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Worsening preoperative functional status increases morbidity and mortality in patients undergoing coronary artery bypass grafting: A propensity matched study of the ACS-NSQIP database

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ABSTRACT

Introduction: Dependent functional status is correlated with increased mortality in patient undergoing coronary artery bypass grafting (CABG). However, patients who are partially dependent and totally dependent may have different peri-operative outcome profiles. This study aims to retrospectively examine the effect of different levels of functional dependency on post-CABG morbidity and mortality.
Methods: Patients who underwent a CABG from 2005 to 2021 were identified in the ACS-NSQIP database. Subjects were stratified into independent (IFS), partially dependent (PDFS), and totally dependent functional status (TDFS). A 5:1 propensity matching between IFS and each functional dependent group was performed, respectively. The 30-day peri-operative outcomes of PDFS and TDFS were compared to that of IFS. Peri-operative outcomes between PDFS and TDFS were compared using multivariable logistic regression, adjusted for demographics and co-morbidities.
Results: There were 968 PDFS with 4779 matched IFS and 247 TDFS with 1202 matched IFS. Compared to IFS, PDFS and TDFS had higher mortality, sepsis, bleeding, and length of stay>7 days. TDFS have higher MACE, cardiac/pulmonary/renal complications, and OR return than IFS. Compared to PDFS, TDFS had higher mortality (aOR 1.68, $p = 0.03$), higher risk of MACE (aOR 1.88, $p<0.01$), cardiac events (aOR 2.74, $p<0.01$), perioperative sepsis (aOR 1.73, $p = 0.03$), pulmonary complications (aOR 2.16, $p<0.01$), and returning to OR (aOR 1.68, $p = 0.02$).
Conclusion: Our study shows that dependent functional status is associated with increased morbidity and mortality after CABG. Additional post-CABG complication monitoring and care may be required for TDFS.

Introduction

Coronary artery disease (CAD) is a leading cause of mortality in the US and is characterized by pathologic plaque accumulation in the coronary artery, blocking adequate blood flow to the heart and may progress into myocardial infarction [1]. Coronary artery bypass grafting (CABG) surgery remains one of the primary treatments for CAD. CABG surgery is a common procedure where a blood vessel is harvested and grafted distal to the stenosis in the coronary artery to restore blood flow to the ischemic heart [2–4].

Functional status reflects the individual's ability to perform daily activities and maintain health and is a factor used to estimate the risk of complications and adverse events [5,6]. The American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) is a high quality, risk adjusted, nationally validated database that collects patient data and classifies the patients into one of the three categories: independent (IFS), partially dependent (PDFS), and totally dependent functional status (TDFS). Functional status in the ACS-NSQIP database was determined within 30 days prior to the operation and is highly correlated with peri-operative outcomes of surgeries across different specialties. [7,8].

IFS is defined as one who can perform daily activities without help from another individual. Patients with prosthetics and other medical assisting devices who can function independently also belong to this category. PDFS is defined as one who may be able to perform daily activities but requires some assistance from another individual. TDFS is

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defined as one who cannot perform daily activities unless one receives help from another individual and requires complete assistance [9].

A previous single institution study found pre-operative dependent functional status was correlated with increased mortality in CABG surgery [10]. Moreover, differences in morbidity regarding pre-operative functional status are not well-established. Another single-institute study looked at the effect of pre-operative functional status without differentiating between the PDFS and TDFS groups, and this study also had a small sample size cohort [11]. However, PDFS and TDFS may have different peri-operative outcome profiles because patients with different levels of functional status may have different intrinsic capacities to handle invasive surgeries. In addition, the potential differences of peri-operative profiles between PDFS and TDFS had not been clearly explored in previous research. Thus, our study aimed to retrospectively examine the effect of different levels of pre-operative functional status on post-CABG mortality and morbidities using ACS-NSQIP nation-wide database gathered from several institutions. This study can offer clinical insights regarding prognosis and peri-operative management in functionally-dependent patients.

Methods

Data source

This study utilized Current Procedural Terminology (CPT) codes to extract all patients who underwent CABG surgery from the ACS-NSQIP database from 2005 to 2021. The patients were stratified into 3 different categories based on levels of functional health status defined by ACS-NSQIP: IFS, PDFS, and TDFS.

Preoperative values

To account for preoperative differences between the patients with different levels of functional health status, patient demographics and comorbidities were extracted and compared between IFS and PDFS. The same characterization was performed to compare IFS and TDFS. Demographics and comorbidities included sex, age older than 70 years, body mass index (BMI) greater than 30 kg/m^2, race, smoking history, diabetes, dyspnea, chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), hypertension, acute kidney injury (AKI), dialysis, preoperative sepsis, cancer, usage of steroids, weight loss, bleeding disorders, estimated glomerular filtration rate (eGFR) less than 60 mL/min, serum albumin less than 3.4 g/L, white blood cell (WBC) count greater than 11,000 counts/mL, hematocrit less than 37 %, platelet count less than 150,000 counts/mL, blood urea nitrogen (BUN) greater than 23 mg/dL, American Society of Anesthesiologists Classification (ASA) score of 4 or 5.

30-Day Peri-operative values

Peri-operative variables considered in this analysis included 30-day mortality, major adverse cardiovascular events (MACE), cardiac events (myocardial infarction or cardiac arrest requiring cardiopulmonary resuscitation), stroke, wound complications (superficial and deep surgical site infections, organ space infection, or dehiscence), renal complications (i.e. progressive renal insufficiency defined as rise in serum creatinine by >2 mg/dL above baseline), sepsis, clot formation (i.e. pulmonary embolism), pulmonary complications (pneumonia, unplanned intubation, prolonged mechanical ventilation >48 h), return to the operating room, average operative time greater than 4 h, and average length of stay over 7 days.

Statistical analysis

To account for the significant preoperative differences presented between IFS and PDFS and a significant mismatch in their sample sizes, a propensity matching between the two groups was conducted in a 5:1 ratio using the Greedy Matching algorithm with a 2 % caliper. IFS and TDFS went under 5:1 propensity matching. Fisher's exact tests were used to compare the perioperative variables between IFS and PDFS as well as the perioperative variables between IFS and TDFS.

Due to the small sample sizes of PDFS and TDFS, propensity matching was not viable. To compare the perioperative differences between PDFS and TDFS, a multivariable logistic regression model was used and pre-operative variables with noted difference ($p < 0.1$) were included in the model. Adjusted odds ratio (aOR) was used to characterize group differential in their association to the outcomes. P-value less than 0.05 was considered as statistically significant.

This study was exempt from the IRB approval by George Washington University as it analyzed retrospective ACS-NSQIP data. All analyses were performed using SAS version 9.4. The author had full access to all data and takes responsibility for the integrity of the data analysis.

Results

There were 30,434, 970, and 247 IFS, PDFS, and TDFS, respectively, who underwent CABG surgery identified in ACS-NSQIP from 2005 to 2021. In comparison to IFS, PDFS were more likely to be female, Black, Hispanic, Asian, and having diabetes, dyspnea, COPD, CHF, hypertension, AKI, dialysis, sepsis, steroid use, weight loss, bleeding disorders, age > 70 years, GFR ⟨ 60 mL/min, serum albumin < 3.4 g/L, WBC ⟩ 11,000 counts/mL, hematocrit ⟨ 37 %, platelet < 150,000 counts/mL, BUN ⟩ 23 mg/dL, and ASA Score of 4 or 5. In comparison to IFS, TDFS were more likely to be female, Hispanic, Asian, and having dyspnea, COPD, CHF, AKI, dialysis, sepsis, bleeding disorders, age > 70 years, eGFR ⟨ 60 mL/min, serum albumin < 34 g/L WBC ⟩ 11,000 counts/mL, hematocrit ⟨ 37 %, platelet < 150,000 counts/mL, BUN ⟩ 23 mg/dL, and ASA Score of 4 or 5. However, TDFS were less likely to have BMI > 30 kg/m^2. With respect to PDFS, TDFS who underwent CABG were more likely to be Asians, have an ASA score of 4 or 5, and with dyspnea, CHF, sepsis, bleeding disorders, WBC greater than 11,000 counts/mL. In contrast, PDFS who underwent CABG surgery were more likely to be White or have diabetes, hypertension, BMI > 30 kg/m^2 (Table 1).

After the 5:1 propensity matching, 4,779 IFS were matched to 968 PDFS and 1,202 IFS were matched to 247 TDFS. All preoperative variables between IFS and PDFS and those between IFS and TDFS were not statistically significant, as shown in Table 2 and 3, indicating successful matches. Their comparisons between the 30-day post-CABG surgical outcomes were shown in Table 4.

Compared to IFS, PDFS and TDFS had higher mortality (6.92 % PDFS vs 5.31 % IFS, $p = 0.05$; 14.17 % TDFS vs 7.24 % IFS, $p<0.01$). Compared to PDFS, TDFS had higher mortality (aOR 1.68, 95 % CI 1.06–2.68, $p = 0.03$). Additionally, PDFS and TDFS patients had higher rates of sepsis (6.71 % PDFS vs 3.83 % IFS, $p<0.01$; 12.55 % TDFS vs 5.49 % IFS, $p<0.01$), bleeding (48.55 % PDFS vs 62.69 % IFS, $p<0.01$; 43.72 % TDFS vs 67.72 % IFS, $p<0.01$), and length of stay>7 days (82.95 % PDFS vs 75.08 % IFS, $p<0.01$; 87.85 % TDFS vs 78.29 % IFS, $p<0.01$). TDFS have higher MACE (14.17% vs 8.65 %, $p = 0.01$), cardiac (11.34% vs 6.49 %, $p = 0.01$)/pulmonary (32.39% vs 18.97 %, $p<0.01$)/ renal (11.74% vs 6.16 %, $p<0.01$) complications, and return to the OR (16.19% vs 8.99 %, $p<0.01$) when compared to IFS patients.

Compared to PDFS, TDFS had higher risk of MACE (aOR 1.88, 95 % CI 1.20–2.95, $p<0.01$), cardiac events (aOR 2.74, 95 % CI 1.64–4.59, $p<0.01$), perioperative sepsis (aOR 1.73, 95 % CI 1.07–2.81, $p = 0.03$), pulmonary complications (aOR 2.16, 95 % CI 1.52–3.07, $p<0.01$), return to OR (aOR 1.68, 95 % CI 1.11–2.55, $p = 0.02$) (Table 5).

Discussion

In our study, we observed higher mortality as well as higher MACE, pulmonary events, renal dysfunction, and chances of returning to the operating room among TDFS patients compared to IFS patients.

Table 1
Participants pre-operative characteristics of patients with partially dependent functional status (PDFS) and totally dependent functional status (TDFS).

Pre-operative Variables	PDFS	TDFS	P-value
Female	336 (34.64 %)	91 (36.84 %)	0.55
Black	67 (6.91 %)	11 (4.45 %)	0.19
White	663 (68.35 %)	147 (59.51 %)	0.01
Hispanic	144 (14.85 %)	37 (14.98 %)	1.00
Asian	42 (4.33 %)	31 (12.55 %)	<0.01
Diabetes	500 (51.55 %)	98 (39.68 %)	0.00
History of Smoking	223 (22.99 %)	54 (21.86 %)	0.73
Dyspnea	519 (53.51 %)	162 (65.59 %)	0.00
COPD	131 (13.51 %)	32 (12.96 %)	0.92
CHF	256 (26.39 %)	92 (37.25 %)	0.00
Hypertension	840 (86.6 %)	200 (80.97 %)	0.03
AKI	18 (1.86 %)	8 (3.24 %)	0.21
Dialysis	84 (8.66 %)	13 (5.26 %)	0.09
Sepsis	88 (9.07 %)	51 (20.65 %)	<0.01
Cancer	5 (0.52 %)	2 (0.81 %)	0.64
Steroid Use	49 (5.05 %)	10 (4.05 %)	0.62
Weight Loss	11 (1.13 %)	1 (0.4 %)	0.48
Bleeding Disorders	243 (25.05 %)	85 (34.41 %)	0.00
Age > 70 years	419 (43.2 %)	116 (46.96 %)	0.31
BMI > >30 kg/m^2	420 (43.3 %)	80 (32.39 %)	0.00
eGFR < 60 mL/min	383 (39.48 %)	102 (41.3 %)	0.61
Serum Albumin < 3.4 g/L	302 (31.13 %)	90 (36.44 %)	0.13
White Blood Cell > 11,000 counts/mL	134 (13.81 %)	65 (26.32 %)	<0.01
Hematocrit < 37 %	525 (54.12 %)	132 (53.44 %)	0.89
Platelet < 150,000 counts/mL	143 (14.74 %)	44 (17.81 %)	0.24
Blood Urea Nitrogen > 23 mg/dL	340 (35.05 %)	97 (39.27 %)	0.23
ASA Score of 4 or 5	831 (85.67 %)	238 (96.36 %)	<0.01

Abbreviations: AKI, acute kidney injury; ASA, American Society of Anesthesiology; BMI, body mass index; CEA, carotid endarterectomy; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate.

Table 2
Participants pre-operative characteristics of patients with independent (IFS) and partially dependent functional status (PDFS) after 5-to-1 propensity matching.

Pre-operative Variables	IFS (*n* = 4,779)	PDFS (*n* = 968)	P-value
Female	1679 (35.13 %)	335 (34.61 %)	0.77
Black	343 (7.18 %)	67 (6.92 %)	0.84
White	3290 (68.84 %)	661 (68.29 %)	0.73
Hispanic	665 (13.92 %)	142 (14.67 %)	0.54
Asian	233 (4.88 %)	42 (4.34 %)	0.51
Diabetes	2511 (52.54 %)	498 (51.45 %)	0.55
History of Smoking	1135 (23.75 %)	223 (23.04 %)	0.65
Dyspnea	2490 (52.1 %)	517 (53.41 %)	0.46
COPD	649 (13.58 %)	131 (13.53 %)	1.00
CHF	1266 (26.49 %)	255 (26.34 %)	0.94
Hypertension	4136 (86.55 %)	838 (86.57 %)	1.00
AKI	83 (1.74 %)	18 (1.86 %)	0.79
Dialysis	373 (7.8 %)	82 (8.47 %)	0.47
Sepsis	376 (7.87 %)	88 (9.09 %)	0.22
Cancer	19 (0.4 %)	5 (0.52 %)	0.58
Steroid Use	235 (4.92 %)	49 (5.06 %)	0.87
Weight Loss	50 (1.05 %)	11 (1.14 %)	0.73
Bleeding Disorders	1183 (24.75 %)	241 (24.9 %)	0.93
Age > 70 years	2047 (42.83 %)	419 (43.29 %)	0.80
BMI > >30 kg/m^2	2049 (42.88 %)	420 (43.39 %)	0.78
eGFR < 60 mL/min	1839 (38.48 %)	381 (39.36 %)	0.61
Serum Albumin < 3.4 g/L	1454 (30.42 %)	301 (31.1 %)	0.67
White Blood Cell > 11,000 counts/mL	660 (13.81 %)	134 (13.84 %)	0.96
Hematocrit < 37 %	2639 (55.22 %)	523 (54.03 %)	0.50
Platelet < 150,000 counts/mL	673 (14.08 %)	143 (14.77 %)	0.58
Blood Urea Nitrogen > 23 mg/dL	1639 (34.3 %)	339 (35.02 %)	0.68
ASA Score of 4 or 5	4057 (84.89 %)	829 (85.64 %)	0.59

Abbreviations: AKI, acute kidney injury; ASA, American Society of Anesthesiology; BMI, body mass index; CEA, carotid endarterectomy; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate.

Additionally, we observed increased risk of sepsis and length of hospital stay being longer than 7 days among PDFS and TDFS compared to IFS. Dependent functional status is defined as the ability to carry out general tasks and activities to live independently. Often, CABG is completed on adults near retirement age [12,13], and in general, elderly individuals exhibit a higher tendency to rely on external assistance to perform various activities. It is therefore important to differentiate between functional status tiers to determine relative risks in guiding care after CABG.

In 2018, Ko and colleagues examined perioperative outcomes in patients underwent CABG. The study demonstrated that lower functional status is associated with increased 180-day all-cause mortality; however, the study did not explore specific complications that may occur to the patient depending on functional status [10]. Identifying specific complications is vital for perioperative management. Identifying specific complications related to functional status may guide perioperative management, provide insight into factors that contribute to increased mortality in patients with lower functional status, and identify patients who would not benefit from coronary artery bypass grafting, especially if percutaneous coronary intervention is an acceptable alternative. Additionally, von Meijenfeldt and colleagues demonstrated that for cardiac surgery in general, lower functional status is strongly associated with higher out of hospital mortality and readmission rate [14] . This is in accordance with our study's results but fails to produce the same amount of power as using NSQIP due to sample size and does not account for CABG specifically.

Because the etiology of peripheral arterial atherosclerosis causing peripheral arterial disease and coronary artery atherosclerosis leading to coronary artery disease is similar, perioperative surgical risk and morbidity may also be quite comparable. Atherosclerotic plaque formation, hyperlipidemia, and other risk factors of vascular surgery are also common in cardiac surgery. Multiple studies have investigated the impact of functional status on peripheral vascular surgery outcomes, with some demonstrating that lower preoperative functional status is associated with higher 30-day mortality, pulmonary complications, and dialysis dependence in lower extremity bypass surgery and endovascular aortic repair [15–17]. Although our study focused on cardiovascular surgery, specifically CABG, the findings align with those of prior investigations. The similarities observed in outcomes based on

Table 3
Participants pre-operative characteristics of patients with independent (IFS) and totally dependent functional status (TDFS) after 5-to-1 propensity matching.

Pre-operative Variables	IFS (*n* = 1,202)	TDFS (*n* = 247)	P-value
Female	416 (34.61 %)	91 (36.84 %)	0.51
Black	50 (4.16 %)	11 (4.45 %)	0.86
White	748 (62.23 %)	147 (59.51 %)	0.43
Hispanic	150 (12.48 %)	37 (14.98 %)	0.30
Asian	138 (11.48 %)	31 (12.55 %)	0.66
Diabetes	473 (39.35 %)	98 (39.68 %)	0.94
History of Smoking	278 (23.13 %)	54 (21.86 %)	0.74
Dyspnea	805 (66.97 %)	162 (65.59 %)	0.71
COPD	183 (15.22 %)	32 (12.96 %)	0.43
CHF	460 (38.27 %)	92 (37.25 %)	0.77
Hypertension	984 (81.86 %)	200 (80.97 %)	0.72
AKI	37 (3.08 %)	8 (3.24 %)	0.84
Dialysis	66 (5.49 %)	13 (5.26 %)	1.00
Sepsis	226 (18.8 %)	51 (20.65 %)	0.53
Cancer	7 (0.58 %)	2 (0.81 %)	0.66
Steroid Use	41 (3.41 %)	10 (4.05 %)	0.57
Weight Loss	1 (0.08 %)	1 (0.4 %)	0.31
Bleeding Disorders	401 (33.36 %)	85 (34.41 %)	0.77
Age > 70 years	538 (44.76 %)	116 (46.96 %)	0.53
BMI > >30 kg/m^2	393 (32.7 %)	80 (32.39 %)	0.94
eGFR < 60 mL/min	479 (39.85 %)	102 (41.3 %)	0.67
Serum Albumin < 3.4 g/L	427 (35.52 %)	90 (36.44 %)	0.83
White Blood Cell > 11,000 counts/mL	287 (23.88 %)	65 (26.32 %)	0.42
Hematocrit < 37 %	627 (52.16 %)	132 (53.44 %)	0.73
Platelet < 150,000 counts/mL	215 (17.89 %)	44 (17.81 %)	1.00
Blood Urea Nitrogen > 23 mg/dL	461 (38.35 %)	97 (39.27 %)	0.83
ASA Score of 4 or 5	1162 (96.67 %)	238 (96.36 %)	0.85

Abbreviations: AKI, acute kidney injury; ASA, American Society of Anesthesiology; BMI, body mass index; CEA, carotid endarterectomy; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate.

preoperative functional status across different types of vascular procedures allow for a more nuanced understanding of how functional status affects the outcomes of different procedures such as CABG, lower extremity bypass surgery, and endovascular aortic repair.

Outside of cardiovascular and peripheral operations, functional status has been correlated with worse surgical outcomes. Kilic and colleagues showed that lung transplant patients needing total functional assistance had a significant risk of early mortality [18]. Furthermore, other studies have shown high Frailty score, which is a metric of overall fitness that overlaps with functional status, is a risk factor for increased mortality post operationally across multiple specialties [19]. For example, Velanoch and colleagues demonstrated that high Frailty patients have increased risk of mortality across cardiac, general, gynecologic, neurosurgical, orthopedic, otolaryngologic, plastic, general thoracic, urologic, and vascular surgical operations using the NSQIP database [20]. However, we conducted a deeper analysis by examining a specific procedure and multiple adverse outcomes that may lead to increased mortality.

This study has several important limitations. As a retrospective study, there is always the potential for uncontrolled and unknown bias. The NSQIP database exclusively tracks outcomes that occur within the 30-day postoperative period. There is a possibility that other factors may emerge beyond the 30-day period following CABG. Although the data was adjusted for multiple variables, unrecorded confounding variables may still exist. Additionally, other specific adverse outcomes related to CABG may be present post-surgery that were not recorded in the database and, thus, were not analyzed in our study. Finally, inter-center variability in patient selection, postoperative treatments, and heterogenicity of how functional status was recorded may introduce confounding factors into our study.

Here, we observed that functional status may be used to predict the frequency of various complications after CABG. Postoperative outcomes such as mortality, MACE, cardiac events, pulmonary events, renal dysfunction, sepsis, bleeding, return to the operating room, and length

Table 5
Comparison of 30-day post-CABG surgical outcomes between patients with partially dependent (PDFS) and totally dependent functional status (TDFS) in multivariable regression.

	PDFS (*n* = 970)	TDFS (*n* = 247)	aOR for TDFS/PDFS with 95 % CI	P-value
Mortality	68 (7.01 %)	35 (14.17 %)	1.68 (1.06–2.68)	0.03
MACE	70 (7.22 %)	35 (14.17 %)	1.88 (1.20–2.95)	0.01
Cardiac	47 (4.85 %)	28 (11.34 %)	2.74 (1.64–4.59)	<0.01
Stroke	23 (2.37 %)	9 (3.64 %)	1.23 (0.55–2.76)	0.62
Pulmonary Events	153 (15.77 %)	80 (32.39 %)	2.16 (1.52–3.07)	<0.01
Renal Dysfunction	61 (6.29 %)	29 (11.74 %)	1.58 (0.96–2.62)	0.07
Sepsis	66 (6.8 %)	31 (12.55 %)	1.73 (1.07–2.81)	0.03
Clot Formation	24 (2.47 %)	9 (3.64 %)	1.53 (0.70–3.37)	0.29
Bleeding Events	471 (48.56 %)	108 (43.72 %)	0.79 (0.58–1.07)	0.13
Return to OR	95 (9.79 %)	40 (16.19 %)	1.68 (1.11–2.55)	0.02
Length of Stay >7 Days	805 (82.99 %)	217 (87.85 %)	1.50 (0.98–2.31)	0.06

Abbreviations: aOR, adjusted odds ratio; MACE, major adverse cardiovascular events; LOS, length of stay; OR, operating room.

Table 4
The 30-day post-CABG surgical outcomes of patients with partially dependent (PDFS) and totally dependent functional status (TDFS) compared to that of their 5-to-1-propensity-matched patients with functionally independent functional status (IFS), respectively.

	PDFS vs IFS			TFDS vs IFS		
	PDFS (*n* = 968)	**IFS (*n* = 4,779)**	**P-value**	**TFDS (*n* = 247)**	**IFS (*n* = 1,202)**	**P-value**
Mortality	67 (6.92 %)	254 (5.31 %)	0.05	35 (14.17 %)	87 (7.24 %)	<0.01
MACE	69 (7.13 %)	347 (7.26 %)	0.95	35 (14.17 %)	104 (8.65 %)	0.01
Cardiac	46 (4.75 %)	231 (4.83 %)	1.00	28 (11.34 %)	78 (6.49 %)	0.01
Stroke	23 (2.38 %)	127 (2.66 %)	0.74	9 (3.64 %)	35 (2.91 %)	0.54
Pulmonary Events	151 (15.6 %)	744 (15.57 %)	1.00	80 (32.39 %)	228 (18.97 %)	<0.01
Renal Dysfunction	61 (6.3 %)	246 (5.15 %)	0.16	29 (11.74 %)	74 (6.16 %)	<0.01
Sepsis	65 (6.71 %)	183 (3.83 %)	0.00	31 (12.55 %)	66 (5.49 %)	<0.01
Clot Formation	24 (2.48 %)	101 (2.11 %)	0.47	9 (3.64 %)	25 (2.08 %)	0.16
Bleeding Events	470 (48.55 %)	2996 (62.69 %)	<0.01	108 (43.72 %)	814 (67.72 %)	<0.01
Return to OR	95 (9.81 %)	403 (8.43 %)	0.17	40 (16.19 %)	108 (8.99 %)	<0.01
Length of Stay >7 Days	803 (82.95 %)	3588 (75.08 %)	<0.01	217 (87.85 %)	941 (78.29 %)	<0.01

Abbreviations: MACE, major adverse cardiovascular events; LOS, length of stay; OR, operating room.

of stay > 7 days are dependent on functional status of the patient. Our analysis aims to provide healthcare providers with insights into the risks associated with preoperative functional status in patient undergoing CABG.

Ethics approval

This study was exempt from the IRB approval by The George Washington University as it analyzed retrospective, deidentified NSQIP data.

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Disclosure

The authors have no disclosure.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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