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Gender and racial differences in surgical outcomes among adult patients with acute heart failure

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ABSTRACT

Background: Approximately three million U.S. adult women have heart failure (HF), increasing their risk of adverse perioperative outcomes. While gender and racial differences are reported in surgical outcomes, less is known about 30-day perioperative outcomes in HF patients.
Objectives: To characterize and compare gender and racial differences in 30-day perioperative outcomes in adults with new or acute/worsening HF.
Methods: The 2012–2013 American College of Surgeons National Surgical Quality Improvement Program database of surgical patients (n = 9458) with HF was analyzed. Logistic regression was used to adjust for gender and racial differences in baseline covariates.
Results: No gender difference in mortality (odds ratio = 0.922, 95% confidence interval = 0.0792–1.073, p = 0.294) was noted. Whites were more likely than Blacks to die 30 days after surgery (14% vs 9%, p < 0.001); after adjustment, Blacks were more likely to experience complications and be readmitted compared to Whites.
Conclusions: There was no gender difference in mortality. White patients with HF were more likely to die after surgery than Black patients.

Introduction

Approximately three million U.S. adult women, age 20 and older, are currently living with heart failure (HF),[1] which increases the risk of adverse perioperative outcomes.[2–6] While both men and women are affected by this cardiac syndrome, women are more likely to develop HF, to be discharged from the hospital for it, and to die from it compared to men.[1] The type of HF may differ between men and women, with women being less likely to have reduced ejection fraction.[7,8] The etiology of HF may also differ between men and women with women being less likely to have coronary artery disease as the presumptive cause.[9]

In addition to gender differences, racial differences also exist in the prevalence of HF. African Americans are more likely than Whites to have HF[1,10,11] and Black women have the highest prevalence of HF compared to White women and Black males.[1] Non-Hispanic White women have the highest HF mortality compared to all other racial groups of men and women.[1] When hospitalized for heart failure Blacks are at greater risk for death or for developing worsened functional status.[12] There are also racial differences in responses to medicines used to treat heart failure, with Blacks deriving less benefit from digoxin and bucindolol (an investigational, pharmacologically unique beta-blocker and mild vasodilator genetically targeted therapy for HF) than Whites. Blacks possibly receive greater benefit from hydralazine and isosorbide dinitrate combination.[13–15] Blacks also have a reduced potassium retention

AbbreviationList: ASA Class, American Society of Anesthesiologists Physical Status Classification; BUN, Blood Urea Nitrogen; COPD, Chronic Obstructive Pulmonary Disease; CPR, Cardiopulmonary Resuscitation; HF, Heart Failure; INR, International Normalized Ratio; MAC/IV, Monitored Anesthesia Care/Intravenous Sedation; NSQIP, National Surgical Quality Improvement Program; PTT, Partial Thromboplastic Time; SGOT, Serum Glutamic Oxaloacetic Transaminase; SSI, Surgical Site Infection; SIRS, Systemic Inflammatory Response Syndrome.

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with spironolactone.[16] These differences in type, etiology, and treatment of HF between men and women and between Blacks and Whites may lead to different outcomes when they undergo surgery.

As the number of adults living with HF increases, the number of patients with HF undergoing surgery is becoming more common.[3] Among all adults undergoing surgery, racial and gender disparities have been reported.[11] For example, Blacks are more likely than Whites to die after coronary artery bypass graft and craniotomy surgery.[11] Black women have more complications and are more likely to die after surgery for breast cancer compared to White women.[17] In addition to racial differences in surgical outcomes, gender differences are also reported. For example, compared to men, women experience higher perioperative stroke and higher mortality after carotid endarterectomy[18] and higher 30-day mortality after aortic valve replacement.[19] However, less is known about gender and racial differences in 30-day perioperative outcomes in adult patients with new or acute/worsening HF.

To address health care disparities, the National Institutes of Health and American College of Surgeons recently put forth a comprehensive research agenda to address clinical, patient, system/access, clinical quality and postoperative care and rehabilitation-related factors.[20] Among the recommendations is the call for the identification of sex-specific risk factors and outcomes to support interventions to mitigate these disparities.

Given the increasing frequency of HF patients undergoing surgery, their high risk for complications, readmissions, and mortality and the recommendation to identify gender and race disparities, the objective of this study was to characterize and compare gender and racial differences in 30-day surgical morbidity and mortality outcomes among adult patients with new or acute/worsening HF.

Methods

An analysis of the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) data was conducted to compare 30-day morbidity and mortality of adult patients with new/worsening HF undergoing surgical procedures. NSQIP is a registry of prospectively collected data on a weighted sample of patients undergoing surgery at more than 300 US hospitals. Patients, 18 years or older, who underwent surgery are recruited over an 8 day cycle. The starting day of the cycle is rotated. High volume procedures are limited so they don't overweight the population. Cases are excluded that are trauma, American Society of Anesthesiologists physical status 6, or transplant. Most cases performed under local anesthesia are excluded. In addition to vascular and general surgery, institutions choose which surgical subspecialties to include. Data were entered by NSQIP trained collectors, typically registered nurses, who conducted chart reviews, using common definitions and audited for accuracy. All data are anonymized at both the patient and institutional level.

All 18 complications were prospectively defined using NSQIP definitions and occurred within 30 days after the surgery.[21] Readmissions and mortalities that occurred within 30 days after surgery were also examined and compared for gender and racial differences.

We included all patients at least 18 years old with a preoperative diagnosis of HF, defined by NSQIP as "newly diagnosed congestive heart failure within the previous 30 days or a diagnosis of chronic congestive heart failure with new signs or symptoms in the 30 days prior to surgery," who underwent surgery in 2012 and 2013.[21]

Table 1
Patient categorical characteristics stratified by sex.

	Male N = 5155	54%	Female 4393	46%	p
Race					0.001
White	3748	73	3079	70	
Black	721	14	749	17	
Unknown	535	10	421	10	
Other	151	3	144	3	
Admitted from					<0.001
Hospital inpatient	496	10	457	10	
Home	4009	78	3284	75	
Nursing Home	292	6	264	8	
Outside emergency dept	287	6	220	5	
Other	57	1	58	1	
Unknown	14	0.3	10	0.2	
Anesthesia					0.869
General	4485	87	3812	87	
MAC/IV sedation	352	7	304	7	
Spinal	208	4	193	4	
Other	109	2	83	2	
Surgical Specialty					<0.001
Cardiac	542	10	329	7	
General	1994	39	1912	44	
Gynecology	1	0	85	2	
Interventional radiology	3	0.1	5	0.1	
Neurosurgery	130	3	110	3	
Orthopedics	567	11	757	17	
Otolaryngology	48	1	44	1	
Plastics	29	0.6	37	0.8	
Thoracic	142	3	114	3	
Urology	308	6	65	1	
Vascular	1391	27	935	21	
Diabetes					<0.001
No	2923	57	2651	60	
Non-insulin	912	18	633	14	
Insulin	1320	26	1109	25	
Smokes tobacco	1107	21	735	17	<0.001
Dyspnea	2090	41	1762	40	0.682
COPD	1403	27	1176	27	0.624
Ascites	162	3	104	2	0.022
Hypertension	4384	85	3776	86	0.211
Renal failure	318	6	191	4	<0.001
Dialysis	702	14	469	11	<0.001
Disseminated cancer	140	3	103	2	0.251
Wound infection	973	19	738	17	0.005
Steroid use	381	7	427	10	<0.001
Weight loss	186	4	146	3	0.242
Bleeding disorder	1374	27	1118	25	0.095
Transfusion	474	9	109	9	0.437
SIRS or sepsis	1075	21	985	22	0.067
Functional status					<0.001
Independent	4121	80	3276	75	
Partially dependent	770	15	839	19	
Totally dependent	193	4	193	4	
Unknown	71	1	85	2	
Mechanical ventilation	277	5	202	5	0.090
ASA Class					<0.001
1	5	0.1	3	0.1	
2	85	2	107	2	
3	1988	39	1954	44	
4	2941	57	2207	50	
5	116	2	103	2	
None assigned	20	0.4	19	0.4	
Emergency	1081	21	1052	24	0.001

MAC – monitored anesthesia care. ASA – American Society of Anesthesiologists.

Power analysis

Using a 30-day mortality of 13% in white males, we estimated that with alpha = 0.05, we would have >95% power to detect a change in mortality of 20% (from 13 to 10.4%) in women given 5100 men and 4400 women and >80% power to detect a change in