I. Introduction

The Society of Thoracic Surgeons' risk models predict the risk of operative mortality and morbidity after adult cardiac surgery on the basis of patient demographic and clinical variables. The models are primarily used to adjust for case mix when comparing outcomes across institutions with different patient populations. Such comparisons are provided in the Database reports received by STS Database participants. The STS models are also used by physicians and patients as tools for understanding the possible risks of surgery. As these risks are solely statistical estimates, they should be supplemented by the professional judgment of the patients' healthcare provider, particularly their cardiac surgeon.

This overview is provided as background to help users of the online STS risk calculator understand and interpret the results. Throughout this document, variable short names are used frequently. Detailed information on the STS variables, including variable short names and clinical definitions can be found at the STS website - http://www.sts.org under the STS National Database tab, Database Managers Section. Brief definitions are also available by clicking the "definitions" link on the risk calculator web page.

II. Surgical Procedures

The STS currently has three risk models: CABG, Valve, and Valve + CABG. The models apply to seven specific surgical procedure classifications:

CABG model
1. Isolated Coronary Artery Bypass   (CABG Only)

Valve model
2. Isolated Aortic Valve Replacement   (AV Replace)
3. Isolated Mitral Valve Replacement   (MV Replace)
4. Isolated Mitral Valve Repair   (MV Repair)

Valve+CABG model
5. Aortic Valve Replacement + CABG   (AV Replace + CABG)
6. Mitral Valve Replacement + CABG   (MV Replace + CABG)
7. Mitral Valve Repair + CABG   (MV Repair + CABG)

See Table 3 below for detailed definitions of these procedure classifications.

NOTE: A predicted risk value will NOT be calculated for any procedure that does not fall into one of these precisely defined categories.

III. About the Current Models

The current models were developed in 2017 using STS Adult Cardiac Surgery Database records for surgical procedures taking place between July 1, 2011– June 30, 2014. Risk models were developed for the nine endpoints defined in Table 1:

Table 1. Definition of STS Risk Model Outcomes

Endpoint	Description
Operative Mortality	STS v2.9 Sequence number 7124 (MtOpD): Operative mortality includes both (1) all deaths occurring during the hospitalization in which the operation was performed, even if after 30 days; and (2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure.
Permanent Stroke	STS v2.9 Sequence number 6810 (CNStrokP): Postoperative stroke (i.e., any confirmed neurological deficit of abrupt onset caused by a disturbance in blood supply to the brain that did not resolve within 24 hours.
Renal Failure	STS v2.9 Sequence number 6870 (CRenFail): Acute or worsening renal failure resulting in one or more of the following: 1. Increase of serum creatinine to ≥ 4.0 with an increase of at least 0.5mg/dl or 3x most recent preoperative creatinine level. 2. A new requirement for dialysis postoperatively.
Prolonged Ventilation > 24 hours	STS v2.9 Sequence number 6835 (CPVntLng): Prolonged post-operative pulmonary ventilation > 24.0 hours. The hours of postoperative ventilation time include OR exit until extubation, plus any additional hours following reintubation.
Deep Sternal Wound Infection	STS v2.9 Sequence number 6700 (DeepSternInf): Deep sternal wound infection or mediastinitis (according to CDC definition) diagnosed within 30 days of the operation or >30 days after procedure but during hospital for surgery.
Reoperation for any reason	STS v2.9 Sequence numbers 6755 (CopReBld), 6765 (COpReVlv), 6771 (CReintMI), 6778 (COpReOth), 6774 (CAortReint) : Reoperation for bleeding/tamponade, valvular dysfunction, graft failure, aortic reintervention, or other cardiac reason
Major Morbidity or Operative Mortality	A composite endpoint defined as any of the outcomes listed in the first six rows of this table.

Short Stay: PLOS < 6 days *	Discharged alive and within 5 days of surgery
Long Stay: PLOS >14 days	Failure to be discharged within 14 days of surgery

See Table 4 below for listings of the STS variables contained in each of the STS models.

IV. Patient Population

The models can be applied to all adult patients who fall into one of the surgical procedure populations described in Table 3 below, except as follows:
- The model will only calculate a predicted risk value for adult patients age 18 to 110 years.
- The models for renal failure will NOT calculate a predicted risk value for any patients who are on dialysis preoperatively or have a preoperative creatinine level greater than or equal to 4.

V. Missing Data Handling

Missing Data
It is important to understand how missing data values are handled when the STS risk-adjustment models are applied to patients with incomplete data. With the exception of age and gender, missing data values are imputed by assigning a likely substitute value. The algorithm used for missing data imputation is described below.

Required variables: Age is a required variable for all models. If it is missing, no value for predicted risk will be calculated.

Categorical variables: Missing data are generally assumed to have the lowest risk category. For example, if diabetes was not coded, it would be assumed to be "No"; if procedure priority were not coded, the procedure would be assumed to be "Elective." In most cases, the lowest risk category is also the most frequent. The attachment below lists how the categorical variables imputed for missing data.

Continuous variables: Missing data are imputed as in the table attached.

VI. Predicted Risk Values

After information has been entered on a given case, the online STS risk calculator provides a risk percentage for each of the outcomes. The risk percentage is the estimated percentage estimates the chance of a specific outcome for a patient with the indicated risk factors. Please note that the calculator updates the risk percentage for each outcome *as each question is answered*; therefore, the most reliable risk percentage will appear only after all available data have been entered.

A note on interpretation of values

The inherent limitations of statistical risk-adjustment models should be kept in mind when interpreting risk percentage values for an individual patient. Risk adjustment attempts to take into account as many of the patient's risk factors as possible. However, there are potentially difficult-to-measure factors that are not included in the STS risk-adjustment models and which may increase or decrease a patient's risk of an adverse outcome.

As with any statistical estimates, the risk percentage values should be supplemented by the professional judgment of the patients' healthcare provider, particularly their cardiac surgeon.

Links to Procedure ID and Risk Model Variables

Note, fields in green are new in v2.9x, fields in yellow are added or changed from the v2.81 definition

PART 1 (PROCID 1 through 4)				
Variable Short Name/Seq #	**Isolated CAB (ProcID=1)**	**Isolated AVR (ProcID=2)**	**Isolated MVR** (ProcID=3)	**AVR + CAB (ProcID=4)**
OpCAB/2120	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy	• No • Yes, unplanned due to surgical complication • Missing	• No • Yes, unplanned due to surgical complication • Missing	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy •
OpCAB	OpCAB in(3,5)	OpCab in (NULL, 2,4)	OpCab in (NULL, 2,4)	OpCAB in(3,5)
OpValve/2125	<Not used in this calculation>	• Yes	• Yes	• Yes
OpValve		Opvalve eq 1	Opvalve eq 1	Opvalve eq 1
VSAV/3390	• No • Yes, unplanned due to surgical complication • Missing	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy • Missing	• No • Yes, unplanned due to surgical complication • Missing	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy
VSAV	VSAV in (NULL, 2,4)	VSAV in (3,5)	VSAV in (NULL, 2,4)	VSAV in (3,5)
VSAVPr/3395	<Not used in this calculation>	• Replacement	<Not used in this calculation>	• Replacement
VSAVPr		VSAVPr eq 1		VSAVPr eq 1
VSMV/3495	• No • Yes, unplanned due to surgical complication • Missing	• No • Yes, unplanned due to surgical complication • Missing	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy	• No • Yes, unplanned due to surgical complication • Missing
VSMV	VSMV in (NULL, 2,4)	VSMV in (NULL, 2,4)	VSMV in (3,5)	VSMV in (NULL, 2,4)
VSMVPr/3500	<Not used in this calculation>	<Not used in this calculation>	• Replacement	<Not used in this calculation>
VSMVPr			VSMVPr eq 2	
OCarCongProc1/ 6515	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair • Anomalous aortic origin of coronary artery from aorta (AAOCA) repair	• Missing • PFO, Primary closure	• Missing • PFO, Primary closure • ASD repair, Primary closure • ASD repair, Patch	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair • Anomalous aortic origin of coronary artery from aorta (AAOCA) repair

OCarCongProc1	Ocarcongproc1 in (NULL,10,1291,1305)	Ocarcongproc1 in (NULL,10)	Ocarcongproc1 in (NULL,10,20,30)	Ocarcongproc1 in (NULL,10,1291,1305)
OCarCongProc2/ 6520	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair • Anomalous aortic origin of coronary artery from aorta (AAOCA) repair	• Missing • PFO, Primary closure	• Missing • PFO, Primary closure • ASD repair, Primary closure • ASD repair, Patch	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair • Anomalous aortic origin of coronary artery from aorta (AAOCA) repair
OCarCongProc2	Ocarcongproc2 in (NULL,10,1291,1305)	Ocarcongproc2 in (NULL,10)	Ocarcongproc2 in (NULL,10,20,30)	Ocarcongproc2 in (NULL,10,1291,1305)
OCarCongProc3/ 6525	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair • Anomalous aortic origin of coronary artery from aorta (AAOCA) repair	• Missing • PFO, Primary closure	• Missing • PFO, Primary closure • ASD repair, Primary closure • ASD repair, Patch	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair • Anomalous aortic origin of coronary artery from aorta (AAOCA) repair
OCarCongProc3	Ocarcongproc3 in (NULL,10,1291,1305)	Ocarcongproc3 in (NULL,10)	Ocarcongproc3 in (NULL,10,20,30)	Ocarcongproc3 in (NULL,10,1291,1305)

Tricuspid Procedures: VSTV VSTrReplace VSTrValvec 3640, 3650, 3653	Unplanned Surgical Complications ONLY
	
	VSTV is one of :
	• No
	• Yes, unplanned due to surgical complication
	• Missing
		Unplanned Surgical Complications ONLY
		
		VSTV is one of :
		• No
		• Yes, unplanned due to surgical complication
		• Missing
			All tricuspid repairs are allowed. Tricuspid replacements and valvecotomies are only allowed if the tricuspid procedure was unplanned due to surgical complications. Must satisfy at least one of (1) or (2):
			1.
			VSTrReplace:
			  • No
			  • Missing
			AND
			VSTrValvec:
			  • No
			  • Missing
			
			2.
			VSTV
				Unplanned Surgical Complications ONLY
				
				VSTV is one of :
				• No
				• Yes, unplanned due to surgical complication
				• Missing

			• Yes, unplanned due to surgical complication"]	
Tricuspid Procedures: VSTV VSTrReplace VSTrValvec	VSTV in (NULL, 2,4)	VSTV in (NULL, 2,4)	[VSTrReplace in (NULL, 2) and VSTrValvec in (NULL,2)] OR VSTV eq 4	VSTV in (NULL, 2,4)
VSPV/3685	• No • Yes, unplanned due to surgical complication • Missing			
VSPV	VSPV in (NULL, 2,4)			
PrevVADExp/ 3825	• Yes, not during this procedure • No • Missing			
PrevVADExp	PrevVADExp in (NULL, 1,3)			
VADImpTmg/ 3845	• Pre-Operative (during same hospitalization but not same OR trip as CV surgical procedure) • In conjunction with CV surgical procedure (same trip to the OR)- unplanned • Post-Operative (after surgical procedure during reoperation) • Missing			
VADImpTmg	VADImpTmg in (NULL, 1, 4, 5)			
VADImpTmg2/ 3900	• Pre-Operative (during same hospitalization but not same OR trip as CV surgical procedure) • In conjunction with CV surgical procedure (same trip to the OR)- unplanned • Post-Operative (after surgical procedure during reoperation) • Missing			
VADImpTmg2	VADImpTmg2 in (NULL, 1, 4, 5)			
VADImpTmg3/ 3955	• Pre-Operative (during same hospitalization but not same OR trip as CV surgical procedure) • In conjunction with CV surgical procedure (same trip to the OR)- unplanned • Post-Operative (after surgical procedure during reoperation) • Missing			
VADImpTmg3	VADImpTmg3 in (NULL, 1, 4, 5)			
VExp/3875	• Yes, not during this procedure • No • Missing			
VExp	VExp in (NULL, 3, 2)			
VExp2/3930	• Yes, not during this procedure • No • Missing			
VExp2	VExp2 in (NULL, 3, 2)			

VExp3/3985	• Yes, not during this procedure • No • Missing			
VExp3	VExp3 in (NULL, 3, 2)			
OCarLVA/4075	• No • Missing			
OCarLVA	OCarLVA in (NULL, 2)			
OCarVSD/4130	• No • Missing			
OCarVSD	OCarVSD in (NULL, 2)			
AortProc/2125	• No • Yes, unplanned due to surgical complication • Missing			
AortProc	Aortproc in (NULL, 2,4)			
EndovasProc/5066	• No • Missing			
EndovasProc	EndovasProc in (NULL, 2)			
OCarAFibIntraLes/4040	• No • Missing	• No • Missing	<Not used in this calculation>	• No • Missing
OCarAFibIntraLes	OcarAFibIntraLes in (NULL, 2)	OcarAFibIntraLes in (NULL, 2)		OcarAFibIntraLes in (NULL, 2)
OCarAFibLesLoc/4191	• Primarily epicardial • Missing	• Primarily epicardial • Missing	<Not used in this calculation>	• Primarily epicardial • Missing
OCarAFibLesLoc	OCarAFibLesLoc ne 2	OCarAFibLesLoc ne 2		OCarAFibLesLoc ne 2
OCarASDSec/4035	• No • Missing	• No • Missing	<Not used in this calculation>	• No Missing
OCarASDSec	OCarASDSec in (NULL, 2)	OCarASDSec in (NULL, 2)		OCarASDSec in (NULL, 2)
OCarACD/4055	<Not used in this calculation>	<Not used in this calculation>	• No • Missing • Permanent Pacemaker	<Not used in this calculation>
OCarACD			OCarACD in (NULL, 1, 2)	
OCarACDLE/4065	• Yes, unplanned due to surgical complication • No • Missing			

OCarACDLE	OCarACDLE in (NULL, 2,4)			
OCarLasr/4110	<Not used in this calculation>	<Not used in this calculation>	• No • Missing	<Not used in this calculation>
OCarLasr			OCarLasr in (NULL, 2)	
OCPulThromDis/4085	• No • Missing			
OCPulThromDis	OCPulThromDis in (NULL, 1)			
OCarSubaStenRes/4090	• No • Missing			
OCarSubaStenRes	OCarSubaStenRes in (NULL, 2)			
OCarSVR/4105	• No • Missing			
OCarSVR	OCarSVR in (NULL, 2)			
OCarCrTx/4120	• No • Missing			
OCarCrTx	OCarCrTx in (NULL, 2)			
OCarTrma/4125	• No • Missing			
OCarTrma	OCarTrma in (NULL, 2)			
OCTumor/4115	• No • Missing			
OCTumor	OCTumor in (NULL, 1)			
OCarOthr/4135	• No • Missing			
OCarOthr	OCarOthr in (NULL, 2)			
VSTCV/3400	• No • Missing			
VSTCV	VSTCV in (NULL, 2)			
VSTCVMit/3610	• No • Missing			
VSTCVMit	VSTCVMit in (NULL, 2)			
VSTCVTri/3652	• No • Missing			
VSTCVTri	VSTCVTri in (NULL, 2)			
VSTCVPu/3695	• No • Missing			
VSTCVPu	VSTCVPu in (NULL, 2)			

CCancCase/2050	• No
	• Missing
CCancCase	CCancCase in (NULL, 2)
ONCCarEn/6530	• No
	• Yes, unplanned due to surgical complication
	• Missing
ONCCarEn	ONCCarEn in (NULL, 2, 4)
ONCOVasc/6535	• No
	• Yes, unplanned due to surgical complication
	• Missing
ONCOVasc	ONCOVasc in (NULL, 2, 4)
ONCOThor/6540	• No
	• Yes, unplanned due to surgical complication
	• Missing
ONCOThor	ONCOThor in (NULL, 2, 4)
ONCOther/6545	• No
	• Yes, unplanned due to surgical complication
	• Missing
ONCOther	ONCOther in (NULL, 2, 4)

	PART 2 (PROCID 5 through 8)			
Variable Short Name	**MVR + CAB** (ProcID=5)**	**AVR + MVR** (ProcID=6)**	**MV Repair** (ProcID=7)**	**MV Repair + CAB** (ProcID=8)**
OpCAB/2120	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy	• No • Yes, unplanned due to surgical complication • Missing	• No • Yes, unplanned due to surgical complication • Missing	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy
OpCAB	OpCAB in(3,5)	OpCab in (NULL, 2,4)	OpCab in (NULL, 2,4)	OpCAB in(3,5)
OpValve/2125	• Yes	• Yes	• Yes	• Yes
OpValve	Opvalve eq 1	Opvalve eq 1	Opvalve eq 1	Opvalve eq 1
VSAV/3390	• No • Yes, unplanned due to surgical complication • Missing	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy	• No • Yes, unplanned due to surgical complication • Missing	• No • Yes, unplanned due to surgical complication • Missing
VSAV	VSAV in (NULL, 2,4)	VSAV in (3,5)	VSAV in (NULL, 2,4)	VSAV in (NULL, 2,4)
VSAVPr/3395	<Not used in this calculation>	• Replacement	<Not used in this calculation>	<Not used in this calculation>
VSAVPr		VSAVPr eq 1		
VSMV/3495	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy	• Yes, planned • Yes, unplanned due to unsuspected disease or anatomy
VSMV	VSMV in (3,5)	VSMV in (3,5)	VSMV in (3,5)	VSMV in (3,5)
VSMVPr/3500	• Replacement	• Replacement	• Repair	• Repair
VSMVPr	VSMVPr eq 2	VSMVPr eq 2	VSMVPr eq 1	VSMVPr eq 1
OCarCongProc1/ 6515	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair • Anomalous aortic origin of coronary artery from aorta (AAOCA) repair • ASD repair, Primary closure • ASD repair, Patch	• Missing • PFO, Primary closure • ASD repair, Primary closure • ASD repair, Patch	• Missing • PFO, Primary closure • ASD repair, Primary closure • ASD repair, Patch	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair • Anomalous aortic origin of coronary artery from aorta (AAOCA) repair • ASD repair, Primary closure • ASD repair, Patch
OCarCongProc1	Ocarcongproc1 in (NULL,10,20, 30,1291,1305)	Ocarcongproc1 in (NULL,10,20,30)	Ocarcongproc1 in (NULL,10,20,30)	Ocarcongproc1 in (NULL,10,20,30,1291,1305)
OCarCongProc2/ 6520	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair	• Missing • PFO, Primary closure • ASD repair, Primary closure • ASD repair, Patch	• Missing • PFO, Primary closure • ASD repair, Primary closure • ASD repair, Patch	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair

	PART 2 (PROCID 5 through 8)			
Variable Short Name	**MVR + CAB** (ProcID=5)**	**AVR + MVR** (ProcID=6)**	**MV Repair** (ProcID=7)**	**MV Repair + CAB** (ProcID=8)**
	• Anomalous aortic origin of coronary artery from aorta (AAOCA) repair • ASD repair, Primary closure • ASD repair, Patch			• Anomalous aortic origin of coronary artery from aorta (AAOCA) repair • ASD repair, Primary closure • ASD repair, Patch
OCarCongProc2	Ocarcongproc2 in (NULL,10, 20, 30,1291,1305)	Ocarcongproc2 in (NULL,10,20,30)	Ocarcongproc2 in (NULL,10,20,30)	Ocarcongproc2 in (NULL,10, 20, 30,1291,1305)
OCarCongProc3/ 6525	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair • Anomalous aortic origin of coronary artery from aorta (AAOCA) repair • ASD repair, Primary closure • ASD repair, Patch	• Missing • PFO, Primary closure • ASD repair, Primary closure • ASD repair, Patch	• Missing • PFO, Primary closure • ASD repair, Primary closure • ASD repair, Patch	• Missing • PFO, Primary closure • Anomalous origin of coronary artery from pulmonary artery repair • Anomalous aortic origin of coronary artery from aorta (AAOCA) repair • ASD repair, Primary closure • ASD repair, Patch
OCarCongProc3	Ocarcongproc3 in (NULL,10, 20, 30,1291,1305)	Ocarcongproc3 in (NULL,10,20,30)	Ocarcongproc3 in (NULL,10,20,30)	Ocarcongproc3 in (NULL,10, 20, 30,1291,1305)

Tricuspid Procedures:
VSTV
VSTrReplace
VSTrValvec/
3640, 3650, 3653
	All tricuspid repairs are allowed. Tricuspid replacements and valvecotomies are only allowed if the tricuspid procedure was unplanned due to surgical complications. Must satisfy at least one of (1) or (2):
	1.
	VSTrReplace:
	  • No
	  • Missing
	AND
	VSTrValvec:
	  • No
	  • Missing
	
	2.
	  VSTV
		All tricuspid repairs are allowed. Tricuspid replacements and valvecotomies are only allowed if the tricuspid procedure was unplanned due to surgical complications. Must satisfy at least one of (1) or (2):
		1.
		VSTrReplace:
		  • No
		  • Missing
		AND
		VSTrValvec:
		  • No
		  • Missing
		
		2.
		  VSTV
			All tricuspid repairs are allowed. Tricuspid replacements and valvecotomies are only allowed if the tricuspid procedure was unplanned due to surgical complications. Must satisfy at least one of (1) or (2):
			1.
			VSTrReplace:
			  • No
			  • Missing
			AND
			VSTrValvec:
			  • No
			  • Missing
			
			2.
			  VSTV
				All tricuspid repairs are allowed. Tricuspid replacements and valvecotomies are only allowed if the tricuspid procedure was unplanned due to surgical complications. Must satisfy at least one of (1) or (2):
				1.
				VSTrReplace:
				  • No
				  • Missing
				AND
				VSTrValvec:
				  • No
				  • Missing
				
				2.
				  VSTV

Variable Short Name	MVR + CAB** (ProcID=5)	AVR + MVR** (ProcID=6)	MV Repair** (ProcID=7)	MV Repair + CAB** (ProcID=8)
PART 2 (PROCID 5 through 8)				
	• Yes, unplanned due to surgical complication"]	• Yes, unplanned due to surgical complication"]	• Yes, unplanned due to surgical complication"]	• Yes, unplanned due to surgical complication"]
Tricuspid Procedures VSTV VSTrReplace VSTrValvec	[VSTrReplace in (NULL, 2) and VSTrValvec in (NULL,2)] OR VSTV eq 4	[VSTrReplace in (NULL, 2) and VSTrValvec in (NULL,2)] OR VSTV eq 4	[VSTrReplace in (NULL, 2) and VSTrValvec in (NULL,2)] OR VSTV eq 4	[VSTrReplace in (NULL, 2) and VSTrValvec in (NULL,2)] OR VSTV eq 4
VSPV/3685	• No • Yes, unplanned due to surgical complication • Missing			
VSPV	VSPV in (NULL, 2,4)			
PrevVADExp/ 3825	• Yes, not during this procedure • No • Missing			
PrevVADExp	PrevVADExp in (NULL, 1,3			
VADImpTmg/ 3845	• Pre-Operative (during same hospitalization but not same OR trip as CV surgical procedure) • In conjunction with CV surgical procedure (same trip to the OR)- unplanned • Post-Operative (after surgical procedure during reoperation) • Missing			
VADImpTmg	VADImpTmg in (NULL, 1, 4, 5)			
VADImpTmg2/ 3900	• Pre-Operative (during same hospitalization but not same OR trip as CV surgical procedure) • In conjunction with CV surgical procedure (same trip to the OR)- unplanned • Post-Operative (after surgical procedure during reoperation) • Missing			
VADImpTmg2	VADImpTmg2 in (NULL, 1, 4, 5)			
VADImpTmg3/ 3955	• Pre-Operative (during same hospitalization but not same OR trip as CV surgical procedure) • In conjunction with CV surgical procedure (same trip to the OR)- unplanned • Post-Operative (after surgical procedure during reoperation) • Missing			
VADImpTmg3	VADImpTmg3 in (NULL, 1, 4, 5)			
VExp/3875	• Yes, not during this procedure • No • Missing			
VExp	VExp in (NULL, 3, 2)			
VExp2/3930	• Yes, not during this procedure			

Variable Short Name	MVR + CAB** (ProcID=5)	AVR + MVR** (ProcID=6)	MV Repair** (ProcID=7)	MV Repair + CAB** (ProcID=8)
	• No • Missing			
VExp2	VExp2 in (NULL, 3, 2)			
VExp3/3985	• Yes, not during this procedure • No • Missing			
VExp3	VExp3 in (NULL, 3, 2)			
OCarLVA/4075	• No • Missing			
OCarLVA	OCarLVA in (NULL, 2)			
OCarVSD/4130	• No • Missing			
OCarVSD	OCarVSD in (NULL, 2)			
AortProc/2125	• No • Yes, unplanned due to surgical complication • Missing			
AortProc	Aortproc in (NULL, 2,4)			
EndovasProc/5066	• No • Missing			
EndovasProc	EndovasProc in (NULL, 2)			
OCarAFibIntraLes 4040	<Not used in this calculation>	<Not used in this calculation>	<Not used in this calculation>	<Not used in this calculation>
OCarAFibIntraLes				
OCarAFibLesLoc 4191	<Not used in this calculation>	<Not used in this calculation>	<Not used in this calculation>	<Not used in this calculation>
OCarAFibLesLoc				
OCarASDSec 4035	<Not used in this calculation>	<Not used in this calculation>	<Not used in this calculation>	<Not used in this calculation>
OCarASDSec				
OCarACD 4055	• No • Missing • Permanent Pacemaker	• No • Missing • Permanent Pacemaker	• No • Missing • Permanent Pacemaker	• No • Missing • Permanent Pacemaker
OCarACD	OCarACD in (NULL, 1, 2)	OCarACD in (NULL, 1, 2)	OCarACD in (NULL, 1, 2)	OCarACD in (NULL, 1, 2)
OCarACDLE/4065	• Yes, unplanned due to surgical complication • No			

PART 2 (PROCID 5 through 8)

	PART 2 (PROCID 5 through 8)			
Variable Short Name	**MVR + CAB**** **(ProcID=5)**	**AVR + MVR**** **(ProcID=6)**	**MV Repair**** **(ProcID=7)**	**MV Repair + CAB**** **(ProcID=8)**
	• Missing			
OCarACDLE	OCarACDLE in (NULL, 2,4)			
OCarLasr/4110	• No • Missing	• No • Missing	• No • Missing	• No • Missing
OCarLasr	OCarLasr in (NULL, 2)	OCarLasr in (NULL, 2)	OCarLasr in (NULL, 2)	OCarLasr in (NULL, 2)
OCPulThromDis/ 4085	• No • Missing			
OCPulThromDis	OCPulThromDis in (NULL, 1)			
OCarSubaStenRes/ 4090	• No • Missing			
OCarSubaStenRes	OCarSubaStenRes in (NULL, 2)			
OCarSVR/4105	• No • Missing			
OCarSVR	• OCarSVR in (NULL, 2)			
OCarCrTx/4120	• No • Missing			
OCarCrTx	• OCarCrTx in (NULL, 2)			
OCarTrma/4125	• No • Missing			
OCarTrma	• OCarTrma in (NULL, 2)			
OCTumor/4115	• No • Missing			
OCTumor	• OCTumor in (NULL, 1)			
OCarOthr/4135	• No • Missing			
OCarOthr	• OCarOthr in (NULL, 2)			
VSTCV/3400	• No • Missing			
VSTCV	• VSTCV in (NULL, 2)			
VSTCVMit/3610	• No • Missing			
VSTCVMit	• VSTCVMit in (NULL, 2)			
VSTCVTri/3652	• No • Missing			

PART 2 (PROCID 5 through 8)				
Variable Short Name	MVR + CAB** (ProcID=5)	AVR + MVR** (ProcID=6)	MV Repair** (ProcID=7)	MV Repair + CAB** (ProcID=8)
VSTCVTri	• VSTCVTri in (NULL, 2)			
VSTCVPu/3695	• No • Missing			
VSTCVPu	• VSTCVPu in (NULL, 2)			
CCancCase/2050	• No • Missing			
CCancCase	• CCancCase in (NULL, 2)			
ONCCarEn/6530	• No • Yes, unplanned due to surgical complication • Missing			
ONCCarEn	• ONCCarEn in (NULL, 2, 4)			
ONCOVasc/6535	• No • Yes, unplanned due to surgical complication • Missing			
ONCOVasc	• ONCOVasc in (NULL, 2, 4)			
ONCOThor/6540	• No • Yes, unplanned due to surgical complication • Missing			
ONCOThor	• ONCOThor in (NULL, 2, 4)			
ONCOther/6545	• No • Yes, unplanned due to surgical complication • Missing			
ONCOther	• ONCOther in (NULL, 2, 4)			

**For Version 2.9 - Please note that the ProcID algorithms for all Mitral Valve Procedures now also include intracardiac lesions and tricuspid repairs. Since it is common practice to do a full Maze procedure and/or an occasional tricuspid repair STS Leadership wanted to keep these cases in the MV Risk Algorithms.

The following fields are no longer collected:
     AortProcTEVAR – replaced by EndovascProc
     OpTricus – replaced by VSTrRepair, VSTrReplace, and VSTrValvec

Table 13 STS Risk Model Variables – 2017 Models v 2.9

CABG	Operative Mortality	Stroke	Renal Failure	Prolonged Ventilation	Deep Stern Inf ☐	Reop	Mortality/ Morbidity	Length of Stay>14	Length of Stay<6
B. Demographics									
Age (70)	✗	✗	✗	✗	✗	✗	✗	✗	✗
Gender (75)	✗	✗	✗	✗	✗	✗	✗	✗	✗
RaceBlack (160)	✗	✗	✗	✗	✗	✗	✗	✗	✗
RaceAsian (165)		✗	✗	✗	✗	✗	✗	✗	✗
Ethnicity (185)		✗	✗	✗	✗	✗	✗	✗	✗
RaceNativeAm (170)			✗	✗	✗	✗	✗	✗	✗
RacNativePacific (175)			✗	✗	✗	✗	✗	✗	✗
C.Hospitalization									
SurgDt (310)			✗	✗	✗	✗	✗	✗	✗
PayorPrim (291)	✗	✗	✗	✗	✗	✗	✗	✗	✗
PayorSecond (293)	✗	✗	✗	✗	✗	✗	✗	✗	✗
D. Risk Factors									
WeightKg (335)	✗	✗	✗	✗	✗	✗	✗	✗	✗
HeightCm (330)	✗	✗	✗	✗	✗	✗	✗	✗	✗
Diabetes (360)	✗	✗	✗	✗	✗	✗	✗	✗	✗
DiabCtrl (365)	✗	✗	✗	✗	✗	✗	✗	✗	✗
Hct (575)	✗	✗	✗	✗	✗	✗	✗	✗	✗
WBC (565)	✗	✗	✗	✗	✗	✗	✗	✗	✗
Platelets (580)	✗	✗	✗	✗	✗	✗	✗	✗	✗
CreatLst (585)	✗	✗	✗	✗	✗	✗	✗	✗	✗
Dialysis (375)	✗	✗	✗	✗	✗	✗	✗	✗	✗
Hypertn (380)		✗	✗	✗			✗		✗

InfEndTy (840)					×				
InfEndo (385)									
ChrLungD (405)	×	×	×	×	×		×	×	×
ImmSupp (490)	×		×	×	×		×	×	×
PVD (505)	×	×	×	×	×	×	×	×	×
CVD (525)	×	×	×	×			×	×	×
CVA (530)	×	×	×	×			×	×	×
CVAWhen (535)	×	×	×	×			×	×	×
CVDTIA (540)	×	×	×	×			×	×	×
CVDStenRt (550)	×	×	×	×			×	×	×
CVDStenLft (555)	×	×	×	×			×	×	×
CVDPCarSurg (560)	×	×		×					×
IVDrugAb (470)				×		×		×	×
Alcohol (480)	×	×	×	×	×	×	×	×	×
Pneumonia (465)			×	×			×	×	×
MediastRad (495)	×			×				×	×
Cancer (500)		×							
TobaccoUse (400)			×	×	×		×	×	×
FHCAD (355)		×	×	×			×	×	×
HmO2 (450)	×			×			×	×	×
SlpApn (460)		×		×			×		×
LiverDis (485)	×		×	×		×	×	×	×
UnrespStat (520)	×	×		×			×		
Syncope (515)	×			×		×	×		×
E. Previous Interventions									

Field	1	2	3	4	5	6	7	8	9
PrCAB (670)	✕		✕	✕	✕	✕	✕	✕	✕
PrValve (675)			✕	✕	✕	✕	✕	✕	✕
PrValveProc1 (695)				✕		✕	✕	✕	✕
PrValveProc2 (700)				✕		✕	✕	✕	✕
PrValveProc3 (705)				✕		✕	✕	✕	✕
PrValveProc4 (710)				✕		✕	✕	✕	✕
PrValveProc5 (715)				✕		✕	✕	✕	✕
POC (805)			✕	✕	✕			✕	✕
POCInt1 (810)		✕	✕	✕	✕		✕	✕	✕
POCInt2 (815)		✕	✕	✕	✕		✕	✕	✕
POCInt3 (820)		✕	✕	✕	✕		✕	✕	✕
POCInt4 (825)		✕	✕	✕	✕		✕	✕	✕
POCInt5 (830)		✕	✕	✕	✕		✕	✕	✕
POCInt6 (835)		✕	✕	✕	✕		✕	✕	✕
POCInt7 (840)		✕	✕	✕	✕		✕	✕	✕
pocpci (775)	✕		✕			✕	✕		✕
pocpciwhen (780)	✕		✕			✕	✕		✕
pocpciin (800)	✕		✕			✕	✕		✕
PrCVInt (665)			✕	✕		✕	✕		
F. Preoperative Cardiac Status									
MIWhen (890)	✕	✕	✕	✕			✕	✕	✕
HeartFailTmg (912) (was just CHF on previous model not timing)	✕	✕	✕	✕	✕	✕	✕	✕	✕
ClassNYH (915)	✕	✕	✕	✕	✕	✕	✕	✕	✕
CardSympTimeOfAdm (895)	✕		✕	✕		✕	✕	✕	✕

	1	2	3	4	5	6	7	8	9
CarShock (930)	×		×	×		×	×	×	×
ArrhythAtrFib (961)	×	×	×	×	×	×	×	×	×
ArrhythAFib (962)	×	×	×	×	×	×	×	×	×
ArrhythAFlutter (960)	×	×	×	×	×	×	×	×	×
ArrhythThird (970)	×	×	×	×	×	×	×	×	×
ArrhythSecond (965)	×			×	×	×	×	×	×
ArrhythSSS (955)	×			×	×	×	×	×	×
ArrhythVV (950)	×			×		×	×	×	×
G. Preoperative Medications									
MedInotr (1130)	×	×	×	×			×	×	×
MedADP5Days (1060)	×	×	×	×		×	×	×	×
MedADPIDis (1065)	×	×	×	×		×	×	×	×
MedSter (1143)	×	×	×	×		×	×	×	×
MedGP (1073)	×	×	×	×		×	×	×	×
Resusc (935)	×	×	×	×	×	×	×	×	×
medacei48 (1020)			×						
H. Hemodynamics and Cath									
NumDisV (1170)	×	×	×	×	×	×	×	×	×
PctStenLMain (1195)	×			×		×	×		
HDEF (1545)	×	×	×	×		×	×	×	×
PctStenPro LAD (1215)		×						×	×
VDStenA (1600)	×					×			
VDStenM (1690)	×		×					×	

VDInsufA (1590)	×	×	×	×		×	×	×	×
VDInsufM (1680)	×		×	×		×	×		×
VDInsufT (1775)	×		×	×		×	×	×	×
VDAoPrimEt (1646)									
I. Operative									
Incidenc (1970)	×		×	×	×	×	×	×	×
Status (1975)	×	×	×	×	×	×	×	×	×
K. Valve Surgery									
VSTrRepair (3646)					×				
L. Mechanical Cardiac Assist Devices									
IABPWhen (3730)	×		×	×	×	×	×	×	×
CathBasAssistWhen (3760)	×		×	×		×	×	×	×
ECMOWhen (3780)	×		×	×		×	×	×	×

Valve (AVRepl, MVRepl, MVRepr)	Operative Mortality	Stroke	Renal Failure	Prolonged Ventilation	Deep Stern Infx	Reop	Mortality/ Morbidity	Length of Stay>14	Length of Stay<6
B. Demographics									
Age (70)	x	x	x	x	x	x	x	x	x
Gender (75)	x	x	x	x	x	x	x	x	x
RaceBlack (160)		x	x	x	x	x	x	x	x
RaceAsian (165)				x		x			x
Ethnicity (185)			x	x	x	x	x	x	x
RaceNativeAm (170)				x					
RacNativePacific (175)									
C.Hospitalization									
SurgDt (310)		x	x	x	x	x	x	x	x
PayorPrim (291)	x	x	x	x	x	x	x	x	x
PayorSecond (293)	x	x	x	x	x	x	x	x	x
D. Risk Factors									
WeightKg (335)	x	x	x	x	x	x	x	x	x
HeightCm (330)	x	x	x	x	x	x	x	x	x
Diabetes (360)	x	x	x	x	x		x	x	x
DiabCtrl (365)	x	x	x	x	x		x	x	x

	1	2	3	4	5	6	7	8	9
Hct (575)	x	x	x	x	x	x	x	x	x
WBC (565)	x	x	x	x	x	x	x	x	x
Platelets (580)	x	x	x	x	x	x	x	x	x
CreatLst (585)	x	x	x	x	x	x	x	x	x
Dialysis (375)	x	x	x	x	x	x	x	x	x
Hypertn (380)	x		x	x			x	x	x
InfEndTy (840)	x	x	x	x	x	x	x	x	x
InfEndo (385)						x		x	
ChrLungD (405)	x	x	x	x	x		x	x	x
ImmSupp (490)	x	x			x	x	x	x	x
PVD (505)	x		x	x	x		x	x	x
CVD (525)	x	x	x	x			x	x	x
CVA (530)	x	x	x	x			x	x	x
CVAWhen (535)	x	x	x	x			x	x	x
CVDTIA (540)	x	x	x	x			x	x	x
CVDStenRt (550)		x		x					
CVDStenLft (555)		x		x					
CVDPCarSurg (560)	x		x				x		
IVDrugAb (470)	x	x		x		x		x	x
Alcohol (480)	x	x		x	x			x	x
Pneumonia (465)			x	x			x	x	x
MediastRad (495)	x		x	x			x	x	x
Cancer (500)									
TobaccoUse (400)		x		x	x	x	x		
FHCAD (355)									x

HmO2 (450)	x			x			x	x	x
SlpApn (460)									x
LiverDis (485)	x		x	x		x	x	x	x
UnrespStat (520)		x	x	x			x	x	
Syncope (515)		x							
E. Previous Interventions									
PrCAB (670)	x	x	x	x	x	x	x	x	x
PrValve (675)	x	x	x	x	x	x	x	x	x
PrValveProc1 (695)	x	x	x	x		x	x	x	x
PrValveProc2 (700)	x	x	x	x		x	x	x	x
PrValveProc3 (705)	x	x	x	x		x	x	x	x
PrValveProc4 (710)	x	x	x	x		x	x	x	x
PrValveProc5 (715)	x	x	x	x		x	x	x	x
POC (805)		x	x	x	x		x	x	x
POCInt1 (810)		x	x	x	x		x	x	x
POCInt2 (815)		x	x	x	x		x	x	x
POCInt3 (820)		x	x	x	x		x	x	x
POCInt4 (825)		x	x	x	x		x	x	x
POCInt5 (830)		x	x	x	x		x	x	x
POCInt6 (835)		x	x	x	x		x	x	x
POCInt7 (840)		x	x	x	x		x	x	x
pocpci (775)		x	x	x		x	x	x	x
pocpciwhen (780)		x	x	x		x	x	x	x
pocpciin (800)		x	x	x		x	x	x	x
PrCVInt (665)	x	x	x	x			x		x

F. Preoperative Cardiac Status									
MIWhen (890)							x		
HeartFailTmg (912)	x	x	x	x	x	x	x	x	x
ClassNYH (915)	x	x	x	x	x	x	x	x	x
CardSympTimeOfAdm (895)	x		x	x		x		x	x
CarShock (930)	x	x	x	x		x	x	x	x
ArrhythAtrFib (961)	x	x	x	x	x	x	x	x	x
ArrhythAFib (962)	x	x	x	x	x	x	x	x	x
ArrhythAFlutter (960)	x	x	x	x	x	x	x	x	x
ArrhythThird (970)	x	x	x	x	x	x	x	x	x
ArrhythSecond (965)	x	x	x	x	x	x	x	x	x
ArrhythSSS (955)	x	x	x	x	x	x	x	x	x
ArrhythVV (950)	x	x	x	x		x	x	x	x
G. Preoperative Medications									
MedInotr (1130)				x			x	x	x
MedADP5Days (1060)	x	x	x	x		x	x		x
MedADPIDis (1065)	x	x	x	x		x	x		x
MedSter (1143)	x	x	x	x					x
MedGP (1073)									
Resusc (935)	x	x	x	x	x	x	x	x	x
medacei48 (1020)				x			x	x	x
H. Hemodynamics and Cath									
NumDisV (1170)				x	x				

PctStenLMain (1195)	x								
HDEF (1545)	x			x		x	x	x	x
PctStenProxLAD (1215)			x						
VDStenA (1600)	x	x	x					x	x
VDStenM (1690)				x			x		
VDInsufA (1590)	x	x	x			x		x	x
VDInsufM (1680)	x	x	x	x		x	x	x	x
VDInsufT (1775)	x	x	x	x		x	x	x	x
VDAoPrimEt (1646)	x			x			x		x
I. Operative									
Incidenc (1970)	x	x	x	x	x	x	x	x	x
Status (1975)	x	x	x	x	x	x	x	x	x
K. Valve Surgery									
VSTrRepair (3646)			x	x	x	x	x	x	x
L. Mechanical Cardiac Assist Devices									
IABPWhen (3730)		x	x	x	x	x	x	x	x
CathBasAssistWhen (3760)	x	x	x	x		x	x	x	x
ECMOWhen (3780)	x	x	x	x		x	x	x	x

Valve+CABG (AVRepl+CABG, MVRepl+CABG, MVRepr+CABG)	Operative Mortality	Stroke	Renal Failure	Prolonged Ventilation	Deep Stern Infx	Reop	Mortality/ Morbidity	Length of Stay>14	Length of Stay<6
B. Demographics									
Age (70)	x	x	x	x	x	x	x	x	x
Gender (75)	x	x	x	x	x	x	x	x	x
RaceBlack (160)	x		x	x	x	x	x	x	x
RaceAsian (165)	x		x				x		x
Ethnicity (185)	x		x	x	x	x	x		x
RaceNativeAm (170)	x		x						
RacNativePacific (175)	x								
C.Hospitalization									

SurgDt (310)	x		x	x	x	x	x	x	x
PayorPrim (291)	x	x		x	x	x	x	x	x
PayorSecond (293)	x	x		x	x	x	x	x	x
D. Risk Factors									
WeightKg (335)	x	x	x	x	x	x	x	x	x
HeightCm (330)	x	x	x	x	x	x	x	x	x
Diabetes (360)	x	x	x	x	x	x	x	x	x
DiabCtrl (365)	x	x	x	x	x	x	x	x	x
Hct (575)	x	x	x	x	x	x	x	x	x
WBC (565)	x		x	x	x		x	x	x
Platelets (580)	x	x	x	x	x	x	x	x	x
CreatLst (585)	x	x	x	x	x	x	x	x	x
Dialysis (375)	x	x	x	x	x	x	x	x	x
Hypertn (380)						x	x		
InfEndTy (840)	x	x	x	x	x		x	x	x
InfEndo (385)									
ChrLungD (405)	x	x	x	x	x	x	x	x	x
ImmSupp (490)	x			x	x			x	x
PVD (505)	x	x		x	x		x	x	x
CVD (525)	x	x		x			x	x	x
CVA (530)	x	x		x			x	x	x
CVAWhen (535)	x	x		x			x	x	x

	1	2	3	4	5	6	7	8	9
CVDTIA (540)	x	x		x			x	x	x
CVDStenRt (550)		x	x	x		x	x		x
CVDStenLft (555)		x	x	x		x	x		x
CVDPCarSurg (560)			x	x		x	x		
IVDrugAb (470)									x
Alcohol (480)	x			x	x				x
Pneumonia (465)				x			x		
MediastRad (495)			x	x			x	x	x
Cancer (500)	x		x						
TobaccoUse (400)	x		x	x	x	x	x		x
FHCAD (355)									
HmO2 (450)	x			x			x	x	x
SlpApn (460)				x					
LiverDis (485)	x		x	x		x	x	x	x
UnrespStat (520)		x		x			x	x	
Syncope (515)	x								
E. Previous Interventions									
PrCAB (670)	x		x	x	x	x	x	x	x
PrValve (675)	x		x	x	x	x	x	x	x
PrValveProc1 (695)	x		x	x			x		x
PrValveProc2 (700)	x		x	x			x		x
PrValveProc3 (705)	x		x	x			x		x
PrValveProc4 (710)	x		x	x			x		x
PrValveProc5 (715)	x		x	x			x		x
POC (805)	x		x	x	x	x	x	x	x
POCInt1 (810)	x		x	x	x	x	x	x	x
POCInt2 (815)	x		x	x	x	x	x	x	x
POCInt3 (820)	x		x	x	x	x	x	x	x

POCInt4 (825)	x		x	x	x	x	x	x	x
POCInt5 (830)	x		x	x	x	x	x	x	x
POCInt6 (835)	x		x	x	x	x	x	x	x
POCInt7 (840)	x		x	x	x	x	x	x	x
pocpci (775)	x		x						x
pocpciwhen (780)	x		x						x
pocpciin (800)	x		x						x
PrCVInt (665)			x						
F. Preoperative Cardiac Status									
MIWhen (890)	x		x	x			x		
HeartFailTmg (912)	x	x	x	x	x	x	x	x	x
ClassNYH (915)	x	x	x	x	x		x	x	x
CardSympTimeOfAdm (895)		x	x			x	x	x	
CarShock (930)	x		x	x		x	x	x	x
ArrhythAtrFib (961)	x	x	x	x	x	x	x	x	x
ArrhythAFib (962)	x	x	x	x	x	x	x	x	x
ArrhythAFlutter (960)	x		x	x	x		x	x	x
ArrhythThird (970)	x		x	x	x		x	x	x
ArrhythSecond (965)	x		x	x	x		x	x	x
ArrhythSSS (955)	x		x	x	x		x	x	x
ArrhythVV (950)	x			x			x	x	x
G. Preoperative Medications									
MedInotr (1130)				x			x	x	x
MedADP5Days (1060)				x		x	x		
MedADPIDis (1065)				x		x	x		

	1	2	3	4	5	6	7	8	9
MedSter (1143)						x	x	x	
MedGP (1073)									
Resusc (935)	x	x	x	x	x	x	x	x	x
medacei48 (1020)								x	
H. Hemodynamics and Cath									
NumDisV (1170)	x	x	x	x	x	x	x	x	x
PctStenLMain (1195)	x			x			x		x
HDEF (1545)	x			x		x	x	x	x
PctStenProxLAD (1215)							x	x	x
VDStenA (1600)			x					x	
VDStenM (1690)	x					x		x	x
VDInsufA (1590)		x				x	x	x	x
VDInsufM (1680)	x			x			x	x	x
VDInsufT (1775)	x	x	x	x			x	x	x
VDAoPrimEt (1646)	x		x	x			x		x
I. Operative									
Incidenc (1970)	x		x	x	x	x	x	x	x
Status (1975)	x	x	x	x	x	x	x	x	x
K. Valve Surgery									
VSTrRepair (3646)				x	x		x	x	x
L. Mechanical Cardiac Assist Devices									
IABPWhen (3730)	x		x	x	x		x	x	x
CathBasAssistWhen (3760)	x		x	x		x	x	x	x
ECMOWhen (3780)	x		x	x		x	x	x	x