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Impact of electronic medical record utilization on obesity screening and intervention for obese patients with endometrial cancer

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ABSTRACT

Objective To identify the prevalence of obesity documented within the electronic medical record problem list.

Methods We conducted a retrospective cohort study of adult patients with obesity and endometrial cancer receiving care from January 2018 to March 2021 at a single institution. Obesity intervention was defined as receipt of at least one of the following: referral to weight loss clinic, referral to a nutritionist, completion of obesity intervention tab, or documentation of weight loss counseling. Our secondary objectives were to (1) identify the prevalence of completed obesity interventions, (2) identify the number of patients who have achieved weight loss since their initial visit, and (3) identify covariates associated with presence of obesity on problem list, completion of obesity interventions, and weight loss.

Results We identified 372 patients who met inclusion criteria. Of eligible patients, 202 (54%) had obesity documented on their problem list and 171 (46%) completed at least one obesity intervention. Within our cohort, 195 (52%) patients achieved weight loss from diagnosis or initial clinical encounter at our institution to most recent clinical encounter with median weight loss of 3.9 kg (IQR 1.5–8.0). In the multivariable logistic regressions, patients with obesity on the problem list were approximately twice as likely to have completion of obesity intervention (OR 1.91, 95% CI 1.09, 3.35, $p=0.024$). Although presence of obesity on the problem list was not associated with weight loss, completion of health maintenance obesity intervention tab in the electronic medical record (Epic) was associated with weight loss (OR 2.77, 95% CI 1.11, 6.89, $p=0.03$).

Conclusions Only half of obese endometrial cancer patients had documentation of obesity within the electronic medical record problem list. The electronic medical record could be leveraged to achieve compliance with weight loss interventions. Further investigation on how the electronic medical record can be optimized to help patients achieve weight loss is needed.

INTRODUCTION

Obesity increases the risk of developing endometrial cancer¹ and remains a significant contributor of morbidity and mortality after treatment. Obese patients with endometrial cancer are at increased risk of both all-cause mortality and endometrial cancer

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Obesity-related comorbidities are the leading cause of death among endometrial cancer survivors. The majority of endometrial cancer survivors are interested in weight loss, but there are numerous barriers to achieving this goal.

WHAT THIS STUDY ADDS

⇒ Documentation of obesity in the electronic medical record problem list is associated with increased completion of obesity interventions including referral to medical weight loss clinic.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Utilization of the electronic medical record problem list for obesity is low. Future investigation of how the electronic medical record could be leveraged to improve weight loss for obese patients with endometrial cancer is warranted.

mortality when compared with non-obese patients with endometrial cancer.² Increases in morbidity and mortality are often secondary to obesity-driven comorbidities such as cardiovascular disease and diabetes.

Among endometrial cancer survivors, obesity was negatively associated with adverse oncologic and post-operative outcomes, including poor physical, functional, and emotional well-being at 6-month follow-up.^{3–7} Referrals to nutrition and weight loss clinics are not currently considered standard or routine interventions for all morbidly obese patients diagnosed with endometrial cancer. However, as the incidence of obesity continues to rise, it is imperative for healthcare providers to identify reliable weight loss interventions to optimize the health of our obese endometrial cancer survivors.

The electronic medical record presents a unique opportunity to identify obesity as a medical problem and to implement weight loss interventions. Specifically, the electronic medical record problem list is a tool that is used to document and prioritize a patient's medical comorbidities. Our institution utilizes the electronic medical record Epic (Epic Systems, Verona,

WI, USA). This features a health maintenance intervention tab which gives providers access to a checklist of relevant health screening interventions personalized to the patient such as breast, cervical, and colon cancer screening. It includes a section called “obesity intervention”, which is a best practice advisory for addressing obesity and weight loss in patients who are obese. Problem list completeness has been associated with increased healthcare quality measures,⁸ including cancer screenings and preventative care. However, problem list completeness is often low and highly variable.^{9,10} There is a paucity of data on how the use of the electronic medical record could help facilitate obesity interventions in obese patients diagnosed with endometrial cancer.

The primary objective of this study was to identify the prevalence of obesity recorded on the electronic medical record problem list among patients with obesity and endometrial cancer receiving care at a single institution. We hypothesize the presence of obesity on the problem list would be associated with increased compliance with completion of obesity interventions.

METHODS

This was a retrospective cohort study of all patients with obesity and endometrial cancer who received care at Vanderbilt University Medical Center (VUMC) from January 1, 2018 to March 31, 2021. The former date was chosen as this marked our go live date with our transition to Epic and therefore the date on which we had access to the health maintenance information. This study was Institutional Review Board (IRB)-exempt (IRB#211228) as determined by the Human Research Protections Program at VUMC. Patients were included in this study if they were ≥ 18 years of age, had a body mass index (BMI) ≥ 30 kg/m², and completed at least two outpatient visits with a gynecologic oncology provider at our institution. Patients were included in all phases of oncologic care including initial diagnosis, active treatment or surveillance/survivorship, recurrent disease, and end of life. The primary objective was to identify the prevalence of obesity documented on the problem list. Our secondary objectives were to: (1) identify the prevalence of completed obesity interventions (which includes referral to medical weight loss clinic, referral to a nutritionist, completion of obesity intervention tab in the healthcare maintenance section of the Epic electronic medical record, or documentation in any clinic visit note on counseling about the importance of weight loss during our study time frame), (2) identify the number of patients who have achieved weight loss since their initial visit, and (3) identify covariates associated with presence of obesity on problem list, completion of obesity interventions, and weight loss.

We created a composite outcome obesity intervention which was defined as receipt of at least one of the following: referral to medical weight loss clinic, referral to a nutritionist, completion of obesity intervention tab in electronic medical record, or documentation in the clinic visit note on counseling about the importance of weight loss. Our institution's weight loss clinic offers both medical and surgical management of obesity including bariatric surgery.

Data Abstraction

Tumor registry confirmed endometrial cancer cases were identified using International Classification of Disease for Oncology codes from our institution's Research Derivative database. Cases were

manually reviewed for eligibility based on the aforementioned inclusion criteria. For cases which met eligibility criteria, demographics data, referrals to nutrition and weight loss clinics, and completion of the obesity intervention tab within Epic were extracted from the electronic medical record. Charts were then manually reviewed to obtain American Society of Anesthesiology (ASA) physical status, Charlson Comorbidity Index, oncologic history, documentation of obesity or BMI within the electronic medical record problem list, as well as documentation of obesity or weight loss counseling within provider notes.

The index visit was defined as the most recent clinical encounter with a gynecologic oncology provider within the study period. Completion of obesity intervention was a composite variable defined as completion of any of the following between the time of patient diagnosis and the index visit: referral to medical weight loss clinic, referral to a nutritionist, completion of obesity intervention tab in the healthcare maintenance section of the Epic electronic medical record, or documentation in the clinic visit note on counseling about the importance of weight loss. These interventions could occur at any period during our study time frame, not just at diagnosis. Weight loss was defined as decrease in weight from diagnosis (or first visit at our institution if patient was diagnosed elsewhere and we did not have prior medical records with weight at diagnosis) to index visit (most recent visit within study time frame).

Statistical Analysis

Summary statistics were utilized to describe demographic, clinical, and surgical characteristics. Mean with SD or median with IQR were utilized where appropriate. Chi-squared tests were utilized to compare categorical data. Wilcoxon rank-sum test was utilized to compare medians between groups with continuous variables. Univariable and multivariable logistic regression was conducted using Stata 15.1 for Macintosh (StatCrop LP, College Station, TX, USA). Univariable logistic regression was used to model the logit of probability of our outcomes including presence of obesity on problem list, completion of obesity intervention, and weight loss as a function of whether the patient had obesity listed on the problem list. A saturated model including all factors with $p < 0.20$ and any clinically relevant factors regardless of p value on univariable regression was built. Adjusted odds ratios and corresponding 95% confidence intervals for each factor remaining in the model are reported. Values of $p < 0.05$ were considered statistically significant. Missing data are reported for each variable in the tables. Less than 5% of data was missing for all variables except for ASA information. ASA data are missing for patients who did not have surgery at our institution. All observations that have a missing value were dropped from the regression analysis in Stata.

RESULTS

Demographics and Clinical Characteristics

We identified 705 patients with endometrial cancer seen at our institution between the dates of interest. Of those, 292 were excluded for BMI < 30 kg/m². An additional 41 patients were excluded for having fewer than two outpatient visits. Consequently, 372 patients were included in our final analysis. Patient demographics and oncologic characteristics are listed in Table 1. Median BMI at index visit was 39 kg/

Table 1 Patient demographics and oncologic characteristics (N=372)

Characteristic*	All patients (N=372)	Patients with obesity on problem list (N=202)	Patients without obesity on problem list (N=170)	P value
Age at index visit (years)	64 (58, 71)	63 (55, 69)	66 (60, 72)	0.002
BMI at index visit (kg/m ²)	38.7 (34.6, 45.3)	41.5 (36.9, 48.7)	35.7 (32.7, 40.1)	<0.001
Weight at index visit (kg)	103.6 (92.4, 123.6)	113.5 (96.1, 134.6)	96.4 (86.7, 106.2)	<0.001
Race†				0.93
White	321 (88%)	175 (88%)	146 (88%)	
Black	37 (10%)	21 (11%)	16 (10%)	
Other‡	8 (2%)	4 (2%)	4 (2%)	
Ethnicity§				0.65
Non-Hispanic	346 (98%)	188 (97%)	158 (98%)	
Hispanic	8 (2%)	5 (3%)	3 (2%)	
ASA status¶				0.02
I	1 (<1%)	0 (0%)	1 (<1%)	
II	53 (17%)	24 (13%)	29 (21%)	
III	241 (75%)	138 (75%)	103 (75%)	
IV	26 (8%)	21 (11%)	5 (4%)	
Tobacco use				0.57
Never	281 (76%)	153 (76%)	128 (75%)	
Current	17 (5%)	11 (5%)	6 (4%)	
Former	73 (20%)	37 (18%)	36 (21%)	
Insurance				0.12
Private	151 (41%)	94 (47%)	57 (34%)	
Medicare	211 (57%)	102 (51%)	109 (64%)	
Medicaid	3 (1%)	2 (1%)	1 (1%)	
Uninsured	4 (1%)	2 (1%)	2 (1%)	
Other	3 (1%)	2 (1%)	1 (1%)	
Chronic conditions (n)				0.17
1	24 (6%)	11 (5%)	13 (7%)	
2	46 (12%)	20 (10%)	26 (15%)	
3+	302 (81%)	171 (85%)	131 (77%)	
Charlson Comorbidity Index	4 (3, 6)	4 (3, 7)	3 (4, 6)	0.58
Marital status**				0.42
Single	65 (18%)	37 (19%)	28 (17%)	
Married	213 (58%)	109 (55%)	104 (62%)	
Widowed	35 (10%)	18 (9%)	17 (10%)	
Divorced	52 (14%)	34 (17%)	18 (11%)	
Other††	3 (1%)	2 (1%)	1 (1%)	
Distance from VUMC (miles)	35.7 (20.1, 81.3)	34.7 (18.8, 69.0)	36.9 (21.4, 85.1)	0.29
Stage of disease‡‡				0.33
I	292 (81%)	162 (84%)	130 (78%)	
II	19 (5%)	11 (6%)	8 (5%)	
III	31 (9%)	12 (6%)	19 (11%)	
IV	18 (5%)	9 (5%)	9 (5%)	
Phase of care				0.12
Primary disease	33 (9%)	20 (10%)	13 (8%)	
Surveillance/survivorship	312 (84%)	173 (86%)	139 (82%)	

Continued

Table 1 Continued

Characteristic*	All patients (N=372)	Patients with obesity on problem list (N=202)	Patients without obesity on problem list (N=170)	P value
Recurrence	16 (4%)	6 (3%)	10 (6%)	
Recurrence, last year of life	11 (3%)	3 (1%)	8 (5%)	
Prior oncologic treatments				
New diagnosis (no treatment yet)	7 (2%)	5 (2%)	2 (1%)	0.36
Chemotherapy	99 (27%)	45 (22%)	54 (32%)	0.04
Hormonal therapy	23 (6%)	15 (7%)	8 (5%)	0.28
Surgery	348 (94%)	184 (91%)	164 (96%)	0.04
Radiation	101 (27%)	48 (24%)	53 (31%)	0.11
Other	3 (1%)	0 (0%)	3 (2%)	0.06
Unknown	1 (<1%)	0 (0%)	1 (1%)	0.23
Prior lines of chemotherapy (n)				
1	76 (78%)	36 (80%)	40 (74%)	
2	15 (15%)	7 (16%)	8 (15%)	
3+	8 (8%)	2 (4%)	6 (11%)	
Provider at time of index visit				
A	23 (6%)	9 (4%)	14 (8%)	0.03
B	84 (23%)	41 (20%)	43 (25%)	
C	72 (19%)	32 (16%)	40 (24%)	
D	49 (13%)	27 (13%)	22 (13%)	
E	70 (19%)	46 (23%)	24 (14%)	
F	1 (<1%)	0 (0%)	1 (1%)	
G	73 (20%)	47 (23%)	26 (15%)	

*Percentages exclude missing data. Chi-squared and Fisher's exact tests were used for categorical variables, and Mann-Whitney test to compare medians between cohorts for continuous variables. Percentages may not total 100% due to rounding.

†Unknown or missing data for 6 patients.

‡Includes American Indian or Alaska Native (1), Chinese (1), Filipino (1), Other Asian (1), and Other (4).

§Unknown or missing data for 18 patients.

¶Unknown or missing data for 51 patients.

**Unknown or missing data for 4 patients.

††Other category includes 1 patient with significant other, 1 patient legally separated, 1 other. Unknown or missing data for 4 patients.

‡‡Unknown or missing data for 12 patients.

ASA, American Society of Anesthesiology; BMI, body mass index; VUMC, Vanderbilt University Medical Center.

m² (IQR 35–45), median age was 64 years (IQR 58–71), and most patients identified as White (n=321, 88%). Most patients were categorized as ASA physical class III (n=241, 75%). The majority of patients had three or more chronic medical comorbidities (n=302, 81%). The majority of patients were never-smokers (n=281, 76%). Most patients were diagnosed with stage I disease (n=292, 81%). The majority of patients were considered in surveillance at the time of the index visit (n=312, 84%). Most patients underwent surgery for initial treatment (n=348, 94%). Median time from surgery to index visit was 2.9 years (IQR 1.3–5.7). During the years for which we abstracted data our team was comprised of five gynecologic oncologists and two nurse practitioners. Patients could be seen by either a gynecologic oncologist or nurse practitioner at the index visit.

Patients with obesity on their problem list were more likely to be younger (median age 63 vs 66 years, p=0.002), have class III obesity (118 (58%) vs 44 (26%), p<0.001), or have a specific

provider. Additional differences between these cohorts are displayed in Table 1.

Documentation of Obesity and Completion of Obesity Intervention

Table 2 shows completion of the aforementioned obesity interventions among all patients as well as broken down among patients with or without obesity on the problem list. Of eligible patients, n=202 (54%) had obesity or elevated BMI documented on the problem list. In the multivariable regression, only obesity class and provider were identified as key covariates associated with utilization of the problem list (Table 3). Some 171 patients (46%) had completion of any obesity intervention. Completion of specific interventions was as follows: weight loss counseling n=103 (28%), obesity health maintenance intervention tab completion n=85 (23%), nutrition referral n=14 (4%), and medical weight loss center referral n=45 (12%). In the multivariable

Table 2 Completion of obesity interventions and outcomes (N=372)

Intervention/outcome	All patients (N=372)	Patients with obesity on problem list (N=202)	Patients without obesity on problem list (N=170)	P value
Documentation of obesity on problem list	202 (54%)	NA	NA	
Completion of obesity intervention tab in EMR	85 (22%)	60 (30%)	25 (15%)	0.001
Referral to medical or surgical weight loss clinic	45 (12%)	35 (17%)	10 (6%)	0.001
Completion of medical or surgical weight loss clinic visit	23 (6%)	20 (10%)	3 (2%)	0.001
Referral to nutrition clinic	14 (4%)	9 (5%)	5 (3%)	0.45
Completion of nutrition clinic visit	4 (1%)	4 (2%)	0 (0%)	0.07
Documentation of weight loss counseling	103 (28%)	72 (36%)	31 (18%)	<0.001
Completion of any obesity intervention	171 (46%)	114 (56%)	57 (34%)	<0.001
Achievement of weight loss	195 (52%)	105 (52%)	90 (53%)	0.85
Median weight loss from diagnosis to index visit (kg) (IQR)	3.9 (1.8, 8.0)	3.9 (2.0, 8.6)	3.9 (1.2, 7.1)	0.40

EMR, electronic medical record; IQR, interquartile range; NA, not available.

logistic regression after controlling for key clinical characteristics, patients with obesity on the problem list were 1.9 times more likely to have completion of any obesity intervention (OR 1.91, 95% CI 1.09, 3.35) (Table 4).

Achievement of Weight Loss

We identified 244 patients that were diagnosed at our institution and therefore had a weight at diagnosis within our electronic medical record. We identified 128 patients that were diagnosed at an outside facility and transferred care. Of those 128 patients, we had documentation of weight at diagnosis for 48 patients. For the remaining 80 patients diagnosed outside our institution who then transferred care to our institution we utilized weight at first visit to calculate weight loss. A total of 195 (52%) patients lost weight from diagnosis or first visit to index visit. The median weight loss was 3.9 kg (IQR 1.5–8.0). Clinically significant weight loss has been defined by others in the literature as at least a 5% reduction in weight from baseline level.¹¹ Of the 195 patients who lost weight, 74/195 (38%) achieved a clinically significant weight loss. The median percentage weight loss reduction in our population was 3.6% (IQR 1.4–7.3).

We conducted an exploratory analysis to investigate the covariates associated with weight loss including the impact of different components of the composite obesity intervention variable. In the multivariable regression evaluating key covariates for weight loss, documentation of obesity on the problem list was not significant (OR 1.57, 95% CI 0.90, 2.74). The covariates associated with weight loss were class III morbid obesity, ASA III/IV, completion of health maintenance tab in Epic, completion of any obesity intervention, and completion of weight loss clinic visit. Given the small numbers of patients who participated in each of these interventions, this was considered an exploratory and thought-provoking analysis but underpowered to detect a true impact of each of these interventions (Table 5). Of note, several key socioeconomic covariates such as race, ethnicity, and insurance were not associated with weight loss.

DISCUSSION

Summary of Main Results

Our study demonstrated suboptimal documentation of obesity within the electronic medical record problem list and underutilization of obesity interventions within our cohort. Approximately half of obese patients with endometrial cancer at our institution had documentation of obesity on the problem list, and less than half had completion of a composite obesity intervention. Patients who did have BMI or obesity documented on the problem list were more than twice as likely to have completed at least one obesity intervention. Fifty-two percent of our patients achieved weight loss. Although presence of obesity on the problem list was not associated with weight loss, the use of the Epic healthcare maintenance tab was associated with weight loss. This suggests that the electronic medical record is not being leveraged to its full potential to encourage beneficial obesity interventions for this patient population.

Results in the Context of Published Literature

This study examines a novel opportunity for utilizing the electronic medical record to improve obesity management. Previous studies demonstrate obesity is both a risk factor for and contributor to increased morbidity in endometrial cancer. Specifically, Calle et al demonstrated that in obese patients with BMI >40 kg/m², the relative risk of death from any cancer was 1.62, while the relative risk of death from endometrial cancer was 6.25.¹² Notably, structured behavioral weight loss interventions among women in remission from endometrial cancer have been shown to significantly increase weight loss at 6 and 12 months.¹³ McCarroll et al demonstrated that decreasing BMI by as little as one unit can dramatically increase self-efficacy.¹⁴ Given the negative impact of obesity on general health and oncologic outcomes, there is an interest in encouraging weight loss interventions in the survivorship period.

The electronic medical record provides a tool to systematically identify obesity in patients with endometrial cancer and implement weight loss interventions in the outpatient setting. Factors influencing the utilization of problem list by healthcare providers include uncertainty about responsibilities of maintaining the problem list, little perceived benefit of reusing the data in the future, and the lack

Table 3 Univariable and multivariable regression for presence of obesity on problem list (N=372)

Parameter	Univariable		Multivariable	
	OR (95% CI)	P value	OR (95% CI)	P value
Age (categorical)	0.69 (0.57, 0.84)	<0.001	0.71 (0.51, 0.98)	0.04
BMI at index visit (kg/m ²)				
Class I (reference)				
Class II	3.21 (1.80, 5.73)	<0.001	2.31 (1.19, 4.51)	0.01
Class ≥III	7.55 (4.32, 13.20)	<0.001	5.77 (2.96, 11.25)	<0.001
Race				
White (reference)				
Black	1.10 (0.55, 2.18)	0.80		
Other	0.83 (0.21, 3.39)	0.80		
Ethnicity				
Non-Hispanic (reference)				
Hispanic	1.40 (0.33, 5.95)	0.65		
ASA status				
I/II (reference)				
III/IV	1.84 (1.02, 3.32)	0.04	1.54 (0.76, 3.12)	0.23
Tobacco use				
Never (reference)				
Current	1.53 (0.55, 4.26)	0.41		
Former	0.86 (0.51, 1.44)	0.57		
Insurance				
Private (reference)				
Medicare	0.57 (0.37, 0.87)	0.01	0.85 (0.43, 1.69)	0.64
Medicaid	1.21 (0.11, 13.68)	0.88	0.25 (0.02, 3.21)	0.29
Uninsured	0.61 (0.08, 4.42)	0.62	0.81 (0.08, 8.09)	0.86
Other	1.21 (0.11, 13.68)	0.88	0.95 (0.06, 15.25)	0.97
Chronic conditions (n)				
1 (reference)				
2	0.91 (0.34, 2.45)	0.85	0.63 (0.17, 2.40)	0.50
3+	1.54 (0.67, 3.55)	0.31	1.31 (0.39, 4.38)	0.66
Charlson Comorbidity Index	0.98 (0.90, 1.06)	0.61		
Marital status				
Single (reference)				
Married	0.79 (0.45, 1.39)	0.42		
Widowed	0.80 (0.35, 1.83)	0.60		
Divorced	1.43 (0.67, 3.04)	0.35		
Other	1.51 (0.13, 17.54)	0.74		
Distance from VUMC (miles)	1.00 (1.00, 1.00)	0.89		
Provider				
A (reference)				
B	1.48 (0.58, 3.80)	0.41	2.21 (0.70, 7.03)	0.18
C	1.24 (0.48, 3.24)	0.65	1.53 (0.48, 4.87)	0.47
D	1.91 (0.70, 5.24)	0.21	2.76 (0.80, 9.50)	0.11
E	2.98 (1.13, 7.88)	0.03	5.06 (1.52, 16.90)	0.01
F	1.00 (NA)		NA	
G	2.81 (1.07, 7.38)	0.04	3.91 (1.19, 12.80)	0.02

ASA, American Society of Anesthesiology; BMI, body mass index; CI, confidence interval; NA, not available; OR, odds ratio; VUMC, Vanderbilt University Medical Center.

Table 4 Univariable and multivariable regression for completion of any obesity intervention (N=372)

Parameter	Univariable		Multivariable	
	OR (95% CI)	P value	OR (95% CI)	P value
BMI on problem list	2.57 (1.68, 3.92)	<0.001	1.91 (1.09, 3.35)	0.02
Age (categorical)	0.92 (0.77, 1.10)	0.4		
BMI at index visit (kg/m ²)				
Class I (reference)				
Class II	2.26 (1.29, 3.97)	0.005	2.36 (1.14, 4.87)	0.02
Class ≥III	2.45 (1.46, 4.12)	0.001	1.90 (0.97, 3.73)	0.06
Race				
White (reference)				
Black	0.80 (0.4, 1.59)	0.52	0.63 (0.25, 1.60)	0.33
Other	3.51 (0.7, 17.64)	0.13	1.42 (0.09, 23.30)	0.81
Ethnicity				
Non-Hispanic (reference)				
Hispanic	1.96 (0.46, 8.33)	0.36	0.93 (0.67, 13.03)	0.96
ASA status				
I/II (reference)				
III/IV	2.19 (1.16, 4.11)	0.02	2.00 (0.93, 4.31)	0.08
Tobacco use				
Never (reference)				
Current	0.46 (0.16, 1.33)	0.15	0.18 (0.04, 0.79)	0.02
Former	0.81 (0.48, 1.36)	0.43	0.65 (0.34, 1.24)	0.19
Insurance				
Private (reference)				
Medicare	0.84 (0.55, 1.27)	0.40		
Medicaid	0.52 (0.46, 5.86)	0.60		
Uninsured	0.35 (0.04, 3.41)	0.36		
Other	0.52 (0.05, 5.86)	0.60		
Chronic conditions (n)				
1 (reference)				
2	0.45 (0.16, 1.23)	0.12	0.31 (0.07, 1.32)	0.11
3+	0.75 (0.33, 1.73)	0.50	0.87 (0.26, 2.99)	0.85
Charlson Comorbidity Index	0.98 (0.91, 1.06)	0.67		
Marital status				
Single (reference)				
Married	1.08 (0.62, 1.90)	0.78	1.23 (0.59, 2.58)	0.58
Widowed	0.78 (0.34, 1.81)	0.57	0.63 (0.22, 1.79)	0.39
Divorced	1.95 (0.93, 4.09)	0.08	1.89 (0.74, 4.87)	0.18
Other	0.66 (0.06, 7.66)	0.74	0.52 (0.04, 6.79)	0.62
Distance from VUMC (miles)	1.00 (1.00, 1.00)	0.70		
Provider				
A (reference)				
B	0.80 (0.31, 2.04)	0.64	0.69 (0.22, 2.24)	0.54
C	0.73 (0.28, 1.91)	0.53	0.74 (0.23, 2.41)	0.62
D	0.90 (0.33, 2.44)	0.83	0.7 (0.20, 2.47)	0.58
E	1.16 (0.45, 2.99)	0.76	0.84 (0.25, 2.82)	0.77
F	1.00 (NA)	NA	1.00 (NA)	NA
G	2.83 (1.08, 7.39)	0.03	3.04 (0.91, 10.20)	0.07

ASA, American Society of Anesthesiology; BMI, body mass index; CI, confidence interval; OR, odds ratio; VUMC, Vanderbilt University Medical Center.

Table 5 Univariable and multivariable regression for weight loss (N=372)

Parameter	Univariable		Multivariable	
	OR (95% CI)	P value	OR (95% CI)	P value
BMI on problem list	0.96 (0.64, 1.45)	0.85	1.57 (0.90, 2.74)	0.12
Age (categorical)	1.31 (1.08, 1.58)	0.01	1.30 (0.94, 1.79)	0.11
BMI at index visit (kg/m ²)				
Class I (reference)				
Class II	0.84 (0.49, 1.46)	0.55	0.82 (0.41, 1.65)	0.58
Class ≥III	0.54 (0.33, 0.90)	0.02	0.39 (0.19, 0.79)	0.01
Race				
White (reference)				
Black	1.34 (0.67, 2.67)	0.41	1.52 (0.65, 3.56)	0.34
Other	0.30 (0.06, 1.53)	0.15	0.45 (0.07, 2.86)	0.39
Ethnicity				
Non-Hispanic (reference)				
Hispanic	0.53 (0.12, 2.24)	0.39		
ASA status				
I/II (reference)				
III/IV	1.99 (1.09, 3.64)	0.03	2.89 (1.45, 5.77)	0.003
Tobacco use				
Never (reference)				
Current	0.48 (1.17, 1.34)	0.16	0.32 (0.09, 1.20)	0.09
Former	1.07 (0.64, 1.80)	0.79	1.32 (0.70, 2.48)	0.39
Insurance				
Private (reference)				
Medicare	1.37 (0.90, 2.08)	0.15	1.08 (0.57, 2.02)	0.82
Medicaid	1.00 (NA)	NA	1.00 (NA)	NA
Uninsured	3.29 (0.33, 32.36)	0.31	4.35 (0.39, 48.45)	0.23
Other	1.00 (NA)	NA	1.00 (NA)	NA
Chronic conditions (n)				
1 (reference)				
2	1.28 (0.47, 3.48)	0.62		
3+	1.64 (0.71, 3.81)	0.25		
Charlson Comorbidity Index	1.07 (0.99, 1.16)	0.11	0.98 (0.88, 1.09)	0.72
Marital status				
Single (reference)				
Married	0.79 (0.45, 1.39)	0.42		
Widowed	1.01 (0.44, 2.31)	0.98		
Divorced	0.70 (0.34, 1.46)	0.34		
Other	0.38 (0.03, 4.39)	0.44		
Distance from VUMC (miles)	1.00 (1.00, 1.00)	0.64		
Provider				
A (reference)				
B	1.39 (0.55, 3.49)	0.49		
C	1.22 (0.48, 3.12)	0.68		
D	1.23 (0.46, 3.33)	0.68		
E	1.22 (0.48, 3.14)	0.68		

Continued

Table 5 Continued

Parameter	Univariable		Multivariable	
	OR (95% CI)	P value	OR (95% CI)	P value
F	1.00 (NA)	NA		
G	1.00 (0.39, 2.57)	0.99		
Completion of health maintenance tab	1.24 (0.76, 2.01)	0.40	2.77 (1.11, 6.89)	0.03
Completion of any obesity intervention	0.69 (0.46, 1.03)	0.07	0.24 (0.09, 0.69)	0.01
Referral to weight loss clinic	0.51 (0.27, 0.96)	0.04	2.22 (0.66, 7.46)	0.20
Completion of weight loss clinic visit	0.30 (0.12, 0.78)	0.01	0.16 (0.03, 0.78)	0.02
Referral to nutrition clinic	0.90 (0.31, 2.63)	0.85		
Documentation of weight loss counseling	0.62 (0.39, 0.97)	0.04	1.85 (0.76, 4.49)	0.18

ASA, American Society of Anesthesiology; BMI, body mass index; CI, confidence interval; NA, not available; OR, odds ratio; VUMC, Vanderbilt University Medical Center.

of relevant terms in the problem list that match the exact clinical situation.¹⁵ Implementation of a best practice advisory that prompts providers when evaluating patients with obesity may be beneficial to acknowledging obesity as a problem that needs to be addressed at clinical encounters.

Research on documentation of chronic medical conditions has identified some strategies for improving accuracy of the electronic medical record problem list. For example, a study examining problem list completeness in patients with diabetes identified financial incentives, a culture of problem-oriented charting, and shared responsibility of problem list recording among interdisciplinary healthcare professionals to be associated with increased problem list completeness.⁹ Other studies have shown that increased oversight and modification of problem list descriptors to accurately reflect patient conditions are associated with improved documentation.¹⁵ In addition, implementation of an electronic medical record problem-focused template, with recommended assessment questions for elevated BMI, was shown to greatly increase initiation of obesity interventions.¹⁶

Our findings also demonstrate that the majority of obese patients with endometrial cancer had more than three chronic comorbidities. It is well known that obesity adversely impacts numerous organ systems. A retrospective cohort study by Morton et al showed that 17% of patients with endometrial cancer developed type 2 diabetes in the survivorship period.¹⁷ Targeted interventions have the potential to address comorbidities as well. For example, Bae et al demonstrated that the use of an electronic medical record clinical reminder was associated with increased likelihood of counseling patients with obesity or hypertension on risk factors for cardiovascular disease.¹⁸ A similar framework was investigated in chronic kidney disease, in which patients with chronic kidney disease documented on the problem list were more likely to have chronic kidney disease-specific laboratory studies done.¹⁹ Increased electronic medical record documentation of obesity may improve screening and treatment of related cardiovascular and endocrine outcomes.

Strengths and Weaknesses

To our knowledge, this is the first study to assess electronic medical record documentation of obesity among patients with endometrial cancer. Limitations of this study include its retrospective nature

and a smaller sample size from a single institution. This study also relied on documentation of weight loss counseling in encounter notes and completion of the obesity intervention tab in the electronic medical record to determine if obesity was addressed in the visit. We acknowledge that providers may have addressed this without explicit documentation. We also recognize that this study may not be generalizable to low-resource settings and environments which do not have access to electronic medical records. Although we tracked referral and completion of weight loss clinic referrals, we did not specifically track number of patients who underwent surgical weight loss. Lastly, our data on achievement of weight loss is limited by the number of patients diagnosed outside our institution for which we do not have their weight at diagnosis, as well as short follow-up for patients with a more recent index visit who may not have had time to engage in and benefit from obesity interventions. Longer follow-up interval may better characterize the relationship between completion of obesity intervention and achievement of weight loss.

Implications for Practice and Future Research

This study demonstrates that only half of obese endometrial cancer patients had documentation of obesity in the electronic medical record, despite the association between problem list documentation and increased likelihood of obesity interventions completed. Improved compliance with these tools in the electronic medical record may improve referral to and completion of weight loss interventions. Future studies should examine the efficacy of interventions to increase problem list utilization and obesity interventions in endometrial cancer patients, as well as subsequent achievement of weight loss.

CONCLUSIONS

Only half of obese endometrial cancer patients had documentation of obesity within the electronic medical record problem list. The electronic medical record could be leveraged to achieve compliance with weight loss interventions. Further investigation on how the electronic medical record can be optimized to help patients achieve weight loss is needed.

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