrial cancer early may help a woman understand the link between her obesity and her cancer. Gynecologic oncologists can help her identify healthy lifestyle changes and weight loss as an integral part of her cancer care and survivorship plan. Early intervention provides an opportunity for close follow up and troubleshooting of failed weight loss attempts.

Gynecologic oncologists feel personally responsible for initiating these conversations but prefer to refer to weight loss experts for obesity interventions.⁶ Tseng *et al.* recently surveyed endometrial cancer survivors and only half reported that their gynecologic oncologist provided any weight loss counseling. Women preferred direct conversations with specific recommendations and referrals, but none of the 177 women had been offered a referral.⁸ Neff *et al.* reported that that only 10% of gynecologic oncologists report having received formal training in weight loss counseling⁷. Despite an interest in referral to bariatric specialists trained to take care of this patient population, both patients and providers report a lack of referrals.

The failure of gynecologic oncologists to reliably and effectively provide specific recommendations or referrals to obese women represents a missed opportunity. The Society of Gynecologic Oncology has recently responded to this deficiency by publishing materials aimed at helping providers broach this topic; the online “Obesity Toolkit” aids and encourages providers to actively engage patients in addressing this issue as a standard part of survivorship care.⁹ Continued efforts to educate and empower providers to adequately and effectively address this issue are warranted.

In other patient populations a substantial body of evidence illustrates successful and durable weight loss with bariatric surgery; these outcomes have been met with sustained improved health outcomes, reduced mortality and healthcare costs.¹¹⁻²⁰ Gynecologic oncologists express interest in clinical trials evaluating weight loss surgery in the obese cancer survivors.⁷ However, only one of 66 women offered a surgical referral complied with that referral. Fear of additional surgery as well as financial and geographic barriers were commonly reported barriers.

A randomized controlled trial has demonstrated that motivated endometrial cancer survivors can accomplish weight loss with intensive behavioral and nutritional counseling.¹⁰ However, given that not all endometrial cancer survivors are highly motivated trial enrollees, the wide applicability of these results remains questionable. In our cohort, compliance with a referral was the exception, not the rule. In addition to geographic and financial barriers, many women preferred a self-guided attempt. This underscores the important role the gynecologic oncologist plays overseeing this aspect of their health.

This study quantifies and details the acceptability of and compliance with bariatric referrals and documents weight loss attempts initiated after referrals are offered in the complex atypical hyperplasia and endometrial cancer survivorship setting. Many assumptions have been made about this patient population, but very little objective data has been reported. While we were underpowered to uncover all of the barriers we evaluated, we were able to identify key and persistent barriers to initiation of weight loss attempts and identify targets and strategies for optimizing weight loss seeking behaviors. Associations lost on multivariate analysis cannot be reliably ruled out as our multivariate analysis is likely overfit, but some relationships were impressively persistent, such as the association between timing of referral and referral acceptance. Given the clinical relevance of this relationship, we felt it important to report. Women not cared at a large referral center with on-site bariatric specialists may experience different barriers to care. Participants and providers consented to participation, possibly resulting in an overestimation of the acceptability of weight loss counseling. Alternatively, we offered single referral at one point in time; our results may underestimate cumulative acceptance and compliance of women followed over time.

Obese endometrial cancer survivors are open to weight loss counseling and should be offered a variety of weight loss options, including bariatric referrals, early in the course of their cancer care. Most will initiate a weight loss attempt but minority will comply with referrals offered. Identifying and eliminating barriers to care will be critical to narrowing and addressing this gap. Over half of weight loss attempts are initiated without the guidance of a bariatric expert or commercial program. Support beyond offering referrals will be necessary to aggressively address this issue. Efforts to train gynecologic oncologists to proficiently and effectively address and guide initial weight loss attempts are warranted.

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Condensation

Obese women with endometrial cancer or complex atypical hyperplasia welcome bariatric referrals and are more likely to accept referrals offered shortly after diagnosis.

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Figure 1. Baseline beliefs of obese women with complex atypical hyperplasia and early endometrial cancer

The 106 women consented for participation felt that it was appropriate for gynecologic oncologists to address obesity and believed that a loss of 10% of their body weight would be beneficial.

Figure 2. Recruitment and accrual of subjects

One-hundred-22 women were approached, 14 declined and 1 withdrew her consent. Of 106 consented, 100 were not in the care of a bariatric specialist.

Figure 3. Referrals offered, accepted and weight loss attempts initiated

Of the 100 women not in the care of a bariatric specialist, 43 accepted bariatric referrals and 17 complied with the bariatric referral. A weight loss attempt was initiated by 59 women within 3 months of the referral.

Table 1

Demographics of 100 women offered bariatric referral

Demographic, Cancer and Treatment Variables	N(%), median (95%CI)
Age in years	57 (28.68-65)
Race	
Black	12 (12.00%)
White	88 (88.00%)
Distance from hospital	
Miles	29.45 (3.1-159.8)
Minutes driving without traffic	36 (10.05-153.83)
Median household income (based on zip code, in USD)	48,810 (25,986.4-80,809.7)
Weight at inclusion (in pounds)	242.5 (168.31-421.13)
BMI (kg/m ²)	40.87 (30.14-65.10)
Charleston Comorbidity Index	4 (2-7)
Diabetes	37 (37%)
Hypertension	57 (57%)
Pathology	
Complex Atypical Hyperplasia	8 (8.00%)
Endometrial cancer	92 (92.00%)
Stage	
Stage IA	78 (78.00%)
Stage IB	9 (9.00%)
Stage II	5 (5.00%)
Grade	
Grade 1	65 (65.00%)
Grade 2	24 (24.00%)
Grade 3	3 (3.00%)
Treatment	
Treated without surgery	7 (7.00%)
Surgically treated	93 (93.00%)
Postoperative complications	21 (21.00%)
Adjuvant therapy	28 (28.00%)
Chemotherapy	6 (6.00%)
Radiation therapy	23 (23.00%)
Combination chemotherapy and radiation	4 (4.00%)
Hormonal therapy	4 (4.00%)

At the time of approach, days from...

Demographic, Cancer and Treatment Variables	N(%), median (95%CI)
Diagnosis	399 (22.15-1989.75)
Last therapy	344.5 (0-1896.47)
Surgery	389.5 (12.33-1951.15)

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Table 2

Univariate Analysis of Factors Associated with Acceptance of a Bariatric Referral

Factor	N (%), Mean		
	Accepted	Declined	p value
Age ^a	55.23	54.63	0.7411
Race			
Black (n=12)	6 (50.00%)	6 (50%)	0.6031
White (n=88)	37 (42.05%)	51 (57.96%)	
Distance			
Miles ^a	43.30	42.22	0.9330
Minutes ^a	48.72	48.86	0.9900
Estimated household income ^{a, b}	47,977.2	53,823.6	0.0302*
Baseline weight in pounds ^a	269.62	239.55	0.0204*
BMI in kg/m ^{2a}	44.54	40.54	0.0352*
Charlson Comorbidity Index ^a	4.14	3.56	0.0252*
< 5 (n=76)	26 (34.21%)	50 (62.79%)	0.0015*
5 (n=24)	17 (70.83%)	7 (29.17%)	
Pathology			
Complex atypical hyperplasia (n=8)	3 (37.50%)	5 (62.50%)	0.7418
Endometrial cancer (n=92)	40 (43.48%)	52 (56.52%)	
Treatment			
Surgical (n=93)	39 (41.94%)	54 (58.06%)	0.4360
Nonsurgical (n=7)	4 (57.14%)	3 (42.86%)	
Postop complications (n=21)	12 (57.14%)	9 (42.86%)	0.9226
Minimally invasive surgical staging (n=70)	27 (38.57%)	42 (61.43%)	0.2536
Received Adjuvant Therapy (n=28)	12 (42.86%)	16 (57.14%)	0.9059
Treatment status when offered referral			
Treatment ongoing (n=16)	7 (43.75%)	9 (56.25%)	0.9473
Treatment completed (n=84)	36 (42.86%)	48 (57.14%)	
Time from diagnosis when offered referral, days ^a	567.81	654.97	0.6578
< 1 year (n=45)	21 (46.67%)	24 (53.33%)	0.0586
1 year (n=55)	19 (34.55%)	36 (65.45%)	

Factor	N (%), Mean		
	Accepted	Declined	p value
Time from surgery when offered referral, days ^a	363.97	753.70	0.0030*
< 1 year (n=43)	22 (51.16%)	21 (48.84%)	0.1102
1 year (n=49)	17 (34.69%)	32 (65.31%)	
EORTC QLQ and EN24 scores			
Global health status, Quality of life	67.1	72.92	0.2490
Physical functioning	79.66	82.64	0.4821
Role functioning	80.77	84.59	0.4857
Emotional functioning	70.00	77.56	0.1081
Cognitive functioning	82.92	87.50	0.2128
Social functioning	83.33	83.98	0.8923
Fatigue	34.44	27.46	0.1559
Nausea and vomiting	6.41	5.13	0.6461
Pain	29.17	24.84	0.4671
Dyspnea	19.66	12.84	0.2423
Insomnia	29.91	21.15	0.1546
Appetite loss	11.11	12.17	0.8211
Constipation	11.11	13.46	0.6040
Diarrhea	10.83	7.05	0.2935
Financial difficulties	22.50	24.84	0.7104
Sexual interest	75.24	66.67	0.1410
Sexual activity	86.28	81.33	0.3314
Sexual enjoyment	53.33	45.24	0.4583
Lymphedema	27.08	18.59	0.1529
Urologic symptoms	17.29	17.41	0.9721
Gastrointestinal symptoms	13.38	11.80	0.5434
Poor body image	26.75	21.07	0.3663
Sexual and vaginal problems	25.92	23.88	0.8033
Pain in back and pelvis	28.33	28.20	0.9828
Tingling numbness	30.83	17.30	0.0356*
Muscular pain	40.83	30.22	0.3364
Hair loss	16.67	13.07	0.4946
Taste change	7.69	5.13	0.5168

^a As a continuous variable tested with student t-tests.

^b Household income was estimated using published US census data regarding zip code median household incomes

Table 3

Univariate analysis of factors associated with weight loss attempts

Factor	Any weight loss attempt		MD guided weight loss attempt	
	X ² , n (%)	p value	X ² , n (%)	p value
Age ^a	2.00	0.1578	1.00	0.3176
Race				
Black (n=12)	4 (33.33%)	0.0557*	0 (0.00%)	0.0285*
White (n=88)	55 (62.50%)		17 (19.32%)	
Distance				
Miles ^a	1.09	0.2954	2.30	0.1294
Minutes ^a	1.33	0.2493	2.27	0.1320
Estimated Household Income ^{a,b}	0.13	0.7156	0.01	0.9323
Baseline weight ^a	0.05	0.8149	0.49	0.4819
BMI in kg/m ^{2a}	0.00	0.9564	0.07	0.7946
Charlson Comorbidity Index ^a	0.21	0.6474	0.03	0.8686
< 5 (n=76)	44 (57.89%)	0.6822	12 (15.79%)	0.5734
5 (n=24)	15 (62.5%)		5 (20.83%)	
Pathology				
Complex atypical hyperplasia (n=8)	7 (87.5%)	0.0662	2 (25.00%)	0.5300
Endometrial cancer (n=92)	52 (56.52%)		15 (16.30%)	
Treatment				
Surgical (n=93)	54 (58.06%)	0.4793	16 (17.20%)	0.8396
Nonsurgical (n=7)	5 (71.43%)		1 (1.08%)	
Postop complications (no vs yes)				
No (n=72)	43 (59.72%)	0.5500	15 (20.83%)	0.0556
Yes (n=21)	11 (52.38%)		1 (4.76%)	
Surgical approach				
Minimally invasive surgery (n=70)	39 (55.71%)	0.4198	11 (15.71%)	0.5152
Laparotomy (n=23)	15 (65.22%)		5 (21.74%)	
Adjuvant therapy				
Yes (n=28)	17 (60.71%)	0.7335	3 (10.71%)	0.2590
No (n=65)	37 (56.92%)		13 (20.00%)	
Treatment status at time of approach				

Factor	Any weight loss attempt		MD guided weight loss attempt	
	X ² , n (%)	p value	X ² , n (%)	p value
Treatment ongoing (n=16)	10 (62.5%)	0.7552	2 (12.5%)	0.5892
Treatment completed (n=84)	49 (58.33%)		15 (17.86%)	
Time from diagnosis when approached ^a	0.45	0.5018	1.36	0.2427
< 1 year from diagnosis (n=45)	28 (62.22%)	0.5530	7 (15.56%)	0.7273
1 year from diagnosis (n=55)	31 (56.36%)		10 (18.18%)	
Time from surgery ^a	0.04	0.8423	0.97	0.3237
< 1 year from surgery (n=43)	26 (60.47%)	0.6033	8 (18.60%)	0.5762
1 year from surgery (n=49)	27 (55.10%)		7 (14.29%)	

^a As a continuous variable tested with student t-tests.

^b Household income was estimated using published US census data regarding zip code median household incomes