Published in final edited form as:

Gynecol Oncol. 2015 October ; 139(1): 155–159. doi:10.1016/j.ygyno.2015.08.007.

The Prescription or Proscription of Exercise in Endometrial Cancer Care

Xiaochen Zhang^{1,2}, Ashley F. Haggerty¹, Justin C. Brown², Robert Giuntoli¹, Lilie Lin³, Fiona Simpkins¹, Lorraine T. Dean², Emily Ko¹, Mark Morgan¹, and Kathryn H. Schmitz²

¹Division of Gynecologic Oncology, Department of Obstetrics and Gynecology, University of Pennsylvania Perelman School of Medicine

²Center for Clinical Epidemiology & Biostatistics, University of Pennsylvania Perelman School of Medicine

³Department of Radiation Oncology, University of Pennsylvania Perelman School of Medicine

Abstract

Objective—To determine the proportion of endometrial cancer patients who can be safely prescribed community/home based unsupervised exercise. A better understanding of the physical dysfunction secondary to comorbidities among endometrial cancer patients would assist clinicians in delineating which patients to send to medically-based supervised rehabilitation versus a community/home based unsupervised exercise program.

Methods—A literature review identified health issues which could impede patients from successfully completing an unsupervised exercise program after a cancer diagnosis. The charts of 479 endometrial cancer patients treated between 2006 and 2010 were reviewed to determine the health status at the time of diagnosis and the type and percentage of health-issues that could preclude an unsupervised exercise program in this population. Univariable and multivariable modeling were used to evaluate the association of demographic, cancer-related characteristics and clinical variables with ability to participate in unsupervised exercise.

Results—We determined that 14.2% of endometrial cancer patients were able to exercise without supervision based on their health status at the time of diagnosis. After excluding common comorbidities (hypertension, diabetes and morbid obesity) from the identified health-issues, the proportion increased to 20.5%. Older at diagnosis ($P=0.007$) and higher BMI ($P<0.001$) are more likely to exclude patients from community/home based unsupervised exercise program.

Conclusions—Only 14.2% to 20.5% of endometrial cancer patients were deemed able to exercise without supervision based on their health status at diagnosis. Our data suggest that approximately 80% of endometrial cancer patients would benefit from a referral to a medically-based supervised exercise program.

Corresponding Author: Kathryn H. Schmitz, Center for Clinical Epidemiology & Biostatistics, University of Pennsylvania Perelman School of Medicine, 3440 Market St, Suite 440, Philadelphia, PA 19104, Tel:215-898-6604, schmitz@mail.med.upenn.edu.

Author's Disclosures of Conflict of Interests

The authors declare that there are no conflicts of interest.

Keywords

physical activity; survivorship; exercise prescription

Introduction

Physical activity may reduce the risk of endometrial cancer by 38-46% [1]. Besides the significant role in the primary prevention of endometrial cancer, physical activity also can provide health benefits during and after endometrial cancer therapy. The standard therapy for endometrial cancer includes surgery with or without adjuvant chemotherapy and/or radiation. These treatments can be associated with adverse effects on the cardiovascular and pulmonary systems, and may also lead to acute and chronic side effects such as musculoskeletal weakness, gastrointestinal upset, dysfunction, pain, cancer-related fatigue, depression and long-term physical limitations, which may restrict or impair activities of daily living [2-4]. Aerobic exercise significantly improves cardiopulmonary function, decreases fatigue and pain symptoms, improves muscle strength and physical function, and also positively influences psychological outcomes among cancer survivors during and after curative cancer treatments [5-11].

Three organizations (the American College of Sports Medicine (ACSM), American Cancer Society (ACS), and National Comprehensive Cancer Network (NCCN)) recommend all cancer survivors avoid inactivity, and as soon as initial recovery is completed, to engage in 150-minutes of moderate-intensity, or 75-minutes of vigorous-intensity aerobic exercise per week, perform two to three muscle strengthening sessions per week, and perform flexibility activities on days of exercise [12-14]. Furthermore these three organizations agree that physical activity or exercise training for cancer survivors should be tailored to accommodate the participant's health status, medical comorbidities and side effects of cancer treatment. Prior studies demonstrate that cancer patients may benefit from prescreening for comorbidities to improve the specificity of exercise recommendations [15]. Although these guidelines noted above are shared with oncologists to inform the delivery of physical activity in clinical practice, few oncologists have implemented them [16]. Endometrial cancer patients, in particular, have low physical activity participation rates, ranging from 22% – 41% [5-11]. There may be multiple barriers to engage in physical activity, and in the experience of the gynecologic oncologists at our institution, clinicians and patients may be concerned about the safety of exercise. More specifically, there is a concern regarding the need for and capacity to appropriately triage those needing more medical or supervised interventions versus those for whom community/home based unsupervised exercise may be safe and advisable.

To assess the proportion of endometrial cancer patients who can be safely prescribed community/home based unsupervised exercise, we retrospectively assessed health-issues including comorbidities, medical devices and medical problems at the time of cancer diagnosis of a cohort in endometrial cancer patients. The primary objective of this study was to estimate the proportion of endometrial cancer patients for whom oncologists could safely prescribe community/home based unsupervised exercise at the dose suggested by the

ACSM/ACS/NCCN clinical guidelines, based on the health status at the time of diagnosis. We hypothesized the majority of endometrial cancer patients harbor physical dysfunction secondary to their comorbidities present at the time of cancer diagnosis, and that impedes the potential uptake of physical activity during survivorship and an inability to achieve ACSM/ACS/ NCCN guidelines.

Methods

Study participants

Eligible participants were women aged 20 years and older, with biopsy-proven endometrial cancer (International Classification of Disease, 9th Revision [ICD-9]: 182.0). All patients were treated at one of the Gynecologic Oncology Practices within the University of Pennsylvania Health System (UPHS) between the years of 2006 and 2010. We also excluded those who were 90 years or older, or who were confined to a wheelchair (we assumed we would not prescribe unsupervised exercise for those who are 90 or older or those confined to a wheelchair). All data for the present analysis were abstracted from electronic medical records. The University of Pennsylvania Institutional Review Board approved this protocol (IRB# 817318).

Defining the primary outcome

The primary outcome was ‘the proportion of endometrial cancer patients for whom gynecologic oncologists could prescribe community/home based unsupervised exercise’, as defined previously [17]. More specifically, nine documents published between 2006 and 2013 were reviewed by two researchers and have been used to develop a detailed list (health-issues) to define whether patients would be able to perform unsupervised exercise after a cancer diagnosis. This list has been published and previously applied to colorectal cancer survivors [17]. The health-issues were classified into one of the following system-specific categories: hematologic, musculoskeletal, systemic, gastrointestinal, cardiovascular symptoms, cardiovascular disease history, pulmonary, neurologic, comorbidities, and medical device (S1). The presence of one or more health-issues indicated the inability to perform an unsupervised exercise program.

Outcome Assessment Time point

Given that a complete medical history and physical exam are typically taken at diagnosis and in preparation for surgery, we selected the time at diagnosis of cancer as the most informative time point regarding a patient’s ability to participate in exercise. We presume that a patient’s overall status will likely stay the same or slightly decline following cancer treatment but not likely to improve. Therefore, information regarding comorbidities, medical devices and medical problems at the time of endometrial cancer diagnosis were used to construct a composite measure of ability to participate in exercise without supervision.

Abstraction of Outcomes & Application of Exercise Guidelines to Participant Cohort

Health-issues were evaluated at the time of diagnosis consisting of blood chemistries, resting pulse and blood pressure, oral temperature, physician-diagnosed symptoms, patient-reported

symptoms present at the time of the clinical visit, and any ICD-9 or procedure codes used to classify conditions or procedures in our abstracted list (S1) [17].

Covariates

Age and BMI (body mass index) were calculated at the time of cancer diagnosis. Race was classified as white, black, or other. Categorical variables were generated for cancer-related characteristics, including histology (endometrioid carcinoma; other histologic types including papillary serous carcinomas, clear cell carcinomas; MMMTs: malignant mixed mesodermal tumors or malignant mixed mullerian tumors; and unspecified endometrial cancer), stage, grade (FIGO grade 1-3) and recurrence, as well as clinical variables including type of treatments (surgery, radiation and chemotherapy), other cancer history and Charlson Comorbidity index.

Statistical Analysis

The abstracted medical record data were used to generate a binary variable (yes/no) to indicate whether each participant had health-issues that would impede ability to perform unsupervised exercise. We generated a composite outcome as the sum of all health-issues, and then dichotomized that variable between endometrial cancer patients that had zero versus one or more health-issue(s). A value of zero indicates that community/home based unsupervised exercise may be appropriate. Values of one or more would indicate that the health status precludes patients from safely completing an unsupervised exercise program, and that referral to a medically-based supervised rehabilitation (e.g. physical therapy) might be advisable.

We used median and range to describe continuous variables as they were not normally distributed. Frequency and proportion were used to describe binary and categorical variables. Mann-Whitney test was used to compare the difference of continuous variables. Pearson Chi-square and Fisher exact test were used to compare the difference of categorical variables.

We used univariable logistic regression and multivariable logistic regression to assess the association between the ability of participation in a community/home based unsupervised exercise program and demographic, cancer-related characteristics and clinical variables. We also conducted pre-specified sensitivity analyses excluding common comorbidities among endometrial cancer patients from the composite outcome, including hypertension, diabetes and morbid obesity [6-8, 18-20].

Results

Cohort Demographic and Clinical Characteristics

479 endometrial cancer patients were identified through electronic medical records and met all inclusion criteria. Among the 479 cohort participants, age at diagnosis ranged from 25-86 (Table 1.). The median age at diagnosis was 61.2. Seventy percent of the participants were white. The Charlson comorbidity index ranged from zero to eleven, and 22.1% had no comorbidities (Table 1.).

Application of Exercise Guidelines to Participant Cohort: Primary Outcome

The prevalence of individual and system-specific health-issues identified which would preclude an unsupervised exercise program varied widely (S2). The cumulative number of health-issues is depicted graphically (Figure 1 (a)). The median number of health-issues was three [interquartile range: 1-6] and ranged from 0 to 19. In our primary outcome analysis, only 14.2 percent of endometrial cancer patients were classified as being at a health status that would enable their gynecologic oncologist to prescribe community/home based unsupervised exercise.

Application of Exercise Guidelines to Participant Cohort: Sensitivity Analysis

In sensitivity analysis, we excluded common comorbidities documented among endometrial cancer patients, including hypertension, diabetes, and morbid obesity (BMI of 40 or higher) [6-8, 18-20]. The median number of health-issues was two and ranged from 0 to 16 [Figure 1 (b)]. After exclusion of these three comorbidities, the proportion of endometrial cancer patients for whom it would be safe for gynecologic oncologist to prescribe a community/home based unsupervised exercise program increased to 20.5%.

Factors Associated with Needing to Modify Exercise Guidelines

In multivariable logistic regression, older age (OR=1.05, P=0.007) and higher BMI (OR=1.10, P<0.001) were more likely to preclude endometrial cancer patients from safe participation in a community/home based unsupervised exercise program (Table 2). The predicted probability from the multivariable logistic regression suggests that 75% of women 60 years, or with a BMI ≥ 35 kg/m², would be precluded from participation in an unsupervised exercise program (S3).

Discussion

Our study demonstrated that 79.5-85.8% of the 479 endometrial cancer patients evaluated would need to be referred to a medically-based supervised exercise program. This should not be interpreted as advice against exercise, but instead, as advice for an increase in referrals to appropriate rehabilitative programming to facilitate a return to a level of function consistent with safe performance of unsupervised exercise. Especially, for those who are ≥ 60 years, or with a BMI ≥ 35 kg/m², the likelihood of needing referral to a supervised exercise program is approximately 75%. Gynecologic oncologists frequently serve as the lead coordinator of care for endometrial cancer patients. Therefore, they may be able to play a role in referring such patients, to a medically-based supervised exercise program, perhaps through physical therapy, with a goal of getting these patients ready to return to a level of function that would be consistent with the ability to safely participate in community/home based unsupervised exercise.

The small proportion of endometrial cancer patients who could be prescribed community/home based unsupervised exercise in our study is consistent with reports regarding low participation rates of exercise in this population. Prior studies showed 22%-41% of endometrial cancer patients exercised according to self-report surveys [6-8,10], and when using objective measurements, only 18.1% met physical activity guidelines [20]. This could

be explained by our finding that only 14.2%-20.5% of endometrial cancer patients have the ability to perform unsupervised exercise based on their health status at the time of diagnosis. One possibility based on our data, is that these women had other health-issues (77.9% of participants had at least one comorbidity in our study) at the time of diagnosis that required referral to a medically-based supervised exercise program, in order to improve their condition sufficiently to be able to participate in a community/home-based unsupervised exercise.

In our study, many endometrial cancer patients were obese [6-8] (56.2%), had hypertension [21] (46.1%), or heart disease [22] (26.7%). These are all conditions for which exercise improves short-term and long-term outcomes [23-26]. For endometrial cancer patients to garner these health-benefits, they may initially need referral to a medically-based supervised exercise program. Evidence supports the feasibility of exercise in endometrial cancer patients [9]. In addition, physical therapy may be reimbursed by third-party payers in breast cancer for health conditions relating to lymphatic disorders, joint pain and stiffness, and muscle weakness [27], which are also common health-issues among endometrial cancer patients. It is plausible that third-party payers would also reimburse rehabilitation among endometrial cancer patients. Further, exercise is associated with better long-term health outcomes, such as positive changes in quality of life, improvements in physical function and benefits in psychological outcomes [5-11]. Medically-based supervised rehabilitative exercise program (such as physical therapy) would enable endometrial cancer patients to improve their health conditions, which, in turn, would enable them to be able to participate in community/home-based unsupervised exercise.

In a prior study, our research team documented that 21-42% of colorectal cancer patients could be prescribed unsupervised exercise [17]. In contrast, the present study indicated that endometrial cancer patients suffer more health-issues that impair their ability to participate in community/home-based unsupervised exercise when compared to colorectal cancer patients. One possible explanation for the difference in findings is the well documented association of endometrial cancer with obesity, which is commonly associated with many of the conditions that preclude prescription of community/home based unsupervised exercise. Thus, exercise programming could be particularly valuable to the population of endometrial cancer patients. There is an urgent need of interventions for weight loss and improving management of chronic comorbidities in this population. Unfortunately, simply telling women to walk more often may not be sufficient and, at times, unsafe. Referral to medically-based supervised rehabilitation (e.g. physical therapy) would allow for careful evaluation of what the woman can safely do, time to teach appropriate exercises, and prepare the woman for discharge to community/home based exercise.

There are several strengths of our study. As a retrospective cohort study, all of the 479 participants had biopsy-proven endometrial cancer. The sample size of the study, compared to others, is relatively large for endometrial cancer. Moreover, as the data were collected from electronic medical records, the reliability and validity are higher than self-report surveys. The major limitation of the current study was the generalizability. Our study was conducted within a single health system. Characteristics of endometrial cancer patients seen in the two hospitals may differ from other communities, such as the racial distribution of

69.9% white, 17.5% black and 8.3% other races may not reflect the general racial distribution in the nation. Also, patients who obtain health care at UPHS, tertiary care academic centers, may be at a higher risk or have more health-issues to start with compared to the patients who obtain health care at other hospital in the region, therefore, our results may underestimate the percentage of endometrial cancer patients for whom gynecologic oncologists could safely prescribe community/home based unsupervised exercise program. In addition, the retrospective study design may lead to some bias. As the information was collected from the electronic medical records, our data was limited to the recorded information. Even though we attempted to obtain the primary records and requested the information from outside providers for those who did not follow up in UPHS facilities, there may still be missing and incomplete information, which can lead to information and classification bias in the current study.

Our study found 14.2%-20.5% of endometrial cancer patients can be safely prescribed community/home based unsupervised exercise at the dose recommended by ACSM/ACS/NCCN. Increasing numbers of high quality studies support the evidence of the urgent need to prescribe a medically-based supervised exercise program as a routine part of cancer treatment [17]. Efforts should be taken to help gynecologic oncologists to readily prescribe medically-based supervised exercise to the cancer population in the clinical practices. Additionally, gynecologic oncologists, and knowledgeable staff in the field of exercise science need to tailor exercise for the majority of endometrial cancer patients appropriately. Further research needs to be dedicated towards effective exercise intervention strategies.

Conclusion

Our data suggest that approximately 80% of endometrial cancer patients would benefit from a referral to a medically-based supervised exercise program. Gynecologic oncologists may be able to play an important role by referring endometrial cancer patients who are 60 and older and/or have a BMI higher than 35 kg/m² to a structured, medically-based supervised exercise program (e.g. physical therapy) in order to safely participate in increased physical activities during survivorship, and to become able to engage in community/home based unsupervised exercise.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

REFERENCES

- [1]. National Cancer Institute. Endometrial Cancer Treatment (PDQ®). 2014.
- [2]. Li C, Samsioe G, Iosif C. Quality of life in endometrial cancer survivors. *Maturitas*. 1999; 31:227–236. [PubMed: 10340282]
- [3]. Prue G, Allen J, Gracey J, Rankin J, Cramp F. Fatigue in gynecological cancer patients during and after anticancer treatment. *J.Pain Symptom Manage*. 2010; 39:197–210. [PubMed: 19995675]
- [4]. Kornblith AB, Powell M, Regan MM, Bennett S, Krasner C, Moy B, et al. Long-term psychosocial adjustment of older vs younger survivors of breast and endometrial cancer. *Psycho-Oncology*. 2007; 16:895–903. [PubMed: 17245695]

- [5]. Speck RM, Courneya KS, Masse LC, Duval S, Schmitz KH. An update of controlled physical activity trials in cancer survivors: a systematic review and meta-analysis. *Journal of Cancer Survivorship*. 2010; 4:87–100. [PubMed: 20052559]
- [6]. Courneya KS, Karvinen KH, Campbell KL, Pearcey RG, Dundas G, Capstick V, et al. Associations among exercise, body weight, and quality of life in a population-based sample of endometrial cancer survivors. *Gynecol.Oncol*. 2005; 97:422–430. [PubMed: 15863140]
- [7]. Basen-Engquist K, Scruggs S, Jhingran A, Bodurka DC, Lu K, Ramondetta L, et al. Physical activity and obesity in endometrial cancer survivors: associations with pain, fatigue, and physical functioning. *Obstet.Gynecol*. 2009; 200:288. e1–288. e8.
- [8]. Beesley VL, Eakin EG, Janda M, Battistutta D. Gynecological cancer survivors' health behaviors and their associations with quality of life. *Cancer Causes & Control*. 2008; 19:775–782. [PubMed: 18322812]
- [9]. von Gruenigen VE, Courneya KS, Gibbons HE, Kavanagh MB, Waggoner SE, Lerner E. Feasibility and effectiveness of a lifestyle intervention program in obese endometrial cancer patients: a randomized trial. *Gynecol.Oncol*. 2008; 109:19–26. [PubMed: 18243282]
- [10]. Lukowski J, Gil KM, Jenison E, Hopkins M, Basen-Engquist K. Endometrial cancer survivors' assessment of the benefits of exercise. *Gynecol.Oncol*. 2012; 124:426–430. [PubMed: 22075241]
- [11]. Courneya KS, Segal RJ, Mackey JR, Gelmon K, Reid RD, Friedenreich CM, et al. Effects of aerobic and resistance exercise in breast cancer patients receiving adjuvant chemotherapy: a multicenter randomized controlled trial. *J.Clin.Oncol*. Oct 1.2007 25:4396–4404. [PubMed: 17785708]
- [12]. O'Connor FG, Casa DJ, Bergeron MF, Carter R 3rd, Deuster P, Heled Y, et al. American College of Sports Medicine Roundtable on exertional heat stroke--return to duty/return to play: conference proceedings. *Curr.Sports Med.Rep*. Sep-Oct;2010 9:314–321. [PubMed: 20827100]
- [13]. Rock CL, Doyle C, Demark-Wahnefried W, Meyerhardt J, Courneya KS, Schwartz AL, et al. Nutrition and physical activity guidelines for cancer survivors. *CA: a cancer journal for clinicians*. 2012; 62:242–274.
- [14]. Ligibel JA, Denlinger CS. New NCCN guidelines for survivorship care. *J.Natl.Compr.Canc Netw*. May.2013 11:640–644. [PubMed: 23704233]
- [15]. Jones LW. Evidence-based risk assessment and recommendations for physical activity clearance: cancer 1 1 This paper is one of a selection of papers published in this Special Issue, entitled Evidence-based risk assessment and recommendations for physical activity clearance, and has undergone the Journal's usual peer review process. *Applied Physiology, Nutrition, and Metabolism*. 2011; 36:S101–S112.
- [16]. Kenzik K, Pisu M, Fouad MN, Martin MY. Are long-term cancer survivors and physicians discussing health promotion and healthy behaviors? *Journal of Cancer Survivorship*. 2015:1–9.
- [17]. Brown JC, Schmitz KH. The prescription or proscription of exercise in colorectal cancer care. *Med.Sci.Sports Exerc*. Dec.2014 46:2202–2209. [PubMed: 24781887]
- [18]. Lachance J, Everett E, Greer B, Mandel L, Swisher E, Tamimi H, et al. The effect of age on clinical/pathologic features, surgical morbidity, and outcome in patients with endometrial cancer. *Gynecol.Oncol*. 2006; 101:470–475. [PubMed: 16413048]
- [19]. Cook LS, Nelson HE, Cockburn M, Olson SH, Muller CY, Wiggins CL. Comorbidities and endometrial cancer survival in Hispanics and non-Hispanic whites. *Cancer Causes & Control*. 2013; 24:61–69. [PubMed: 23109171]
- [20]. Loprinzi PD, Lee H, Cardinal BJ. Objectively measured physical activity among US cancer survivors: considerations by weight status. *Journal of Cancer Survivorship*. 2013; 7:493–499. [PubMed: 23686709]
- [21]. Furberg A, Thune I. Metabolic abnormalities (hypertension, hyperglycemia and overweight), lifestyle (high energy intake and physical inactivity) and endometrial cancer risk in a Norwegian cohort. *International Journal of Cancer*. 2003; 104:669–676. [PubMed: 12640672]
- [22]. Ward KK, Shah NR, Saenz CC, McHale MT, Alvarez EA, Plaxe SC. Cardiovascular disease is the leading cause of death among endometrial cancer patients. *Gynecol.Oncol*. 2012; 126:176–179. [PubMed: 22507532]

- [23]. Fletcher GF, Balady G, Blair SN, Blumenthal J, Caspersen C, Chaitman B, et al. Statement on exercise: benefits and recommendations for physical activity programs for all Americans. A statement for health professionals by the Committee on Exercise and Cardiac Rehabilitation of the Council on Clinical Cardiology, American Heart Association. *Circulation*. Aug 15.1996 94:857–862. [PubMed: 8772712]
- [24]. Warburton DE, Nicol CW, Bredin SS. Health benefits of physical activity: the evidence. *CMAJ*. Mar 14.2006 174:801–809. [PubMed: 16534088]
- [25]. Haskell WL, Lee I, Pate RR, Powell KE, Blair SN, Franklin BA, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation*. 2007; 116:1081. [PubMed: 17671237]
- [26]. Nelson ME, Rejeski WJ, Blair SN, Duncan PW, Judge JO, King AC, et al. Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. *Circulation*. 2007; 116:1094. [PubMed: 17671236]
- [27]. Brown JC, Schmitz KH. Weight Lifting and Physical Function Among Survivors of Breast Cancer: A Post Hoc Analysis of a Randomized Controlled Trial. *J.Clin.Oncol*. Jul 1.2015 33:2184–2189. [PubMed: 25964257]

Figure 1. Distribution of health-issues that preclude unsupervised exercise in (a) the primary outcome analysis, and (b) the sensitivity analysis that excluded hypertension, diabetes, and morbid-obesity.

Table 1(a)

Demographic and clinical variables (continuous variables)

	Overall(n=479)		Capable of unsupervised exercise (n=68)		Require supervision for exercise (n=411)		P-value ^a
	Median	Range	Median	Range	Median	Range	
Age at diagnosis	61.2	25-86	57.84	28-79	62	25-86	0.001
BMI (kg/m ²)	31.4	16.1-72.9	27.1	20.7-39.4	31.7	16.1-72.9	<0.001

^aP-value from Mann-Whitney test

Table 1(b)

Demographic and clinical variables (categorical variables)

		Overall(n=479)		Capable of unsupervised exercise (n=68)		Require supervision for exercise (n=411)		P-value ^b
		N	%	N	%	N	%	
Race								0.387
	White	335	69.9	51	75.0	284	69.1	
	Black	84	17.5	7	10.3	77	18.7	
	Other	40	8.4	7	10.3	33	8.0	
	Unknown	20	4.2	3	4.4	17	4.1	
Cancer_type^c								0.235
	Endometrial Type I	282	58.9	43	63.2	239	58.2	
	Endometrial Type II	126	26.3	13	19.1	113	27.5	
	MMMT	24	5.0	2	2.9	22	5.4	
	Unspecified	47	9.8	10	14.7	37	9.0	
Stage								0.95
	I	323	67.4	46	67.7	277	67.4	
	II	37	7.7	4	5.9	33	8.0	
	III	64	13.4	9	13.2	55	13.4	
	IV	21	4.4	3	4.4	18	4.4	
	Unknown	34	7.1	6	8.8	28	6.8	
Grade								0.073
	1	157	32.8	19	27.9	138	33.6	
	2	154	32.2	20	29.4	134	32.6	
	3	124	25.9	17	25.0	107	26.0	
	Unknown	44	9.2	12	17.7	32	7.8	
Comorbidities								<0.001
	0	106	22.1	68	100.0	38	9.3	
	1	84	17.5	0	0.0	84	20.4	
	2	289	60.3	0	0.0	289	70.3	
Surgery		467	97.5	60	98.4	407	99.3	0.427
Chemotherapy		142	29.6	14	23.7	128	31.6	0.22
Radiation		184	38.4	23	33.8	161	39.2	0.401
Recurrence		70	14.6	6	18.2	64	27.2	0.268
Other Cancer		63	13.2	5	100.0	58	85.3	0.468

^b P-value from Pearson Chi-square test^c Cancer type include: Endometrial type I: endometrioid adenocarcinoma; endometrial type II: clear-cell carcinoma, mucinous adenocarcinoma, papillary serous adenocarcinoma and mixed adenocarcinoma. MMMTs: malignant mixed mesodermal tumors or malignant mixed mullerian tumors; unspecified endometrial cancer.

Table 2

Association between demographic and clinical variables and preclude to participate in unsupervised exercise program (N=479)

Variables	Univariable Logistic Regression				Multivariable Logistic Regression			
	OR ^a	P value	95%CI ^b		OR ^a	P value	95%CI ^b	
<i>Age at diagnosis</i>	1.04	0.004	1.01	1.06	1.05	0.007	1.01	1.09
<i>BMI at diagnosis</i>	1.08	0.001	1.04	1.13	1.10	<0.001	1.04	1.15
<i>Race</i>								
White	1.00	--	--	--	1.00	--	--	--
Black	1.98	0.108	0.86	4.53	1.92	0.326	0.52	7.01
Other	0.85	0.707	0.36	2.02	1.59	0.491	0.42	6.01
unknown	1.02	0.978	0.29	3.60	0.51	0.441	0.09	2.79
<i>Cancer type</i>								
Endometrial Type I	1.00	--	--	--	1.00	--	--	--
Endometrial Type II	1.56	0.184	0.81	3.02	1.15	0.778	0.44	2.98
MMMT	1.98	0.367	0.45	8.72	1.08	0.936	0.18	6.53
Unknown	0.67	0.300	0.31	1.44	0.50	0.367	0.11	2.25
<i>Stage</i>								
I	1.00	--	--	--	1.00	--	--	--
II	1.37	0.569	0.46	4.05	0.98	0.975	0.27	3.51
III	1.01	0.970	0.47	2.19	0.95	0.922	0.34	2.68
IV	1.00	0.996	0.28	3.52	--	--	--	--
<i>Grade</i>								
1	1.00	--	--	--	1.00	--	--	--
2	0.92	0.814	0.47	1.81	0.98	0.971	0.42	2.30
3	0.87	0.689	0.43	1.75	0.68	0.480	0.24	1.96

^aOdds Ratio (OR) from Logistic Regression

^b95% Confidence Interval (95% CI)