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Malignant Otitis Externa Outcomes: A study of the University HealthSystem Consortium database

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Introduction

Malignant otitis externa (MOE) or skull base osteomyelitis was first described by Chandler in 1968.¹ It is a progressive, potentially life-threatening infection of the temporal bone that can spread to other areas of the skull base. The most common causative agent remains *Pseudomonas aeruginosa*, but other species of bacteria, including *methicillin-resistant Staph. Aureus* (MRSA), as well as fungal species have been reported.^{2–5} MOE is known to have a predilection for elderly, diabetic, and/or immunocompromised patients.⁶ Common presenting symptoms of MOE include otalgia, otorrhea, aural fullness, and hearing loss. Many of the symptoms of otitis externa are also common to MOE, which can make diagnosis difficult and may lead to a delay in escalating treatment. More advanced cases of MOE may present with cranial neuropathies including facial nerve palsy in 17–26% of cases.^{7,8} Involvement of cranial nerves is an ominous sign that is associated with higher rates of mortality.⁹ Patients often require admission for IV antibiotics and medical management of their underlying co-morbidities.¹⁰

Most studies regarding MOE have been retrospective studies from single institutions with a relatively low number of patients. By utilizing a large national dataset, the University HealthSystem Consortium (UHC) database, this study aims to address specific patient characteristics and how these impact outcomes.

Methods

The University HealthSystem Consortium (UHC) is an organization that delivers approximately 30% of inpatient medical care in the US, including most US academic medical centers.¹¹ The UHC maintains a data repository which compiles inpatient discharge summaries among other measures of medical care. This de-identified data may be accessed online via the UHC Clinical Database/Resource Manager (CDB/RM) and exported in summary format which composites patient groups based on the search query (individual

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patient-level data was unavailable). This study was deemed exempt by our institutional review board.

The UHC CDB/RM was accessed in June 2016 for inpatient discharges over a 36-month timespan (October 2012 to September 2015). Patients diagnosed with MOE were identified by the corresponding ICD-9-CM diagnosis code (380.14).

Patients were categorized into six age groups (<18 years, 18–30 years, 31–50 years, 51–64 years, 65–74 years, 75–84 years, and >84 years). Some age groups were combined from the UHC database as their subgroups had a small number of cases and we believe these groups to be homogenous. Patients were also categorized into groups by payer type including private insurance, self-pay, state-funded insurance (Medicaid), or federally-funded insurance (Medicare). Smaller groups such as charity, military, other, and incarcerated were combined into one category. The patients were also categorized by race including Caucasian, African American, Asian or other. The patients that were identified as “other” were excluded from the statistical analysis regarding race.

Two distinct patient characteristics were analyzed: comorbidities and acute complications. Comorbidities are defined as medical conditions or disorders that the patient had upon admission and were documented using the ICD-9 coding system. These comorbidities were pre-defined by Elixhauser Comorbidity Software for ICD-9-CM, a categorization scheme for certain comorbidities associated with substantial increases in length of stay (LOS) and mortality.¹² For example, this software assigns “diabetes with chronic complications” to diabetic patients with complications including neuropathy, vasculopathy, and retinopathy, while the remaining patients were assigned “diabetes without chronic complications.”

Conversely, acute complications developed during hospitalization and are tracked in the database. Acute complications are assigned by the database when cases meet any of the criteria set by the reportable complication metrics developed by the Agency for Healthcare Research and Quality, UHC, or Centers for Medicare & Medicaid. UHC-tracked acute complications include generalized complications such as stroke, aspiration, and respiratory failure and do not include specific outcomes typically associated with MOE (e.g. facial nerve paralysis).

Readmissions rates were also included in statistical analysis. Readmissions are defined by the UHC database as the readmission diagnosis was the same as the original diagnosis within a 30-day period. Mean and standard deviations were calculated for LOS and means were calculated for intensive care unit (ICU) LOS.

Biostatistics

All analyses, calculations and graphs were performed with Sigma Plot 12.5 (Systat Software, Inc., San Jose, CA) and MedCalc 16.4.3 (MedCalc Software bvba, Belgium). Comorbidities and demographic variables such as age, race, and gender were extracted from the CDB/RM database. Continuous variables were summarized by mean $\pm$ standard deviation. Nominal variables were summarized by percentage and odds ratio (OR). Comparisons of outcomes (nominal variables) were performed using Fisher’s exact test, Chi

Square test, or comparison of proportions. For continuous variables, comparisons were made using a comparison of means t-test. A One-Way ANOVA was also used followed by a Tukey posthoc comparison test. A correlation model was used to determine association among variables including LOS, ICU LOS, complication rate, and readmission rate. Finally, effect size (ES) estimates at 0.2 with 95% CIs were calculated for all statistical tests. The UHC database only contains collective data and not individual specific data; thus we were unable to perform linear regression analysis.

Results

We identified 786 cases of MOE that were treated at 187 hospitals during the 36-month timespan (Table 1). The mean LOS was 18.6 ± 19.7 days. There were 73 (9.3%) patients admitted to the ICU with a mean ICU LOS of 6.8 days. The overall complication rate was 4.3% and the mortality rate was 2.5%. The most common acute complications were stroke, *C. difficile* enteritis, readmission due to infection, aspiration, and myocardial infarction. There were 27 (3.4%) patients who required readmission within 30 days after discharge for reasons related to MOE.

Age

Advancing age correlated with an increased mortality rate ($r=0.955$; 95% CI 0.95 to 0.97) ranging from 0% in patients 30 years and younger to 4.3% in patients 85 years and older. Readmission rates declined with age, having a strong correlation ($r=-0.95$; 95% CI -0.96 to 0.94). The less than 18 age group had the highest readmission rate of 15.9% while the oldest age group (> 84) had zero readmissions. There were no significant differences with respect to LOS and complication rate amongst age groups.

Race

There were no statistically significant differences in the mean LOS based on race (Caucasians 7.1 ± 14.0 days; African Americans 11.1 ± 30.6 days; Asians 12.2 ± 15.0 days; ES 0.44, 95% CI 0.04 to 0.41). Similarly, there were no statistically significant differences in mortality rate among race (Asians 9.5%; African Americans 2.1%; Caucasians 2.4%; ES 0.12, 95% CI 0.03 to 0.28). Asians were, however, found to have significantly higher rate of readmissions (19.0%; ES 0.21, 95% CI 0.05 to 0.36) and admission rate to the ICU (23.8%; ES 1.14, 95% CI 0.02 to 1.45).

There was a significant difference between groups in prevalence of diabetes with associated chronic comorbidities (ES 0.28, 95% CI 0.12 to 0.43); African Americans had the highest prevalence (42%) followed by Caucasians (27%) and Asians (24%) (Table 2). African Americans were also found to have the highest rate of congestive heart failure (CHF) (19%; ES 0.19, 95% CI 0.03 to 0.35), obesity (21%; ES 0.19, 95% CI 0.04 to 0.36), and weight loss (12%; ES 0.25, 95% CI 0.09 to 0.41). The highest rate of renal failure was also found in African Americans (41%; ES 0.24, 95% CI 0.08 to 0.40) compared to Caucasians (29%) and Asians (26%).

Gender and Payer

Males were found to have a significantly higher incidence of MOE compared to females (1.45 males: 1 female, $p<0.0001$). Males also had a significantly longer LOS (10.2 ± 24.6 days vs. 6.4 ± 7.8 days; ES 0.19, 95%CI 0.05 to 0.33). However, no detectable differences were found with respect to complication rate (ES 0.09, 95%CI -0.05 to 0.23), mortality (ES 0.09, 95%CI -0.05 to 0.23), and readmission rate (ES 0.04 (-0.10 to 0.18)). With regard to payer groups, (private Insurance, Medicaid, Medicare, self-pay, and other) the only significant difference found was between privately insured patients and the other payer group which had the shortest and longest LOS, respectively (5.1 ± 5.1 days vs. 14.6 ± 38.4 days; ES 0.46, 95%CI 0.15 to 0.78). There were no significant differences found between payer groups with respect to mortality, complications, or readmissions.

Comorbidities

Patients with weight loss (LOS= 22.6 ± 54.8 days; ES 0.59, 95%CI 0.31 to 0.86), diabetes with chronic complications (LOS= 12.4 ± 31.8 days; ES 0.16 95%CI 0.02 to 0.30), CHF (LOS= 12.6 ± 28.3 days; ES 0.19 95%CI -0.02 to 0.40), coagulopathy (LOS= 17.6 ± 31.8 ; ES 0.44, 95%CI 0.09 to 0.79), and liver disease (LOS= 24.5 ± 79.1 ; ES 0.67, 95%CI 0.27 to 1.1) were found to have a significantly increased LOS compared to the remainder of the cohort. Of all the patients in our study, 64.4% (506) had diabetes (with or without chronic complications). This subgroup had a significantly longer LOS compared to non-diabetics (9.7 ± 23.6 days vs. 6.7 ± 8.5 days; ES 0.15, 95%CI 0.01 to 0.29).

A significantly increased complication rate was found for patients with CHF (OR=3.1;ES 0.54, 95%CI 0.13 to 0.95), weight loss (OR=3.8;ES 0.78, 95%CI 0.22 to 1.35), coagulopathy (OR=5.8;ES 1.49, 95%CI 0.64 to 2.34), valvular heart disease (OR=4.4;ES 0.97, 95%CI 0.12 to 1.82), and renal failure (OR =2.8;ES 0.35, 95%CI 0.09 to 0.62). Significantly increased mortality was associated with weight loss (OR =10.2;ES 1.23, 95%CI 0.61 to 1.85), coagulopathy (OR=8.8; ES 1.84, 95%CI 0.91 to 2.77), and CHF (OR=3.1;ES 0.42, 95%CI 0.02 to 0.82).

Specific Diagnoses

Facial nerve involvement (palsy or paresis) was documented in 15.5% of patients and was associated with a significantly longer mean LOS of 12.9 ± 19.6 days (ES 0.21, 95%CI 0.03 to 0.41) compared to the remainder of the patients. Differences in the mortality rate compared to patients without facial nerve involvement was not statistically significant (4.9% vs. 2.2%;ES 0.56, 95%CI -0.01 to 1.12). There were 179 (19.2%) patients that had a documented surgical procedure. Of these, a mastoidectomy ($n=65$) was the most commonly performed procedure. Other procedures performed include middle or inner ear biopsy, radical mastoidectomy, cranial nerve decompression, myringotomy, external auditory canal reconstruction, excision of skull lesion, and repair of middle ear. Patients undergoing surgery had a significantly longer LOS when compared those that did not have surgery (13.8 ± 33.6 days vs. 7.1 ± 12.6 days; ES 0.34, 95%CI 0.18 to 0.51).

Specific microorganism cultures were only found in 34% ($n=267$) of patients. The most common was isolated microorganism was *Pseudomas* species in $n=153$ patients (19.5%).

This was followed by 46 patients (5.9%) with methicillin-resistant *Staphylococcus aureus* (MRSA) infection, 31 patients (3.9%) with methicillin-sensitive *Staphylococcus aureus* (MSSA) infection and 27 patients (3.4%) had *Streptococcus* infection 16 (2.0%). Fungal species infections including *Aspergillus* and *Candida* were found in 15 (1.9%) and 8 (1.0%) of patients respectfully. Patients with MRSA infection had a 2.4 fold increase in length of stay (20.4 ± 60.0 days; ES 0.59, 95% CI 0.29 to 0.89). Group D *Streptococcus* Infection was also associated with a significantly increased LOS (35.8 ± 98.0 days; ES 0.99, 95% CI 0.49 to 1.49).

Sepsis, severe sepsis, or septicemia was diagnosed in 83 patients (10.6%) with 13 of the 20 deaths in the study belonging to this group; this corresponded to a greatly increased risk of mortality for septic patients (OR=18.5; ES 0.94, 95% CI 0.47 to 1.42). These patients also had a significantly longer LOS (22.3 ± 53.2 days; ES 0.89, 95% CI 0.45 to 1.35) and 39% required admission to the ICU (OR=10.1; ES 1.84, 95% CI 0.91 to 2.77).

Discussion

Malignant otitis externa is a complex and potentially life threatening infection with many associated complications and comorbidities. This study provides insight into key prognostic indicators of this disease process and provides nationwide data that individual institutions can use to determine treatment benchmarks.

Associations with Aging and Comorbidities

We found that increasing age has significant impact on disease incidence and mortality. Several hypotheses have been proposed for the physiologic connection between advanced age and MOE including decreased epithelial migration of the ear canal and microvascular disease inhibiting a proper immune response.¹⁵ Advanced age has been linked to comorbidities including diabetes which is known to also be associated with impaired immune response and microvascular disease.²⁰

The first study of MOE in 1968 by Chandler believed it to be a disease exclusive to diabetics based on a limited number of cases.¹ Recent studies have varied with reported the incidence of diabetes anywhere from 5% to 90%.^{16–18} In our study, 64.4% had diabetes and patients that had complications related to diabetes were found to have a significantly increased LOS compared to those without chronic complications. Our findings agree with a previous study showing a more severe type of MOE is associated with a history of diabetic vascular complications.¹⁹ HbA1c levels have also been correlated with recovery time indicating the importance of tight glycemic control during treatment.²⁰ Our data support the presence of the progressive complications of diabetes portend worst outcomes from MOE. We recommend physicians to include MOE on their differential for patients with diabetes, particularly poorly-controlled diabetes, or those it's associated chronic complications (retinopathy, vasculopathy, etc.) when these patients present with otalgia or otitis externa.

Weight loss was also associated with significantly worse outcomes including increased LOS, complications, and mortality. Weight loss is comprised of diagnoses related to clinically significant low body weight and malnutrition, and ultimately impaired immune response as a

result, which has been associated with increased inpatient mortality.^{12,21,22} This is likely present in numerous immunocompromised states in which MOE is known to occur. Patient frailty is a research topic of increasing interest and further research looking at frailty index scores for MOE should be considered. The other comorbidities that had significantly impacted LOS, ICU admission, complications, and mortality were CHF and coagulopathy. These two comorbidity categories are most likely influenced by these patients being older and having several other comorbidities.

Cranial Nerve Involvement

With regard to facial nerve involvement, we found no statistically significant increase in mortality in patients whereas other studies have found facial nerve involvement significantly associated with higher mortality.^{23,24} We found an overall mortality rate of 2.5% (20) in our cohort of 786 patients, though this only included mortalities during initial inpatient admission. Studies following patients over a longer term have found mortality rates of 3.6 – 14%^{23,25} A significantly higher mortality rate in patients with involvement of the facial nerve may have been found if follow-up data over the long-term was available. Lower cranial neuropathies have been shown to lead to worse outcomes and higher rates of mortality.⁹ Unfortunately, the database does not provide specific information regarding other lower cranial neuropathies.

Differences in Race and Gender

We also found that males had a higher incidences and significantly increased LOS, a finding in other studies of MOE as well.^{9,26–28} However, gender was not significant in complication, mortality, and readmission rates. It has been suggested that male gender may be associated with a more severe form of MOE.⁹ Another finding of our study was that race was a significant factor in patient outcomes, particularly for African Americans. This group also had a significantly higher incidence rate of CHF, obesity, renal failure, and diabetes without chronic complications, as well as a 2.4-fold greater incidence of MOE compared to Caucasians. Although the presence of comorbidities likely explains increased incidence, there were no significant differences among racial groups in outcomes except readmission rate and ICU admission rate that should be considered when treating this population.

Surgical Intervention

There is a growing trend towards surgical intervention in severe cases of MOE.^{29–32} The surgical patients in our study had a significantly longer LOS but no significant difference in mortality. The most likely explanation for the increased LOS in this population is that patients requiring surgery may have more severe disease requiring longer hospitalizations. While MOE is not traditionally a surgical disease, surgery may be considered to obtain adequate cultures, debride necrotic tissue or rule out an underlying malignancy. Surgery has traditionally been utilized if medical management is failing. Further studies are needed with individual patient level data to better determine the role of surgery in MOE.

Limitations

The limitations of this study are similar to other large database studies in that patient-level data cannot be accessed including: physical examination findings, laboratory data, and radiographic imaging. Our study is limited by the analysis of summary data from the UHC database that precludes us from performing multivariate analysis. Although we were unable to extract this data, we were still able to draw meaningful conclusions concerning MOE. Coding practices employed by institutions may vary based on institutional size creating another potential bias which could change the capture rate for diagnoses and complications. Further ICD-9-CM coding is performed by non-clinicians who may incorrectly interpret findings in the chart, introducing error and bias into the data. However, the UHC database has been found to have a high level of concordance with patient-level institutional charts.³³

Conclusion

This study of MOE from a large national database demonstrates the significant negative outcomes in patients that are elderly, have diabetes with chronic complications, and other significant comorbidities. These findings should help providers who treat and manage patients with MOE with educating patients on duration of hospitalization, risk of complications, and mortality rates. Additionally, it serves as a nationwide synopsis of patient outcomes that can be used by hospital systems to develop treatment benchmarks.

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Key Points

Question:

Which patients, with malignant otitis externa, have an increased risk of poor outcomes?

Findings:

The results of the this large database study of 786 patients with malignant otitis externa show that male gender, advancing age and significant comorbidities including diabetes, sepsis, weight loss, coagulopathy, or cranial neuropathies are at increased risk for mortality and longer length of hospitalization.

Meaning:

Malignant otitis externa is a life threatening infectious disease that requires appropriate treatment including management of patient comorbidities.

Importance:

Malignant otitis externa (MOE) is an uncommon but life-threatening infectious disease that needs further characterization of the patient population at risk for negative outcomes.

Objective:

To characterize factors that impact outcomes for patients with malignant otitis externa.

Design:

Retrospective review utilizing the University HealthSystem Consortium (UHC) national inpatient database.

Methods:

We searched for inpatient admissions for malignant otitis externa (MOE) from September 2012 to October 2015. Patient demographics, comorbid conditions, complications, procedures, and mortalities were analyzed. Continuous variables were analyzed with independent t-test or ANOVA. Nominal variables were compared using chi-squared or Fisher's exact test.

Results:

A total of 786 patients with MOE were identified. The mean hospitalization length of stay (LOS) was 18.6 days (SD=19.7). The overall mortality rate was 2.5% (n=20) and complication rate was 4.3% (n=34). Increasing age significantly and positively correlated with the incidence of MOE ($r=0.979$, $p<0.0001$). The factors that contributed to longer LOS were male gender, patients with diabetes or MRSA associated infections. Other factors that were associated with an increased rate of mortality were sepsis (OR=18.5; ES 0.94, 95% CI 0.47 to 1.42), congestive heart failure (OR=3.1; ES 0.42, 95% CI 0.02 to 0.82), weight loss (OR=10.2; ES 1.23, 95% CI 0.61 to 1.85), and coagulopathy (OR=8.8; ES 1.84, 95% CI 0.91 to 2.77). Surgical intervention was performed in 19.2% (n=151) of patients. Facial nerve involvement was present in 15.5% (n=122) of patients and was associated with a significantly longer LOS of 12.9 days (SD=19.6; ES 0.21, 95% CI 0.03 to 0.41).

Conclusions:

This large multi-institutional database study of MOE demonstrates that several patient factors impact the LOS and mortality rates. Patients that are at risk for unfavorable outcomes include the elderly, male gender, those with cranial neuropathies or who have significant underlying comorbidities.

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Table 1:

Characteristics of inpatient admission by age, gender, race, and payer

	Cases		LOS		Intensive Care Unit			Complications			Mortality			Readmissions		
Admission Age Group	n	%	Mean $\pm$ SD	Effect Size (95% CI)	Mean LOS	Admit %	Effect Size (95% CI)	Rate	OR	Effect Size (95% CI)	Rate	OR	Effect Size (95% CI)	Rate	OR	Effect Size (95% CI)
<18	13	2%	5.2 $\pm$ 6.3	0.56 (0.03 to 0.49)	2.0 $\pm$ 3.0	7.7%	3.11 (0.05 to 2.46)	0.0%	0.0	0.09 (-0.04 to 0.24)	0.0%	0.0	r = 0.96 (0.95 to 0.97)	15.4%	5.4	r = -0.95 (-0.96 to 0.94)
18 – 30	52	7%	4.0 $\pm$ 2.5		3.4 $\pm$ 1.4	9.6%		0.0%	0.0		0.0%	0.0		7.7%	2.6	
31 – 50	162	21%	8.4 $\pm$ 32.0		6.4 $\pm$ 0.8	9.9%		3.7%	0.8		1.2%	0.4		5.6%	2.0	
51 – 64	212	27%	8.7 $\pm$ 10.3		12.2 $\pm$ 0.7	8.0%		3.3%	0.7		2.8%	1.2		3.3%	0.9	
65 – 74	153	19%	12.0 $\pm$ 25.9		5.6 $\pm$ 0.8	10.5%		7.8%	2.4		2.6%	1.0		2.0%	0.5	
75–84	125	16%	7.9 $\pm$ 8.8		5.3 $\pm$ 0.9	12.5%		5.6%	1.4		4.0%	1.8		1.6%	0.4	
>84	69	9%	7.2 $\pm$ 4.7		1.5 $\pm$ 1.2	3.9%		2.9%	0.6		4.3%	1.9		0.0%	0.0	
Race																
Asian	21	3%	12.2 $\pm$ 15.0	0.44 (0.04 to 0.41)	5.2 $\pm$ 2.3	23.8%	1.14 (0.02 to 1.45)	9.5%	2.4	0.05 (-0.10 to 0.21)	9.5%	4.4	0.12 (-0.03 to 0.28)	19.0%	7.6	0.21 (0.05 to 0.36)
African American	187	24%	11.1 $\pm$ 30.6		8.0 $\pm$ 0.7	11.8%		4.3%	1.0		2.1%	0.8		2.7%	0.7	
Caucasian	420	53%	7.1 $\pm$ 14.0		5.3 $\pm$ 0.5	7.9%		4.3%	1.0		2.4%	0.9		3.1%	0.8	
Sex																
Female	321	41%	6.4 $\pm$ 7.8	0.19 (0.05 to 0.33)	8.0 $\pm$ 0.6	7.8%	-3.31 (-3.53 to -3.09)	3.1%	0.6	0.09 (-0.05 to 0.23)	1.6%	0.5	0.09 (-0.05 to 0.23)	2.8%	0.7	0.04 (-0.10 to 0.18)
Male	465	59%	10.2 $\pm$ 24.6		6.2 $\pm$ 0.5	10.3%		5.2%	1.7		3.2%	2.1		3.9%	1.4	
Payer																
Private Insurance	144	18%	5.1 $\pm$ 5.1 *		6.7 $\pm$ 0.8	6.9%	1.25 (0.32 to 0.99)	4.2%	1.0	0.04 (-0.09 to 0.18)	0.7%	0.2	0.12 (-0.02 to 0.26)	2.08%	0.5	0.02 (-0.12 to 0.16)
Medicaid	165	21%	11.0 $\pm$ 34.5		8.1 $\pm$ 0.8	10.9%		4.8%	1.2		2.4%	0.9		4.24%	1.3	
Medicare	383	49%	8.3 $\pm$ 9.8		5.9 $\pm$ 0.5	10.2%		5.0%	1.4		2.9%	1.3		3.39%	1.0	
Self-Payer	37	5%	7.1 $\pm$ 10.4		0.0	0.0%		0.0%	0.0		0.0%	0.0		2.70%	0.8	

	Cases		LOS		Intensive Care Unit			Complications			Mortality			Readmissions		
Admission Age Group	n	%	Mean $\pm$ SD	Effect Size (95% CI)	Mean LOS	Admit %	Effect Size (95% CI)	Rate	OR	Effect Size (95% CI)	Rate	OR	Effect Size (95% CI)	Rate	OR	Effect Size (95% CI)
Other Payer	55	7%	14.6 $\pm$ 38.4		9.5 $\pm$ 1.3	10.9%		1.8%	0.4		7.3%	3.5		5.45%	1.7	
Total	786				6.8	9.3%		4.3%			2.5%			3.4%		

Length of stay (LOS), intensive care unit (ICU) LOS, complications, mortality, and readmissions by demographic group (admission age group, race, sex, and payer)

Table 2:

Prevalence of comorbidities by race

Comorbidity	Asian (N = 21)	African American (N = 187)	Caucasian (N = 420)	Effect Size (95% CI)
Hypertension	76%	72%	66%	0.08 (−0.07 to 0.24)
Diabetes without chronic complications	67%	32%	30%	0.25 (0.09 to 0.40)
Diabetes with chronic complications	24%	42%	27%	0.28 (0.12 to 0.43)
Renal failure	29%	41%	26%	0.24 (0.08 to 0.40)
Depression	0%	15%	16%	0.12 (−0.03 to 0.28)
Chronic pulmonary disease	5%	19%	15%	0.14 (−0.02 to 0.29)
Obesity	0%	21%	13%	0.19 (0.04 to 0.36)
Congestive heart failure	5%	19%	11%	0.19 (0.03 to 0.35)
Coagulopathy	10%	2%	5%	0.16 (0.01 to 0.31)
Weight loss	10%	12%	4%	0.25 (0.09 to 0.41)

Prevalence of various comorbidities compared across races (Asian, African American, and Caucasian)