History of Serious Mental Illness Is a Predictor of Morbidity and Mortality in Cardiac Surgery

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Background. **Serious mental illness (SMI), defined as a mental disorder causing functional impairment, affects 9.8 million Americans. SMI correlates with earlier onset, more extensive cardiac disease, and reduced life expectancy by 25 years. The impact of SMI on patients undergoing cardiac surgery has not been extensively studied. We hypothesized that patients with SMI have worse cardiac surgery outcomes.**

Methods. **Using our institution's Society of Thoracic Surgeons database of 16,781 cardiac operations (2002-2017), a total of 1445 (8.7%) patients with SMI were identified and stratified into anxiety, mood disorders, and psychosis. The risk-adjusted impact on morbidity and mortality were evaluated using multivariable regression.**

Results. **Patients with SMI were more often female patients, were younger, and had more comorbid disease. SMI patients were more likely to have had previous cardiac surgery and require urgent or emergent procedures (both $P < .05$). Among specific SMI diagnoses, patients with psychosis had worse outcomes compared with the general population, with higher operative mortality (9.1% vs 4.2%; $P = .001$), major morbidity (30.4% vs 15.8%; $P < .0001$), and cost ($50,211 vs $38,820; $P < .001$). After multivariable risk adjustment, SMI and psychosis remained independently associated with composite mortality and major morbidity (odds ratio, 1.21; $P = .012$; and odds ratio, 1.68; $P = .003$, respectively).**

Conclusions. **SMI is independently associated with morbidity and mortality after cardiac surgery. SMI patients, especially the subset with psychosis, are complicated, high-risk, and resource-consuming. Refined strategies to reduce postoperative complications and improve care coordination are necessary in this population.**

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Serious mental illness (SMI) is defined as a mental condition causing significant impairment in every aspect of life, resulting in poor physical health secondary to lifestyle risk factors,[1] impaired self-management, and poor interaction with the healthcare system.[2] This translates to significant mortality and reduced life expectancy by 13 to 30 years.[3-6] Most excess deaths in the SMI population are attributable to cardiovascular disease.[7-10]

SMI has a remarkable association with advanced cardiac disease, which is likely multifactorial in etiology. People with SMI engage in behaviors that make comorbidities more severe, including drug use,[11] poor diet,[12] and smoking.[13] Furthermore, chronic medical conditions are more difficult to manage because of disordered interactions with the medical system,[14-17] and these patients are at risk of receiving lower-quality care.[18] Physiologically, patients with SMI may live in a sustained inflammatory state. In a meta-analysis on bipolar disorder, patients were found to have higher levels of tumor necrosis factor alpha,[19] which is implicated in development of atherosclerosis and congestive heart failure.[20,21]

Given the strong correlation between cardiac disease and SMI, research is needed to examine how SMI affects outcomes after cardiac operations. The purpose of this study was to assess the risk-adjusted impact of SMI on cardiac surgery outcomes. We hypothesized that patients with SMI have worse outcomes with higher resource utilization after cardiac surgery than does the general population.

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Table 1. SMI and Subgroups Baseline and Operative Characteristics

Characteristics	No SMI (n = 15,336)	SMI (n = 1445)	Psychosis (n = 296)	Anxiety Disorder (n = 97)	Mood Disorder (n = 1148)
Baseline					
Age, y	66 (56-73)	62 (53-71)	65 (55-74)	51 (41-63)	61 (52-70)
Female	4616 (30.1)	656 (45.4)	99 (33.5)	52 (53.6)	656 (45.4)
Body mass index, kg/m^2	27.7 (25-31)	28.7 (25-33)	26.8 (24-31)	27.9 (24-32)	29.3 (25-33)
Smoker	5402 (58.3)	379 (60.3)	126 (61.76)	26 (59.1)	256 (22.3)
Hypertension	10,589 (69.1)	1008 (69.8)	200 (67.6)	54 (55.7)	810 (70.6)
Diabetes	4685 (30.6)	547 (37.9)	103 (34.8)	25 (25.8)	452 (39.4)
Dialysis dependent renal failure	328 (2.1)	58 (4.0)	15 (5.1)	4 (4.1)	43 (3.8)
Peripheral arterial disease	2281 (14.9)	232 (16.1)	66 (22.3)	7 (7.2)	176 (15.3)
Coronary artery disease	10732 (71.2)	848 (59.6)	193 (66.1)	53 (46.7)	659 (58.2)
Heart failure	5036 (32.8)	669 (46.3)	35 (11.8)	7 (7.2)	136 (11.9)
Prior stroke	1175 (7.7)	163 (11.3)	53 (18.0)	6 (6.3)	157 (13.7)
Chronic lung disease (moderate/severe)	1622 (10.6)	207 (14.4)	139 (47.0)	30 (30.9)	400 (34.8)
Prior myocardial infarction	5883 (38.4)	536 (37.1)	136 (46.0)	40 (41.2)	543 (47.3)
Left ventricular ejection fraction, %	55 (40-63)	57 (40-63)	50 (35-60)	56 (28-63)	57 (43-63)
Previous cardiac intervention	5202 (34.0)	633 (43.8)	130 (43.9)	43 (44.8)	505 (44.0)
Previous valve	776 (5.1)	148 (10.3)	24 (8.1)	10 (10.4)	128 (11.5)
Previous CABG	986 (6.6)	116 (8.0)	30 (10.1)	8 (8.3)	86 (7.5)
Prior percutaneous intervention	2392 (15.6)	233 (16.1)	57 (19.3)	10 (10.3)	175 (15.2)
STS PROM, %	3.3 (1.2-42) (n =10,082)	2.6 (1.1-8.3) (n = 884)	6.9 (1.8-117) (n = 176)	2.7 (1.3-28) (n = 44)	2.3 (1.0-5.8) (n = 708)
Operative characteristics					
CPB time, min	101 (77-134)	107 (80-139)	111 (84-153)	107 (74-138)	106 (80-136)
Operative urgency					
Elective	9172 (60.3)	759 (53.2)	118 (41.1)	53 (55.2)	623 (54.6)
Urgent	5395 (35.5)	589 (41.3)	145 (50.5)	36 (37.5)	456 (40.0)
Emergent	635 (4.2)	78 (5.5)	24 (8.4)	7 (7.3)	58 (5.1)
Operation type					
CABG only	7707 (50.3)	545 (37.7)	129 (43.6)	26 (26.8)	418 (36.4)
Valve only	2417 (15.8)	284 (19.7)	43 (14.5)	15 (15.5)	237 (20.7)
CABG + valve	1296 (8.5)	120 (8.3)	28 (9.5)	6 (6.2)	103 (8.2)
Non-STS PROM procedures	3961 (25.5)	496 (34.3)	96 (34.3)	50 (51.6)	399(37.8)
Ventricular assist device	285 (1.8)	28 (1.9)	3 (1.0)	2 (2.2)	25 (2.2)
Transplant	222 (1.5)	14 (1.1)	1 (0.7)	2 (2.2)	11 (1.0)
CABG conduit					
Single arterial	8110 (90.1)	580 (87.2)	135 (85.9)	27 (84.3)	458 (87.9)
Bilateral arterial	995 (9.1)	62 (9.3)	16 (10.2)	3 (9.4)	45 (8.6)

(*Continued*)

Table 1. Continued

Characteristics	No SMI (n = 15,336)	SMI (n = 1445)	Psychosis (n = 296)	Anxiety Disorder (n = 97)	Mood Disorder (n = 1148)
Valve type (mitral or aortic replacement):					
Mechanical	827 (22.2)	89 (22.1)	12 (16.9)	4 (19.0)	73 (21.5)
Bioprosthetic	1625 (43.7)	185 (45.7)	33 (46.4)	10 (47.6)	142 (41.7)

Values are median (interquartile range) or n (%).

CABG, coronary artery bypass grafting; CPB, cardiopulmonary bypass; PROM, Predicted Risk of Mortality; SMI, serious mental illness; STS, Society of Thoracic Surgeons.

Patients and Methods

Patient Data

We conducted a retrospective review of all cases (16,781) in our institution's prospectively collected Society of Thoracic Surgeons (STS) database from 2002 to 2017. Standard STS database definitions for operative mortality and STS major morbidity (renal failure, prolonged ventilation, stroke, reoperation, and deep sternal wound infection) were used, as previously reported.[22-25] Cost data acquisition has been previously described.[26,27] Charges are captured by Uniform Billing-04/92 files, classified by International Classification of Diseases–Ninth Revision (ICD-9) and International Classification of Diseases–Tenth Revision (ICD-10) and matched to the STS data, with a matching rate of 99%. Costs were adjusted for inflation using the Centers for Medicare and Medicaid Services Inpatient Prospective Payment System and presented in 2017 dollars. The institutional Clinical Data Repository (which is paired with the electronic medical record) was queried for patients with SMI based on Substance Abuse and Mental Health Services Administration ICD-9 and ICD-10 codes, which were captured either preoperatively or up to 30 days postoperatively. Per the Substance Abuse and Mental Health Services Administration, SMI is defined as a mental, behavioral, or emotional disorder causing functional impairment.[28] The SMI cohort was stratified by diagnosis type: anxiety (posttraumatic stress disorder and obsessive-compulsive disorder), mood disorders (bipolar disorder, major depressive disorder), and psychosis (schizophrenia spectrum). A summary of the identifier codes used to identify SMI can be found in Supplemental Table 1. The University of Virginia Institutional Review Board approved this study with waiver of consent due to the retrospective nature of the design (Protocol #19762).

Statistical Analysis

Continuous variables are presented as median (interquartile range) because of the skewed nature of the data, while categorical data are summarized as number and percentage. The Wilcoxon rank sum test was utilized for continuous variables and the chi-square test for categorical variables. Multivariable logistic regression based on prior STS risk models was fit for our outcome of interest: composite morbidity or mortality. Composite SMI diagnosis was forced into the model to ascertain the risk-adjusted effect. Similarly, psychosis, anxiety, and mood were forced into the same model to ascertain their risk-adjusted effects as components of SMI. Statistical significance was defined as a *P* value less than .05. All statistical analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC).

Results

Baseline Patient Data and Operative Characteristics

Of 16,781 patients in our database, a total of 1445 (8.7%) patients were identified with SMI diagnoses. Those with SMI were younger, were more likely female patients, and

Table 2. SMI Short-Term Postoperative Outcomes

Outcome	No SMI (n = 15,336)	SMI (n = 1445)	Psychosis (n = 296)	Anxiety Disorder (n = 97)	Mood Disorder (n = 1148)
Operative mortality	634 (4.1)	81 (5.6)	28 (9.5)	5 (5.2)	54 (4.7)
Major morbidity	2381 (15.5)	304 (21.0)	90 (30.4)	14 (14.4)	227 (19.8)
Morbidity or mortality	2499 (16.3)	323 (22.4)	97 (32.8)	16 (16.5)	239 (20.8)
Permanent stroke	428 (2.8)	53 (3.7)	22 (7.5)	2 (2.1)	37 (3.2)
Cardiac arrest	382 (2.5)	38 (2.6)	10 (3.4)	3 (3.1)	28 (2.4)
Pneumonia	579 (3.8)	72 (5.0)	27 (9.1)	3 (3.3)	44 (3.8)
Prolonged ventilation	1050 (6.9)	156 (10.8)	31 (10.5)	8 (8.3)	130 (11.3)
Renal failure	929 (6.1)	110 (7.6)	45 (15.3)	5 (5.2)	71 (6.2)
Renal failure requiring dialysis	345 (2.3)	40 (2.8)	8 (2.7)	2 (2.1)	33 (2.9)
Deep sternal wound infection	4 (0.04)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Transfusion packed red blood cells	3953 (27.7)	561 (44.4)	79 (40.1)	31 (37.8)	486 (45.8)
Reoperation for any reason	1003 (6.5)	122 (8.4)	31 (10.5)	6 (6.2)	96 (8.4)
Reoperation for bleeding	581 (3.8)	77 (5.3)	19 (6.4)	5 (5.2)	60 (5.2)
Readmission	170 (1.1)	30 (2.1)	4 (1.4)	4 (4.2)	26 (2.3)
Discharge to facility	1772 (11.6)	279 (19.3)	55 (18.6)	13 (13.4)	236 (20.6)
Preoperative LOS, d	1 (0-3)	1 (0-4)	2 (0-6)	1 (0-5)	1 (0-4)
Postoperative LOS, d	6 (4-8)	7 (5-11)	8 (6-15)	6 (5-10)	6 (5-10)
Intensive care unit LOS, h	43 (23-88)	55 (26-116)	66 (28-139)	46 (23-93)	59 (26-116)
Inpatient prospective payment system total cost, US$	38,333 (30,121-54,281)	44,443 (33,996-70,835)	50,211 (37,706-82,677)	46,973 (31,481-73,400.7)	44,184 (33,988-69,307)

Values are n (%) or median (interquartile range).

LOS, length of stay; PROM, Predicted Risk of Mortality; SMI, serious mental illness; STS, Society of Thoracic Surgeons.

had more comorbid disease. They were also more likely to have undergone cardiac surgery previously. Patients in the SMI cohort had a higher proportion of urgent or emergent operative procedures and were more likely to undergo isolated valve surgery and non–STS Predicted Risk of Mortality procedures (defined as non–coronary artery bypass grafting or valve procedures) (summary results shown Table 1, full analysis and *P* values shown in Supplemental Table 2).

Outcomes for Cardiac Surgery in Patients With SMI

Patients with SMI experienced higher complication rates, including STS major morbidity (SMI 21.0% vs no SMI 15.5%; $P < .001$), which was primarily driven by higher rates of prolonged ventilation, renal failure, and reoperation. Similarly, operative mortality was higher in the SMI population (5.6% vs 4.1%; $P = .008$). Finally, the SMI group demonstrated higher resource utilization including longer intensive care unit lengths of stay (55 hours vs 43 hours; $P < .001$), postoperative stays (7 days vs 6 days; $P < .0001$), and medical-inflation–adjusted total hospital cost ($44,443 vs $38,333; $P < .001$) (summary results shown Table 2, full analysis and *P* values shown in Supplemental Table 3).

After multivariable risk adjustment, SMI was associated with increased risk of composite major morbidity or mortality (odds ratio [OR], 1.21; 95% confidence interval [CI], 1.04-1.40; $P = .013$; C-statistic = 0.76) (summary results are shown in Table 3, full model is shown in Supplemental Table 4).

Psychosis

Compared with the no psychosis cohort, the subgroup of psychosis patients (n = 296, 1.8% of total, 20.5% of SMI) had more preoperative comorbidities, including peripheral arterial disease, dialysis-dependent renal failure, stroke, lung disease, myocardial infarction, and heart failure. They were also more likely to have undergone previous cardiac surgery (summary results shown in Table 1, full analysis and *P* values shown in Supplemental Table 5). Their operations were more likely emergent or urgent, with longer cardiopulmonary bypass times. Compared with the no psychosis cohort, patients with psychosis had higher operative mortality (psychosis 9.5% vs no psychosis 4.2%; $P < .001$) and more postoperative major morbidity (30.4% vs 15.7%) (summary results shown in Table 2, full analysis and *P* values shown in Supplemental Table 6).

After multivariable risk adjustment, psychosis was associated with increased risk of composite major morbidity or mortality (OR, 1.6; 95% CI, 1.27-2.22; $P = .003$; C-statistic = 0.76) (Table 4; full model shown in Supplemental Table 7).

Table 3. Predictors of Composite Morbidity and Mortality in SMI

Parameter	Odds Ratio	95% CI	*P* Value
SMI	1.206	1.041-1.397	.013
Preoperative intraaortic balloon pump	4.060	3.535-4.664	<.001
Non-STS PROM procedures[a]	3.474	2.950-4.091	<.001
Cardiogenic shock	2.715	2.222-3.318	<.001
AV replacement + MV replacement[a]	4.016	2.221-7.262	<.001
Endocarditis (active)	2.681	2.059-3.491	<.001
AV replacement + CABG[a]	2.389	1.843-3.096	<.001
Peripheral artery disease	1.606	1.432-1.800	<.001
MV repair + CABG[a]	1.898	1.363-2.644	.002
Insulin-dependent diabetes	1.530	1.328-1.762	<.001
MV replacement + CABG[a]	1.966	1.259-3.071	.003
MV replacement only[a]	1.706	1.222-2.383	.002
Hypertension	1.346	1.211-1.495	<.001
Prior cerebrovascular accident	1.390	1.204-1.605	<.001
Immunosuppression	1.482	1.193-1.841	.004
AV replacement[a]	1.570	1.179-2.089	.002
Heart failure	1.280	1.150-1.425	<.001
Preoperative atrial fibrillation	1.272	1.126-1.437	.001
Baseline creatinine, 1 mg/dL	1.173	1.113-1.236	<.001
Inotropes	1.394	1.106-1.756	.005
Severe tricuspid insufficiency	1.397	1.047-1.863	.023
Severe lung disease	1.163	1.019-1.327	.025
Age (1 y)	1.018	1.014-1.022	<.001
MV repair[a]	1.452	1.005-2.098	.047

[a]Compared with CABG alone.

AV, aortic valve; CABG, coronary artery bypass grafting; CI, confidence interval; MV, mitral valve; PROM, Predicted Risk of Mortality; SMI, serious mental illness; STS, Society of Thoracic Surgeons.

Anxiety

The subgroup of patients with anxiety (n = 97, 0.6% of total, 8.6% of SMI) was younger, more likely female, and had less comorbid disease compared with the no anxiety cohort. They underwent more non-STS Predicted Risk of Mortality procedures (anxiety 51.6% vs no anxiety 26.1%; $P < .001$) (summary results shown in Table 1, full analysis and *P* values shown in Supplemental Table 8). They had similar outcomes to the no anxiety cohort, except for increased rates of readmission (4.2% vs 1.1%; $P = .029$) (summary results shown Table 2, full analysis and *P* values shown in Supplemental Table 9).

After multivariable risk adjustment, anxiety was not a predictor of composite major morbidity or mortality (OR, 0.83; 95% CI, 0.46-1.50; $P = .539$; C-statistic = 0.76) (Table 4; full model shown in Supplemental Table 7).

Mood Disorders

Patients with mood disorders (n = 1148, 6.8% of total, 79.4% of SMI) were younger, were more likely female patients, and had more comorbidities, including diabetes, dialysis-dependent renal failure, prior stroke, lung disease, and heart failure, than did patients with no mood disorder (summary results shown Table 1, full analysis and *P* values shown in Supplemental Table 10). Procedures were more likely urgent or emergent. Patients with mood disorders had higher rates of major morbidity (mood disorder 19.8% vs no mood disorder 15.7%; $P = .003$) (summary results shown Table 2, full analysis and *P* values shown in Supplemental Table 11).

After risk adjustment using multivariable logistic regression, mood disorder was not a predictor of composite major morbidity or mortality (OR, 1.12; 95% CI, 0.95-1.33; $P = .188$, C-statistic = 0.76) (Table 4; full model shown in Supplemental Table 7).

Comment

Patients with SMI had higher rates of baseline comorbidities, placing them at higher surgical risk and contributing to increased complications after cardiac surgery. SMI was also associated with higher resource utilization, including total hospital cost. After risk-adjusting for baseline differences, SMI, particularly psychosis, remains a risk factor for composite morbidity and mortality. Patients with psychosis were notably more likely to suffer operative mortality, prolonged ventilation, stroke, renal failure, and postoperative pneumonia. Given the excessive burden of cardiac disease in patients with SMI, this information can guide perioperative care.

Table 4. Predictors of Composite Morbidity and Mortality in SMI Psychosis, Mood, and Anxiety

Parameter	Odds Ratio	95% CI	*P* Value
Psychosis	1.68	1.27-2.223	.003
Mood disorder	1.12	0.946-1.326	.188
Anxiety	0.832	0.463-1.495	.539
Preoperative intraaortic balloon pump	4.052	3.527-4.655	<.001
Non-STS procedures	3.469	2.946-4.085	<.001
Cardiogenic chock	2.719	2.224-3.323	<.001
AV replacement + MV replacement[a]	3.974	2.195-7.193	<.001
Endocarditis (active)	2.693	2.067-3.508	<.001
AV replacement + CABG[a]	2.379	1.835-3.084	<.001
Peripheral artery disease	1.6	1.427-1.794	<.001
MV repair + CABG[a]	1.899	1.363-2.645	.001
Insulin-dependent diabetes	1.53	1.328-1.763	<.001
MV replacement + CABG[a]	1.945	1.244-3.043	.004
MV replacement only[a]	1.709	1.223-2.388	.002
Hypertension	1.347	1.213-1.496	<.001
Prior cerebrovascular accident	1.389	1.203-1.603	<.001
Immunosuppression	1.474	1.186-1.832	.001
AV replacement[a]	1.566	1.176-2.085	.002
Heart failure	1.278	1.149-1.423	<.001
Preoperative atrial fibrillation	1.275	1.129-1.441	<.001
Baseline creatinine (1 mg/dL)	1.172	1.111-1.235	<.001
Inotropes	1.382	1.096-1.742	.006
Severe tricuspid insufficiency	1.394	1.045-1.859	.024
Severe lung disease	1.16	1.017-1.324	.027
Age (1 y)	1.018	1.014-1.022	<.001
MV repair[a]	1.447	1.002-2.091	.045
Ejection fraction (1%)	0.995	0.992-0.999	.014
No preoperative resuscitation requirement	0.554	0.381-0.806	.002

[a]Compared with CABG alone.

AV, aortic valve; CABG, coronary artery bypass grafting; CI, confidence interval; MV, mitral valve; SMI, serious mental illness; STS, Society of Thoracic Surgeons.

After risk adjustment for comorbid conditions and operative factors, SMI remained an independent predictor of composite morbidity and mortality. The most dramatic increase was observed in the psychosis subgroup, a finding congruent with similar studies. In 8967 patients with schizophrenia undergoing major surgery, Liao and colleagues[29] demonstrated increased risk of 30-day mortality (OR, 2.70), renal failure (OR, 3.92) pneumonia (OR, 2.99), and stroke (OR, 1.39). The increased rate of complications in patients with psychos is likely multifactorial. Altered pain perception has been described in schizophrenic patients. Kraepelin[30] described patients being able to "endure uncomfortable positions, pricks of needles, injuries, without thinking much of it." In a retrospective review of appendicitis cases in Japan, patients with schizophrenia were more likely to be delayed in presentation, and to present with perforation (risk-adjusted OR, 4.87).[31] Similar cardiac phenomena have been reported, in which patients with psychosis are more likely to have unrecognized myocardial infarction.[32] When paired with an inability to communicate concerning symptoms, more urgent-emergent surgery, and difficulty with follow-up, delays in diagnosis of postoperative complications may occur, leading to worse outcomes.

Cardiac care for patients with SMI should be refined. Risk factor modification, such as smoking cessation, dietary modification, and more aggressive screening, may improve the cardiac health and comorbidity burden of these patients. Menza and colleagues[33] describe a novel, multimodal weight control program for patients on antipsychotic medications, incorporating nutrition, exercise, and behavioral interventions, which showed significant reductions in weight, body mass index, hemoglobin A1c, and blood pressure over the course of a year. Further, screening for cardiac disease at the time of SMI diagnosis as described by Baller and colleagues[34] may also lead to earlier intervention.

Our analysis highlights the opportunity for improvement in overall cardiac care for patients with SMI. A multidisciplinary team approach with psychiatrists, social workers, and home health providers may improve surgical outcomes and earlier identification of postoperative

complications. A strategy of community health workers, employed to accompany the most complex patients to appointments and assist with medication compliance has proved effective in challenging patients with HIV and diabetes, and may be a good strategy in patients with SMI.[35] Similarly, as patients with SMI are prone to unplanned psychiatric hospitalizations, improved communication between inpatient psychiatric facilities and cardiac surgery centers could prevent loss to follow-up after acute psychiatric care. In a more overarching approach, groups are advocating that patients with SMI be recognized as a health disparities group, to improve awareness and gather resources for research into health maintenance for this complex population.[36]

As a retrospective study, this analysis has several limitations. At baseline, patients with SMI have significant differences in aggregate compared with those in the general population. This was addressed with multivariable regression. Furthermore, in our dataset, details on SMI diagnoses were limited to ICD-9 and ICD-10 billing codes. These diagnoses may not consistently carry forward with every encounter, and are not always captured if made at an outside facility; thus, SMI may be underreported, or biased toward those with more severe disease. The STS dataset is also limited to short-term outcomes, in which SMI may have its largest effect on long-term survival. Finally, as with any database, it is limited by the variables collected and is at risk for coding errors, although STS represents some of the highest-quality data available.

Patients with SMI represent a high-risk, resource-intensive cardiac surgery population. These patients suffer from more severe and complex cardiac disease and experience more postoperative complications. Proactive interventions are needed to improve outcomes in this population, including aggressive preventative care, close follow-up, and improved long-term coordination within the healthcare system.

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Southern Thoracic Surgical Association: Sixty-Seventh Annual Meeting

The Sixty-Seventh Annual Meeting* of the Southern Thoracic Surgical Association (STSA) will be held November 3-6, 2021, at the Loews Atlanta Hotel in Atlanta, GA.

Those wishing to participate in the Scientific Program should submit an abstract by Monday, April 5, 2021, 11:59 PM, Eastern Time. Abstracts must be submitted electronically. Instructions for the abstract submission process will be posted on the STSA website at www.stsa.org as soon as they are available.

Residents submitting an abstract for presentation at the STSA Sixty-Seventh Annual Meeting may elect to participate in the STSA Hawley Seiler Residents Competition. Hawley Seiler Residents Award candidates must submit a manuscript to the STSA headquarters office no later than October 15, 2021. The Resident Award will be judged based on the quality of the candidate's abstract, presentation, and manuscript. Reference www.stsa.org/awards to learn more about STSA Annual Meeting scientific paper awards.

Contact STSA Headquarters with questions at stsa@stsa.org or (312) 202-5892.

**The 2020 STSA Annual Meeting was cancelled. The 2021 STSA Annual Meeting will remain named the Sixty-Seventh Annual Meeting.*

Please note the 2021 STSA Sixty-Seventh Annual Meeting will likely be held in a hybrid format offering educational content both in-person and virtually. More details will be shared on the STSA website at www.stsa.org as soon as more information becomes available.