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Outcomes of Transcatheter Aortic Valve Replacement in Patients with Underlying Hypercoagulable States

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Abstract

Background

Thrombotic complications remain an important concern after transcatheter aortic valve replacement (TAVR), particularly because leaflet thrombosis may impair prosthetic valve function and contribute to adverse clinical outcomes. Patients with pre-existing hypercoagulable disorders may represent a higher-risk subgroup, yet their outcomes after TAVR have not been well characterized. We evaluated whether selected hypercoagulable conditions were associated with worse inpatient outcomes following TAVR.

Methods

The National Inpatient Sample was queried from 2018 through 2020 to identify adult hospitalizations involving TAVR. Hypercoagulable status was defined by the presence of systemic lupus erythematosus, antiphospholipid antibody syndrome, Factor V Leiden mutation, lupus anticoagulant syndrome, or prothrombin gene mutation using ICD-10-CM codes. Among 205,565 TAVR hospitalizations, 1,480 involved patients with one or more of these conditions. Baseline characteristics were compared using Mann-Whitney U and Chi-square testing. Multivariable logistic regression was then used to assess the relationship between hypercoagulable status and inpatient clinical outcomes, with statistical significance defined as $p < 0.05$.

Results
The study cohort had a median age of 80 years (IQR 73–85), and 43.9% were female. After adjustment, the presence of a hypercoagulable condition was not independently associated with a statistically significant increase in any primary or secondary inpatient outcome. However, several clinically relevant trends were observed. Patients with hypercoagulable states had numerically higher odds of all-cause mortality (OR 1.68) and major adverse cardiovascular events (OR 1.36). They also demonstrated higher odds of prosthetic valve leakage (aOR 1.14) and prosthetic valve thrombosis (aOR 5.03), although these associations did not reach statistical significance. Conversely, post-procedural pacemaker implantation (OR 0.86) and cerebrovascular accident (OR 0.72) were numerically less frequent in the hypercoagulable group.

Conclusion
In a national cohort of patients undergoing TAVR, underlying hypercoagulable disorders were not significantly associated with worse adjusted inpatient outcomes. Nevertheless, the direction of effect for mortality, MACE, prosthetic valve leakage, and particularly prosthetic valve thrombosis suggests a possible signal toward increased thrombotic and adverse cardiovascular risk. These findings highlight the need for larger studies with more granular clinical and antithrombotic data to better define post-TAVR risk and management strategies in patients with hypercoagulable conditions.

Keywords: Transcatheter Aortic Valve Replacement, TAVR, Hypercoagulable States, Valve Leaflet Thrombosis, Prosthetic Valve Thrombosis, Antiphospholipid Syndrome, Factor V Leiden, Systemic Lupus Erythematosus, National Inpatient Sample, Inpatient Outcomes

Introduction
Severe aortic stenosis (AS) prevalence rises sharply with age. In adults ≥65 years, >3% are affected, with rates reaching 3.4% in those >75 years based on pooled data from several meta-analyses [1,2]. Large cohort studies confirm that untreated severe AS carries a high burden, with 45% all-cause mortality at 4 years. Transcatheter aortic valve replacement (TAVR) has rapidly evolved over the past decade. Compared to surgical aortic valve replacement (SAVR), TAVR offers several key benefits, including being less invasive, associated with shorter hospital stays, faster recovery, and lower rates of perioperative complications such as major bleeding, acute kidney injury, and new-onset atrial fibrillation. However, TAVR is also associated with a distinct profile of complications compared to surgical aortic valve replacement [2,3]. The most frequent and clinically significant complications include conduction abnormalities requiring permanent pacemaker implantation, paravalvular leak (PVL), stroke, and vascular access-related complications. More serious complications include coronary obstruction, annular rupture, and valve thrombosis or embolization. Hypercoagulable states such as systemic lupus erythematosus (SLE), antiphospholipid antibody syndrome (APLS), Factor V Leiden mutation (FVL), lupus anticoagulant syndrome (LAS), and prothrombin gene mutation (PGM) may exacerbate these complications especially cerebrovascular accidents, valve thrombosis and perivalvular leak [4-7]. To date, no studies have systematically evaluated TAVR outcomes in patients with hypercoagulable states. We utilized the National Inpatient Sample to assess whether these states are associated with higher complication rates and an altered safety profile in TAVR recipients.

Methods
Data Source
This study utilized data from the National Inpatient Sample (NIS), maintained by the Agency for Healthcare Research and Quality as part of the Healthcare Cost and Utilization Project (HCUP). The NIS is the largest publicly available all-payer inpatient healthcare database in the United States, designed to produce nationally representative estimates of hospitalizations. It comprises a 20% stratified sample of discharges from U.S. hospitals and, when weighted, represents over 35 million hospitalizations annually. As the NIS contains only de-identified patient information, the study was determined to be exempt from institutional review board approval by our institutional policies.

Study Population
The data were analyzed from the National Inpatient Sample (2018-2020), including 205,565 patients who underwent TAVR. The relevant clinical variables were obtained using ICD-10-CM code (International Classification of Diseases, Tenth Revision codes) 02RF3JZ, defined as "Supplement Aortic Valve with synthetic substitute via Percutaneous approach". The patients who underwent transcatheter aortic valve replacement were categorized into two groups based on the presence or absence of hypercoagulable states. These conditions include systemic lupus erythematosus (SLE), lupus anticoagulant, anti-phospholipid antibody syndrome, Factor V Leiden, and prothrombin gene mutation. The ICD-10-CM/PCS codes used to identify TAVR, hypercoagulable states, vascular complications and study outcomes are provided in Supplementary Table 1.

Baseline Characteristics / Comorbidities			
	HCS=0 (n=204,085)	**HCS=1 (n=1,480)**	**P- value**
Median Age	80 (73-85)	75 (69-82)	<0.05
Female	89,348 (43.78)	980 (66.2)	<0.05

Elective Procedure (n, %)	170,472 (83.53)	1,189 (80.34)	0.14
Median Household Income National			0.5
0-25th percentile	43,102 (21.12)	300 (20.27)	
26th to 50th percentile (median)	53,266 (26.10)	396 (26.80)	
51st to 75th percentile	53,347 (26.63)	351 (23.71)	
76th to 100th percentile	54,307 (26.61)	432 (29.21)	
Bed Size of Hospital			0.2
Small	15,449 (7.57)	75 (5.07)	
Medium	44,532 (21.82)	310 (20.95)	
Large	144,104 (70.61)	1,095 (73.99)	
Location/ Teaching of Hospital			0.88
Rural	2,714 (1.33)	15 (1.01)	
Urban nonteaching	18,490 (9.06)	130 (8.78)	
Urban teaching	182,880 (89.61)	1,335(90.20)	
Region of Hospital			0.1
Northeast	45,572(22.33)	295(19.93)	
Midwest	46,776 (22.92)	405 (27.36)	
South	69,572 (34.09)	435(29.39)	
West	42,143 (20.65)	345(23.31)	
Control/Ownership of Hospital			0.5
Government, non-federal	15,694 (7.69)	90 (6.08)	
Private, not-profit	168,206 (82.42)	1,255 (84.80)	
Private, invest-own	20,163 (9.88)	135 (9.12)	
Hypertension			
Hypertension (Uncomplicated)	40,000 (19.6)	205 (13.85)	<0.05
Hypertension (Complicated)	144,859(70.98)	1,110 (75)	0.12
Diabetes			
Diabetes (Uncomplicated)	30,082(14.74)	165 (11.15)	0.08
Diabetes (Complicated)	48,021(23.53)	250(16.89)	<0.05
End-Stage Renal Disease	7,632(3.74)	95(6.42)	<0.05
Chronic Kidney Disease	38,919(19.07)	245(16.55)	0.27
Congestive Heart Failure	134,226(65.77)	1,005(67.91)	0.44
Cardiac Arrhythmias	109,797(53.8)	750(50.68)	0.28
Pulmonary Circulation Disorders	31,184(15.28)	280(18.92)	0.08
Peripheral Vascular Disorders	41,715(20.44)	313(21.16)	0.51
Chronic Pulmonary Disease	53,531 (26.23)	440 (29.73)	0.17
Obstructive Sleep Apnea	30,367 (14.88)	260 (17.57)	0.19
Lymphoma	2,122(1.04)	5(0.34)	0.23
Metastatic Cancer	1,388(0.68)	5(0.34)	0.47
Solid Tumor Without Metastasis	5,245(2.57)	30(2.03)	0.55
Blood Loss Anemia	10 (0.005)	10 (0.68)	<0.05
Syncope	5 (0.002)	20 (1.35)	0.89
Cardiogenic Shock	20 (0.01)	60 (4.05)	0.07
Transient Ischemic Attack	23,265 (11.4)	200 (13.51)	0.25
Acute Kidney Injury	2,775 (1.36)	20(1.35)	0.99
Intracranial Hemorrhage	184 (0.09)	10(0.68)	<0.05
Acute Respiratory Failure	7,633 (3.74)	95 (6.42)	<0.05
Complete Heart Block	17,837 (8.74)	125 (8.45)	0.85
Depression	16,898 (8.28)	200 (13.51)	<0.05

Table 1

Patient and hospital variables: The baseline demographic characteristics were systematically extracted from the National Inpatient Sample (NIS) database. These characteristics encompassed age, gender, and pertinent clinical variables associated with comorbidities such as diabetes, hypertension, cardiac arrhythmias, heart failure, chronic obstructive pulmonary disease (COPD), obstructive sleep apnea (OSA), cerebrovascular diseases, renal injury, and malignancies. The study also accounts for hospital-level variables, median household income, and additional procedures such as the necessity for post-procedural pacemakers. These variables and the procedures used in this study were identified using the International Classification of Diseases, Tenth Revision Procedure Coding System (ICD-10 PCS), ICD-10 codes, clinical software codes, alongside the NIS database.

Outcome and Definition

Primary and secondary outcomes are summarized in Table 2 and Table 3, respectively.

Primary Outcomes

The primary outcome of this study was to assess differences in all-cause mortality and the incidence of major adverse cardiovascular events among patients who underwent transcatheter aortic valve replacement (TAVR), comparing those with and without hypercoagulable states such as systemic lupus erythematosus (SLE), lupus anticoagulant, antiphospholipid antibody syndrome, Factor V Leiden mutation, and prothrombin gene mutation.

Secondary Outcomes

The secondary outcomes of this study were to assess the differences in cerebrovascular accidents, prosthetic heart valve leakage, post-procedure permanent pacemaker implantation requirement, and thrombosis among patients who underwent transcatheter aortic valve replacement, comparing those with and without hypercoagulable states.

Primary Outcomes

	Chi Square Test for Primary Outcomes		
Outcome (n%)	HCS=0 (n=204,085)	HCS=1 (n=1,480)	p value
All-Cause Mortality	2,530 (1.24)	30 (2.03)	0.22
MACE	25,347 (12.42)	209 (14.14)	0.35

Adjusted and Unadjusted logistic regression for Primary Outcomes (HCS/No HCS)

Outcome	Unadjusted Odds Ratio	Adjusted Odds Ratio*	p value
All Cause Mortality	1.64		0.22
		1.68	0.27
MACE	1.16		0.36
		1.36	0.07

*Adjustment has been performed for age, weekend admission, elective admission, gender, length of stay, total charges, payer type, Income, Bed size, Location, Teaching status, CKD, ESRD, TIA, CVA, AKI, Cardiac Shock, Diabetes, OSA- CHF, ICH, cardiac arrhythmias, valvular disease, pulmonary circulation disease, peripheral vascular disorders, Hypertension, Underlying Cancer, Metastatic Disease, Obesity, Electrolyte imbalance

Table 2

Secondary outcomes included cerebrovascular complications, prosthetic heart valve leakage, requirement for post-procedure permanent pacemaker implantation, and thrombosis secondary to prosthetic valve placement.

Secondary Outcomes			
	Chi Square Test for Secondary Outcomes		
Outcome (n, %)	HCS=0 (n=204,085)	HCS=1 (n=1,480)	p value
Cerebrovascular Accident	1,061 (0.52)	5(0.34)	0.66
Leakage from prosthetic Heart Valve	592 (0.29)	50 (0.34)	0.88
Post procedure pacemaker requirement	14,265 (6.99)	90(6.08)	0.54
Thrombosis secondary to prosthetic valve placement	143 (0.07)	50(0.34)	0.07
Adjusted and Unadjusted logistic regression for Secondary Outcomes (HCS/No HCS)			
Outcome	Unadjusted Odds Ratio	Adjusted Odds Ratio*	p value
Cerebrovascular Accident	0.64		0.63
		0.72	0.75
Leakage from prosthetic Heart Valve	1.15		0.88
		1.14	0.89
Post procedure pacemaker requirement	0.86		0.54
		0.86	0.58
Thrombosis secondary to prosthetic valve placement	5.12		0.1
		5.03	0.13

Table 3

Statistical Analysis

The data were analyzed using weighted samples from the NIS database. Continuous variables were compared using the Mann-Whitney U test, and categorical variables were compared using the chi-squared test. All analyses were performed with Stata 19. Adjusted logistic regression models were used for both primary and secondary outcomes, with p-values less than 0.05 indicating statistical significance. While evaluating outcomes, adjustment was performed for potential confounding variables which were thought to be relevant in clinical context.

Results

Baseline Characteristics

Baseline characteristics and comorbidities of patients with and without hypercoagulable states are summarized in Table 1. Among 205,565 patients who underwent TAVR between 2018 and 2020, 1,480 (0.72%) had an underlying hypercoagulable state. The most common hypercoagulable conditions were systemic lupus erythematosus (n=748) and Factor V Leiden mutation (n=604), followed by lupus anticoagulant (n=79), prothrombin gene mutation (n=44), and antiphospholipid antibody syndrome (n=5).

Compared with patients without hypercoagulable states, patients with hypercoagulable states were younger (median age 75 years [IQR 69-82] vs 80 years [IQR 73-85], $p<0.05$) and more frequently female (66.2% vs 43.8%, $p<0.05$). Uncomplicated hypertension was less common in the hypercoagulable state group (13.9% vs 19.6%, $p<0.05$), as was complicated diabetes (16.9% vs 23.5%, $p<0.05$). In contrast, end-stage renal disease was more frequent among patients with hypercoagulable states (6.4% vs 3.7%, $p<0.05$). Patients with hypercoagulable states also had higher rates of blood loss anemia (0.68% vs 0.005%, $p<0.05$), intracranial hemorrhage (0.68% vs 0.09%, $p<0.05$), acute respiratory failure (6.4% vs 3.7%, $p<0.05$), and depression (13.5% vs 8.3%, $p<0.05$). Other major comorbidities, including chronic kidney disease, congestive heart failure, cardiac arrhythmias, pulmonary circulation disorders, peripheral vascular

disease, chronic pulmonary disease, and complete heart block, were not significantly different between groups.

Hospitalization Characteristics

The proportion of elective TAVR procedures was similar between patients with and without hypercoagulable states (80.3% vs 83.5%, p=0.14). There were no significant differences in median household income quartile distribution (p=0.50), hospital bed size (p=0.20), hospital teaching status or location (p=0.88), hospital region (p=0.10), or hospital ownership (p=0.50).

Clinical Outcomes

Primary Outcomes

In-hospital all-cause mortality occurred in 2.03% of patients with hypercoagulable states compared with 1.24% of patients without hypercoagulable states (p=0.22). MACE occurred in 14.1% and 12.4% of patients, respectively (p=0.35). After multivariable adjustment, hypercoagulable states were not significantly associated with increased odds of in-hospital all-cause mortality (aOR 1.68, p=0.27) or MACE (aOR 1.36, p=0.07).

Secondary Outcomes

Among secondary outcomes, rates of cerebrovascular accident (0.34% vs 0.52%, p=0.66), prosthetic valve leakage (0.34% vs 0.29%, p=0.88), post-procedure pacemaker implantation (6.1% vs 7.0%, p=0.54), and prosthetic valve thrombosis (0.34% vs 0.07%, p=0.07) were not significantly different between patients with and without hypercoagulable states. On adjusted analysis, hypercoagulable states were not significantly associated with cerebrovascular accident (aOR 0.72, p=0.75), prosthetic valve leakage (aOR 1.14, p=0.89), post-procedure pacemaker implantation (aOR 0.86, p=0.58), or prosthetic valve thrombosis (aOR 5.03, p=0.13).

Discussion

To the best of our knowledge, this is the first study comparing TAVR outcomes in patients with and without an underlying hypercoagulable state. While primary and secondary outcomes including all-cause mortality, MACE, and prosthetic valve-related complications were not statistically significant, the baseline clinical profiles of these groups reveal several important distinctions.

In this large sample reflective of the national population undergoing TAVR, patients with HCS differed significantly from their non-HCS counterparts in several key baseline characteristics: they were younger in age, more likely to be female, had a lower prevalence of uncomplicated hypertension, had a lower prevalence of complicated diabetes, had higher rates of end-stage renal disease (ESRD), had an increased prevalence of blood loss anemia, experienced higher rates of acute respiratory failure, and had a greater incidence of intracranial hemorrhage. These differences suggest a distinct comorbidity profile among HCS patients that may be attributed to both the underlying pathophysiology of their hypercoagulable conditions and the potential complications of their treatments. Systemic lupus erythematosus (SLE), the most common HCS in our cohort, is known to be associated with anemia, thrombocytopenia, and coagulopathy, which could account for the increased incidence of blood loss anemia and hemorrhagic events. Additionally, SLE and antiphospholipid syndrome (APS) have been implicated in pulmonary complications and thrombotic microangiopathy, which may contribute to the elevated rates of acute respiratory failure observed [8]. Conversely, the lower rates of traditional cardiovascular risk factors such as hypertension and diabetes may suggest an alternative mechanism of aortic valve degeneration in HCS patients—possibly driven by chronic systemic inflammation or immune dysregulation, rather than classic calcific processes [9]. This phenotype has been noted in connective tissue diseases and prothrombotic states, where valvular involvement occurs earlier and progresses differently [10].

In our large cohort of patients undergoing transcatheter aortic valve replacement (TAVR), we found no significant differences in adjusted rates of major outcomes including all-cause mortality, major adverse cardiovascular events (MACE), cerebrovascular accident, or prosthetic valve-related complications between patients with and without HCS. Notably, while the rate of prosthetic valve thrombosis was modestly higher in the HCS group (0.34% vs. 0.07%), this difference was not statistically significant (adjusted OR 5.03; p=0.13).

Multiple studies have documented an association between hypercoagulable conditions and subclinical leaflet thrombosis after TAVR, often detected as hypo attenuated leaflet thickening (HALT) or reduced leaflet motion (RLM) on post-procedural CT imaging. The PROSTHESIS study prospectively assessed hypercoagulable conditions, including Factor V Leiden, prothrombin gene mutation, and protein C/S deficiencies in HALT and suggested that thrombophilia is as common in TAVR patients as in the general population and may not raise HALT risk; it could be linked to more severe and persistent cases [11-14]. However, similar to our results, Mammo et al, who conducted a limited study on patients with surgical prosthetic heart valves comparing the prevalence of factor V Leiden in those with and without thromboembolic complications, found no consistent increase in clinical thromboembolic events attributable solely to hypercoagulable states [15]. Moreover, larger reviews of patients with APS undergoing cardiac surgery suggest that thrombotic risk is driven more by active disease state, antiphospholipid antibody profile, and intensity of perioperative anticoagulation than by the diagnosis of APS alone [16-18].

Several factors could explain the absence of a significantly increased risk of thrombosis in HCS group in our study. First, routine procedural heparinization during TAVR and the early initiation of antithrombotic therapy may blunt thrombotic risk during hospitalization, even in high-risk patients [19]. Second, our HCS distribution was weighted toward conditions such as SLE and Factor V Leiden, with fewer cases of high-risk APS or protein C/S deficiency conditions most strongly linked to post-TAVR valve thrombosis in case reports. Third, patient selection for TAVR likely excluded individuals with unstable or poorly controlled hypercoagulable disorders [20]. Finally, our study's administrative dataset captures only inpatient outcomes, missing delayed or subclinical events that other studies detected via imaging surveillance.

While hypercoagulable states are often associated with thrombotic risk, our findings suggest that TAVR may be a viable option in appropriately selected patients with HCS, without a statistically significant increase in in-hospital adverse outcomes. Nonetheless, vigilance is warranted in high-risk subtypes (e.g., triple-positive APS, severe protein C/S deficiency), as illustrated by published case reports of early bioprosthetic valve thrombosis despite optimal anticoagulation. The modestly higher rate of valve thrombosis among HCS patients in our cohort though not statistically significant may suggest a real but clinically subtle risk pattern that larger or more detailed datasets may be better equipped to identify [17,20].

Future research should aim to delineate the nuanced thrombotic risks in patients with specific hypercoagulable conditions undergoing TAVR. Given the limitations of administrative datasets and the underrepresentation of high-risk HCS subtypes in our cohort, prospective, multicenter studies with standardized post-procedural imaging such as cardiac CT or 4D-CT are essential to detect both clinical and subclinical valve thrombosis. Longitudinal follow-up incorporating detailed antithrombotic regimens and disease activity measures will be critical to understanding long-term outcomes. Comparative analyses across individual HCS subtypes (e.g., triple-positive APS vs. Factor V Leiden) and interventional trials evaluating tailored peri-procedural anticoagulation strategies may further clarify the balance between thrombotic and bleeding risks. Such efforts could guide more personalized management approaches and ensure optimal procedural safety and durability of transcatheter valves in this complex patient population.

Limitation

This study has several limitations. First, it relies on ICD coding, which are subject to misclassification and may not accurately capture the presence, severity, or activity of hypercoagulable states. For instance, we could not differentiate between active and inactive disease states particularly relevant in conditions like APS and SLE, where thrombotic risk may fluctuate based on disease activity and antibody profile. Second, our dataset is limited to inpatient encounters and does not capture post-discharge outcomes, subclinical thrombosis, or delayed valve-related complications, which may be more accurately detected through dedicated imaging surveillance like CT or 4D-CT. Third, despite the large overall sample size, certain high-risk HCS subtypes such as antiphospholipid syndrome (APS) and protein C/S deficiencies were underrepresented, limiting our ability to evaluate outcomes specific to these groups. Additionally, detailed data on peri-procedural anticoagulation regimens were not available, precluding assessment of how specific treatment strategies may have influenced outcomes.

Conclusion

In this large, nationally representative TAVR cohort, hypercoagulable states were not independently associated with significantly increased in-hospital mortality, MACE, or valve thrombosis, although valve thrombosis was numerically higher and warrants further study. While HCS patients had distinct baseline characteristics, their adjusted clinical outcomes were comparable to non-HCS patients. These findings suggest HCS is not a contraindication to TAVR, though careful management remains important in high-risk subtypes. Further prospective studies with long-term follow-up and imaging are needed to clarify risks across specific HCS populations.

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Supplementary Table 1

Diagnoses	ICD-10 codes
APLS / Anticardiolipin syndrome	D6861
SLE	M32, M320, M321, M3210, M3211, M3212, M3213, M3214, M3215, M3219, M328, and M329
Lupus Anticoagulant Syndrome	D6862
APLS with hemorrhagic disorder	D68312
Activated Protein C resistance / Factor V Leiden	D6851
Prothrombin Gene Mutation	D6852
TAVR	02RF37H, 02RF37Z, 02RF38H, 02RF38Z, 02RF3JH, 02RF3JZ, 02RF3KH, 02RF3KZ, 02RF47Z, 02RF48Z, 02RF4JZ, 02RF4KZ
Complete Heart Block	I442
Leakage of heart Valve Prosthesis	T8203, T8203XA, T8203XD, T8203XS
Acute respiratory failure	J960, J9601, J9602
Postprocedural cardiogenic shock	T8111, T8111XA, T8111XD, T8111XS
Cardiogenic shock	R570
Vascular Complications	S15*, S25*, S35*, S45*, S55*, S65*, S75*, S85*, T817*, T8183XA, T8183XS, I770, I97621, I97630, I97631, I97638
Pacemaker insertion	0JH604Z 0JH605Z 0JH606Z 0JH607Z

Table 1: TAVR in patients with hypercoagulable states ICD codes Table

ICD-10-CM diagnosis codes

S55 - Injury of blood vessels at forearm level
S550 - Injury of ulnar artery at forearm level
S551 - Injury of radial artery at forearm level
S552 - Injury of vein at forearm level
S558 - Injury of other blood vessels at forearm level
S559 - Injury of unspecified blood vessel at forearm level
S5500 - Unspecified injury of ulnar artery at forearm level
S5501 - Laceration of ulnar artery at forearm level
S5509 - Other specified injury of ulnar artery at forearm level
S5510 - Unspecified injury of radial artery at forearm level
S5511 - Laceration of radial artery at forearm level
S5519 - Other specified injury of radial artery at forearm level
S5520 - Unspecified injury of vein at forearm level
S5521 - Laceration of vein at forearm level
S75 - Injury of blood vessels at hip and thigh level
S750 - Injury of femoral artery
S751 - Injury of femoral vein at hip and thigh level
S752 - Injury of greater saphenous vein at hip and thigh level
S758 - Injury of other blood vessels at hip and thigh level
S759 - Injury of unspecified blood vessel at hip and thigh level
S7500 - Unspecified injury of femoral artery
S7501 - Minor laceration of femoral artery
S7502 - Major laceration of femoral artery
S7509 - Other specified injury of femoral artery
S7510 - Unspecified injury of femoral vein at hip and thigh level
S7511 - Minor laceration of femoral vein at hip and thigh level
S7512 - Major laceration of femoral vein at hip and thigh level
S7519 - Other specified injury of femoral vein at hip and thigh level
S7520 - Unspecified injury of greater saphenous vein at hip and thigh level
S7521 - Minor laceration of greater saphenous vein at hip and thigh level
S7522 - Major laceration of greater saphenous vein at hip and thigh level
S7529 - Other specified injury of greater saphenous vein at hip and thigh level
S7580 - Unspecified injury of other blood vessels at hip and thigh level

ICD-10-CM diagnosis codes

S85 - Injury of blood vessels at lower leg level
S850 - Injury of popliteal artery
S851 - Injury of tibial artery
S852 - Injury of peroneal artery
S853 - Injury of greater saphenous vein at lower leg level
S854 - Injury of lesser saphenous vein at lower leg level
S855 - Injury of popliteal vein
S858 - Injury of other blood vessels at lower leg level
S859 - Injury of unspecified blood vessel at lower leg level
S8500 - Unspecified injury of popliteal artery
S8501 - Laceration of popliteal artery
S8509 - Other specified injury of popliteal artery
S8510 - Unspecified injury of unspecified tibial artery
S8511 - Laceration of unspecified tibial artery
S8512 - Other specified injury of unspecified tibial artery

ICD-10-CM diagnosis codes

T817 - Vascular complications following a procedure, not elsewhere classified
T8171 - Complication of artery following a procedure, not elsewhere classified
T8172 - Complication of vein following a procedure, not elsewhere classified
T81710 - Complication of mesenteric artery following a procedure, not elsewhere classified
T81711 - Complication of renal artery following a procedure, not elsewhere classified
T81718 - Complication of other artery following a procedure, not elsewhere classified
T81719 - Complication of unspecified artery following a procedure, not elsewhere classified
T81710A - Complication of mesenteric artery following a procedure, not elsewhere classified, initial encounter
T81710D - Complication of mesenteric artery following a procedure, not elsewhere classified, subsequent encounter
T81710S - Complication of mesenteric artery following a procedure, not elsewhere classified, sequela
T81711A - Complication of renal artery following a procedure, not elsewhere classified, initial encounter
T81711D - Complication of renal artery following a procedure, not elsewhere classified, subsequent encounter
T81711S - Complication of renal artery following a procedure, not elsewhere classified, sequela
T81718A - Complication of other artery following a procedure, not elsewhere classified, initial encounter
T81718D - Complication of other artery following a procedure, not elsewhere classified, subsequent encounter
T81718S - Complication of other artery following a procedure, not elsewhere classified, sequela
T81719A - Complication of unspecified artery following a procedure, not elsewhere classified, initial encounter
T81719D - Complication of unspecified artery following a procedure, not elsewhere classified, subsequent encounter
T81719S - Complication of unspecified artery following a procedure, not elsewhere classified, sequela
T8172XA - Complication of vein following a procedure, not elsewhere classified, initial encounter
T8172XD - Complication of vein following a procedure, not elsewhere classified, subsequent encounter
T8172XS - Complication of vein following a procedure, not elsewhere classified, sequela