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Survey article

# Patients with endometrial cancer continue to lack understanding of their risks for cancer

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ABSTRACT

It is unclear if endometrial cancer (EC) patients are aware of their modifiable risk factors. We administered a 33-item questionnaire to EC patients at a university-based cancer center to assess their understanding of how co-morbidities and lifestyle/sexual behaviors impact their cancer risk. We also inquired about their access to a primary care physician (PCP). Pearson's $\chi^2$ test or Fisher's exact test were used to assess differences in understanding based on a dichotomized Charlson comorbidity score, $< 7$ vs $\geq 7$. Of the 50 surveyed women (81% response rate), 39 reported hypertension (80%) and 36 (72%) diabetes. All had a PCP. Most were aware that obesity contributes to diabetes (43/48, 90%), hypertension (42/48, 88%), and heart attack (42, 88%), but only 19/49 (39%) knew that EC is more common in overweight/obese women. More than half lacked understanding of the following risks including modifiable risk factors–unhealthy diet (31, 62%), hormone replacement therapy (38, 76%), alcohol (30, 60%), and the protective effects of cigarette smoking (38, 76%). Most also incorrectly identified the following sexual health factors as risks for EC: early coitarche (30, 60%), or having an abortion (27, 54%), a sexually transmitted infection (35, 70%) or human immunodeficiency virus (34, 68%). Although EC patients recognize that obesity is linked to comorbidities, less than half are aware that it contributes to their cancer risk. Furthermore, responses to lifestyle/sexual health behaviors suggest women may lack understanding of global differences between endometrial and cervical cancer risk factors.

## 1. Introduction

More than 50% of women with early stage endometrial cancer (EC) die from intercurrent illnesses rather than cancer itself (Binder et al., 2016). Obesity has been shown repeatedly to be one of the strongest EC risk factors that drives all-cause and cancer-specific mortality (Gunderson et al., 2014; Arem et al., 2013; von Gruenigen et al., 2006). Appropriately, an abundance of research has been dedicated to better understanding patients' knowledge of the impact of obesity on cancer, and multi-centered weight loss interventions have been implemented among EC survivors to help reduce their risk of death (Ackermann et al., 2005; Connor et al., 2017; Haggerty et al., 2017a,b; Kuroki et al., 2015; Soliman et al., 2008). Unfortunately, positive outcomes of weight loss interventions are brief and reach only a small subset of women affected with EC (Haggerty et al., 2017a).

Less publicized, although equally important, are the impact of other obesity-related comorbidities such as diabetes and hypertension, which have been associated with EC progression and decreased survival even after adjusting for stage and grade (Nagle et al., 2018; Modesitt et al., 2006). A multidisciplinary approach to cancer care and survivorship needs to address not only cancer-specific risks [eg, unopposed estrogen, hormone replacement therapy (HRT), tamoxifen exposure, family history, etc], but also obesity-related comorbidities. Therefore, we implemented a survey to evaluate patient understanding of how co-morbidities and lifestyle/sexual behaviors impact their cancer risk. Our secondary objective was to assess what proportion of EC patients have a primary care physician and if not, whether they felt a referral to an internal medicine physician was acceptable. Due to the lack of a standardized knowledge assessment tool for cancer risk, to address these objectives, we conducted a pilot survey study among EC patients treated at a National Cancer Institute (NCI) designated comprehensive cancer center.

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## 2. Methods

We performed a single institution survey study of 50 women with active or treated EC from February 13, 2019 to April 8, 2019. A total of 62 patients were approached to complete the study; 12 patients declined to participate or withdrew from the study at a later time. All procedures were reviewed and approved by Washington University's Human Research Protection Office (HRPO ID# 201901044). We included women at least 18 years of age who were able to read and write English and provide signed informed consent. Cancer diagnosis was confirmed by review of pathology reports. All patients were included regardless of histologic type, stage, current management, or disease status (in remission, stable, progressive, and/or recurrent). Exclusion criteria were as follows: patients under the age of 18 years, patients without a diagnosis of endometrial cancer, and patients unable to read or write English.

All patients invited to participate were under the care of faculty members of the Division of Gynecologic Oncology at Washington University School of Medicine and Siteman Cancer Center, an NCI designated comprehensive cancer center. Clinic schedules were screened to identify eligible patients and a research team member approached those who met eligibility criteria during their outpatient appointment. Patients were assured that study participation was voluntary, confidential, and had no impact on their care. They completed a 33-item questionnaire (Supplemental Figure) at the time of their appointment. The estimated time for survey completion was approximately 10–15 mins, and there was no required follow-up.

The primary outcome was the proportion of EC patients who correctly identified that obesity is a risk factor for EC. This was assessed using a composite of two questions with answer choices: True/False/I don't know: 1) Endometrial cancer is more common in overweight or obese people and 2) Weighing too much makes a woman more likely to have endometrial cancer. Questions assessed patients' knowledge of the association between obesity, comorbidities, lifestyle and sexual health behaviors and EC risk. Each question had one correct answer, either true or false; “not sure” was an available answer choice for each knowledge question. Questions specifically related to obesity were modified from a previously published survey study on obesity-related risk factors (Kuroki et al., 2015). Those regarding sexual health and other risk factors (eg, hormone replacement therapy, family history, the role of Pap tests etc) were based on a prior survey that highlighted patients' lack of knowledge regarding differences between cervical and EC risks (Ackermann et al., 2005).

Patients were asked about their sociodemographic information including age, race, yearly income, highest level of education, and history of alcohol, cigarette or recreational drug use. These were constructed from validated items in the Center of Disease Control Behavioral Risk Factor Surveillance System surveys (Centers for Disease Control and Prevention, 2018). Other clinical data were abstracted from patient's electronic medical records included age, body mass index (BMI), cancer stage, treatment, and past medical history which was used to calculate a Charlson Comorbidity Index Score (Charlson et al., 1987) for each respondent.

Demographic information was summarized with descriptive statistics. Continuous measurements were summarized with means, standard deviations, medians, percentile, and ranges. Bivariate analysis was conducted using Pearson's $\chi^2$ or Fisher's exact tests where appropriate for categorical variables, and Mann-Whitney U for non-parametric continuous variables. All calculations were performed using SAS version 9.4 (SAS Institute, Cary, NC) and associations were considered

**Table 1**
Patient demographics and clinical characteristics (N = 50).

| Characteristics | N = 50 |
|---|---|
| Age, year[a] | 67 (59,74) |
| Time from diagnosis (months) | 19 (9, 53) |
| Body Mass Index (kg/m$^2$)[a] | 36.9 (33,42) |
| Race | |
| White | 42 (84) |
| Black | 8 (16) |
| Education | |
| High school or less | 18 (36) |
| College or higher | 32 (64) |
| Employment status[d] | |
| Unemployed | 2 (4) |
| Employed | 16 (32) |
| Homemaker | 3 (6) |
| Retired | 29 (58) |
| Annual gross income[d] | |
| < $20,000 | 7 (14) |
| $20,000 to $49,999 | 14 (28) |
| $50,000 to $74,000 | 10 (20) |
| ≥$75,000 | 15 (30) |
| Missing | 4 (8) |
| Relationship status | |
| Never married | 5 (10) |
| Married | 25 (50) |
| Separated, divorced, or single | 10 (20) |
| Widowed | 9 (18) |
| Prefer not to say | 1 (2) |
| Nulliparity | 6 (12) |
| Prior hormone replacement therapy | 9 (18) |
| Alcohol consumption per week | |
| None | 35 (70) |
| Occasionally | 9 (18) |
| > 3 drinks | 6 (12) |
| Cigarette smoking | |
| Never | 36 (72) |
| Former | 12 (24) |
| Current | 2 (4) |
| Diabetes | 14 (28) |
| Hypertension | 40 (80) |
| Mean systolic blood pressure[b] | 139 (126, 151) |
| Mean diastolic blood pressure[b] | 82 (75,84) |
| Charlson comorbidity index | |
| 1–3 | 7 (14) |
| 4–6 | 18 (36) |
| ≥7 | 25 (50) |
| Amount of exercise | |
| Not at all | 23 (46) |
| A couple times a month | 7 (14) |
| Once a week | 7 (14) |
| More than once a week | 13 (26) |
| # of patients who reported a weight gain in last year | 10 (20) |
| # of patients who reported a weight loss in the last year | 18 (36) |
| Recent weight gain[c] | 9.5 (7,10) |
| Recent weight loss[c] | 17.5 (10,35) |
| Histology | |
| Endometrioid | 37 (74) |
| Serous | 7 (14) |
| Clear cell | 1 (2) |
| Mixed/other | 5 (10) |
| Cancer stage | |
| I-II | 39 (78) |
| III-IV | 11 (22) |
| Cancer recurrence | 9 (18) |
| Current treatment | |
| None | 35 (70) |
| Chemotherapy | 14 (28) |
| Radiation | 1 (2) |
| Current cancer status | |

(continued on next page)

**Table 1** (*continued*)

| Characteristics | N = 50 |
|---|---|
| No evidence of disease | 32 (64) |
| Alive with disease | 18 (36) |

[a] Reported as median (Interquartile range).
[b] Median (Interquartile range) systolic and diastolic blood pressure among the 40 patients who had a diagnosis of hypertension. All were on anti-hypertensive medications.
[c] Among those women who reported a weight gain/loss in the last year. Reported as median (Interquartile range).
[d] Missing data Employment status (n = 1) Annual income (n = 4).

statistically significant if $p < .05$.

## 3. Results

Of the 62 EC patients approached to participate, 50 (81%) completed the survey, and their demographic and clinical information is displayed in Table 1. Median age was 67 years, and the majority were white (42, 84%), educated with a college degree or higher (32, 64%) and diagnosed with a Stage I-II (39, 78%), endometrioid adenocarcinoma (37, 74%). Eighteen percent had been diagnosed with recurrence and 70% were not undergoing any treatment. Twenty-five (50%) had a Charlson Comorbidity index score of ≥7, 40 (80%) had hypertension, and 14 (28%) had diabetes. Median body mass index was 37 $kg/m^2$, 44 (88%) correctly identified themselves as overweight or obese, and 23 (46%) reported no engagement in exercise. Eighteen (36%) reported a median weight loss of approximately 17.5 pounds (interquartile range, IQR 10, 35) over the last year. Of the 10 (20%) women who reported weight gain within the last year, the median number of pounds gained was 9.5/year (IQR 7, 10). All patients (50, 100%) had a primary care provider that they followed with regularly.

Assessment of patient knowledge regarding risk factors is shown in Table 2. Most patients were aware that obesity is a risk factor for diabetes (43, 90%), hypertension (42, 88%), and heart attack (42, 88%), but more than half lacked understanding that EC is more common in overweight or obese people (31, 62%). There were no differences in knowledge when respondents were stratified by BMI (data not shown) or Charlson comorbidity score.

Other questions regarding modifiable risk factors that were incorrectly answered or marked unsure by > 50% of respondents included the following: unhealthy diet (31, 62%), hormone replacement therapy (38, 76%), and social health behaviors such as alcohol (30, 60%), illegal drugs (26, 52%), and cigarette smoking (38, 76%).

Responses to questions regarding sexual and gynecologic health are shown in Table 2. Twenty-seven women (54%) believed that not getting a Pap test increased their risk for EC. The majority incorrectly identified or were unsure if having sex early in life (30, 60%), having an abortion (27, 54%), having a sexually transmitted disease (35, 70%), and human immunodeficiency virus (34, 68%) were risk factors for EC.

## 4. Discussion

Women with EC are susceptible to public health messages about the health risks of obesity, yet they remain naïve about their EC-specific risks. While a majority of respondents understood the link between obesity and diabetes, hypertension, and heart attack, less than half identified the association between obesity and EC. The finding that most EC patients were obese despite this level of understanding of the harmful effects of obesity suggests that there is limited public knowledge regarding the link between obesity and endometrial cancer. This infers that educational messages about the link between EC and obesity

**Table 2**
Patient knowledge assessment of risk factors for endometrial cancer.

| Survey questions | Missing data n | Incorrect answer/Unsure n (%) | CCI score < 7 N = 25 | CCI score ≥ 7 N = 25 |
|---|---|---|---|---|
| Obesity-related questions[a] | | | | |
| Endometrial cancer is more common in overweight or obese people. | 1 | 31 (62) | 16 (64) | 15 (60) |
| Weighing too much makes a woman more likely to have endometrial cancer. | 1 | 26 (52) | 11 (44) | 15 (60) |
| Comorbidity questions[a] | | | | |
| Obesity or being overweight leads to other health problems such as: | | | | |
| Diabetes | 2 | 5 (10) | - | - |
| High blood pressure | 2 | 6 (12) | 3 (12) | 3 (12) |
| Heart attacks | 2 | 6 (12) | 2 (8) | 4 (16) |
| Social history questions[a] | | | | |
| What makes a woman more likely to have endometrial cancer? | | | | |
| Drinking too much alcohol | 2 | 30 (60) | 14 (56) | 16 (64) |
| Using illegal drugs | 1 | 26 (52) | 14 (56) | 12 (48) |
| Cigarette smoking | 2 | 38 (76) | 19 (76) | 19 (76) |
| Sexual health questions[a] | | | | |
| Endometrial cancer is a sexually transmitted disease. | | | | |
| What makes a woman more likely to have endometrial cancer? | 0 | 4 (8) | 2 (8) | 2 (48) |
| Having sex early in life | 1 | 30 (60) | 16 (64) | 14 (56) |
| Having sex without a condom | 1 | 22 (44) | 14 (56) | 8 (32) |
| Having multiple sex partners | 1 | 24 (48) | 13 (52) | 11 (44) |
| Oral sex | 2 | 21 (42) | 11 (44) | 10 (40) |
| Having an abortion | 2 | 27 (54) | 14 (56) | 13 (52) |
| Having a sexually transmitted infection | 1 | 35 (70) | 17 (68) | 18 (72) |
| HIV (human immunodeficiency virus) | 1 | 34 (68) | 16 (64) | 18 (72) |
| Miscellaneous questions[a] | | | | |
| What makes a woman more likely to have endometrial cancer? | | | | |
| Others in the family have it | 2 | 23 (46) | 9 (36) | 14 (56) |
| Not getting a Pap test done | 1 | 27 (54) | 12 (48) | 15 (60) |
| Unhealthy diet (i.e. fast-food, little fresh vegetables, fruit) | 1 | 31 (62) | 13 (52) | 18 (72) |
| Hormone replacement therapy | 1 | 38 (76) | 16 (64) | 22 (88) |

CCI: Charlson Comorbidty Index.
Data are frequencies (%), *p*-value based on $\chi^2$/Fisher's exact test.
[a] Answer choices were dichotomized as true versus false/not sure.

may be insufficient to motivate behavior change. Furthermore, women commonly misclassified lifestyle and sexual behaviors that are strongly linked to cervical cancer as EC risks, highlighting a more global misunderstanding of risks associated with preventable gynecologic cancers.

Publications over the last decade reflect that women's knowledge of EC risks have not improved over time, though they may have more accurate self-perception of their weight. Prior work from 2008 showed that 42% of women in the general population without a diagnosis of cancer were aware that obesity increases the risk of EC (Soliman et al., 2008). In 2012, a telephone survey of 1433 adults, both female and male, in Australia, reported public knowledge and beliefs regarding behavioral risk factors for cancer. Mirroring similar patterns of knowledge to our study of U.S. women with EC, they reported only 18% were aware that obesity increased the risk of EC, while the majority were aware of the attributable risk of obesity on diabetes (79%), hypertension (74%) and heart disease (73%). In 2017, Connor et al. not only showed that the obese, EC patients commonly misclassified their weight, but that 44% knew obesity was a risk factor for their cancer type, and only 38% had discussed their weight with their oncologist (Connor et al., 2017). That same year, our institution participated in a Transdisciplinary Research in Energetics and Cancer (TREC) initiative and was one of 3 academic medical centers to conduct a multi-site randomized study of 196 obese, EC survivors (Haggerty et al., 2017a). Participants completed knowledge assessments of obesity as a risk for EC and interest in weight management; and 41 patients were randomized to a 6-month intervention of telemedicine with Wi-Fi scales (n = 14), text messaging (n = 13), or enhanced usual care (n = 15). They showed a third of survey participants lacked awareness that obesity increased the risk of EC, and 40% misclassified their body mass. Importantly though, the TREC study showed that technology-based lifestyle interventions were accessible and resulted in weight loss and improved quality of life.

Two years later, our current study showed improved self-awareness of obesity and enhanced knowledge about the associated risk of obesity on EC. Unfortunately, most patients were not actively losing weight, and in fact, 20% reported gaining almost 10 pounds during the preceding year, but 36% reported having lost a median of 17.5 pounds. While most remained obese, this suggests that some women are amenable to lifestyle modification. Further research is needed to explore what motivates these women, what strategies they employed for successful weight loss, and whether those strategies can motivate successful weight loss in others. Given that the overwhelming majority of early stage endometrioid adenocarcinoma patients are cured of their cancer and instead die from intercurrent illnesses (Binder et al., 2016), the focus of weight loss counseling in this obese population should be on reducing preventable premature death from cardiovascular disease and diabetes.

Our study is limited by the inherent biases of any survey study, including potential for selection and recall bias. We acknowledge our sample size is small and not restricted to endometrioid histology, but given the consistency of our findings with the current literature, it is unlikely that our findings would significantly change with a larger sample of women with Type I EC. Our findings reinforce prior evidence to highlight the need for intervention trials that test innovative strategies to modify behaviors to reduce obesity. Third, these data were collected at a single academic institution, thus limiting generalizability. Collection during office visits for ongoing cancer care posed risks for incorrect answers due to potential time constraints and distractions; nonetheless, all questions allowed for respondents to mark, “I don't know” to minimize skipped questions, and at most, there were 3 missing responses per any one knowledge question (Table 2).

In conclusion our study showed that women with EC lacked fundamental knowledge of their cancer risk factors. Most striking is the discrepancy in knowledge related to the risk of obesity on comorbidities versus EC; however, response to lifestyle/sexual health behaviors suggest women may be unaware of global differences between endometrial and cervical cancer risk factors. A national campaign to decrease the prevalence of these preventable gynecologic cancers is long overdue; and the priority should be on weight loss and human papilloma virus vaccination, respectively. More advocacy by medical professional societies to promote a culture change and weight loss are needed. Among our subspecialty, the Society of Gynecologic Oncology (SGO) has an obesity webpage which includes a toolkit to facilitate discussions about weight management as well as links to clinical trials of exercise, diet and nutrition as well as a BMI calculator. The National Comprehensive Cancer Network guidelines set forth recommendations for EC surveillance exams to include obesity and nutrition counseling. Lastly, the NCI has charged oncologists and primary care providers with the task of engaging in multidisciplinary, survivorship cancer care to address intercurrent illnesses as well as provide appropriate surveillance for cancer recurrence and late side effects of treatment (Hewitt et al., 2006). Supported by our survey results, it would be imperative for future research efforts to involve both PCP and oncologists to not only enhance awareness of preventable cancers, but also evaluate different models of survivorship care for EC patients to incorporate effective education and counseling regarding their modifiable risk factors in order to improve clinical outcomes.

## Author contributions

1. Subhjit Sekhon: Lead author who designed the survey study, worked on IRB submission, performed the majority of data collection and entry, and produced manuscript draft incorporating revisions/feedback from co-authors.
2. L. Stewart Massad: Assisted with manuscript draft and revisions and approval of final submitted version.
3. Andrea R. Hagemann: Assisted with manuscript draft and revisions and approval of final submitted version.
4. Rebecca Dick: Creating REDCap database survey instrument. Assisted with statistical analysis and approval of final submitted version.
5. Andrea Leon: Performed data collection and entry, as well as assisted with manuscript writing and revisions.
6. Abigail S. Zamorano: Assisted with manuscript revisions and approval of final submitted version.
7. Premal H. Thaker: Assisted with manuscript revisions and approval of final submitted version.
8. Carolyn K. McCourt: Assisted with manuscript revisions and approval of final submitted version.
9. David G. Mutch: Assisted with manuscript revisions and approval of final submitted version.
10. Matthew A. Powell: Assisted with manuscript revisions and approval of final submitted version.
11. Lindsay M. Kuroki: Senior author who helped with initial design, IRB submission, data entry, and manuscript writing.

## Declaration of Competing Interest

Dr. McCourt reports UpToDate Ad Hoc section editor for EC. Dr. Thaker reports personal fees from Celsion, personal fees from Stryker, grants and personal fees from Tesaro, grants and personal fees from Merck, personal fees from Abbvie, personal fees from Clovis, personal fees from AstraZeneca outside the submitted work. Dr. Powell reports personal fees from Merck, personal fees from Tesaro, personal fees from Clovis Oncology, personal fees from AstraZeneca, personal fees from Roche/Genentech, personal fees from GOG Foundation, outside the submitted work. Dr. Kuroki reports grants from Washington University Institute of Clinical and Translational Sciences (R25 STRENGTH and KL2) during the conduct of the study. All other authors declare no potential conflict of interest.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.gore.2019.07.013.

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