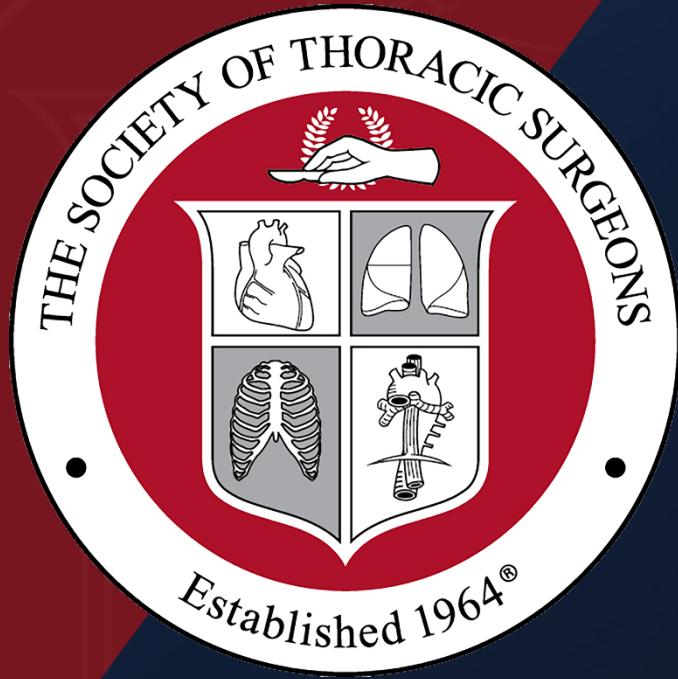




The Society of Thoracic Surgeons

Adult Cardiac Surgery Database

Quality Improvement Series Webinar

July 15, 2026



Agenda

Welcome and Introductions

STS Updates

Using the STS Risk Score API-Paul Meehan
Calculating O/E Ratios-Judy Smith

Open Q&A

Important Dates



AQO 2026 – New Orleans

STS National Database™
Trusted. Transformed. Real-Time.

AQO 2026 will offer a unique opportunity to explore techniques for optimizing data collection, using case scenarios, and driving quality improvement. Head for New Orleans this September to attend the premier gathering of STS National Database professionals as they share valuable research and important clinical findings with hundreds of peers.

- September 30-October 2, 2026
- Intermacs & Pedimacs-Live Virtual Forum-September 24
- CHSD & GTSD Sessions-September 30- October 1
- ACSD Sessions-October 1-October 2 (half day-breakout discussions)

[AQO 2026 Justification Letter Request | STS](#)



 Event

2026 Advances in Quality & Outcomes: A Data Managers Meeting

Discussions on valuable research and important clinical findings with the goal of improving data collection and patient outcomes.



[Register Now](#)

[Meetings | STS](#)



Date(s)

Sep 30 – Oct 2, 2026



Location

New Orleans, LA



Audience

**Allied Health
Data Manager**

Pricing

In-Person Registration	Registration Fee	Late Registration Fee (after Aug. 31, 2026)
STS Member — One Registry (CHSD or GTSD or ACSD)	\$700	\$800
STS Member — Two Registries ((CHSD or GTSD) AND (ACSD))	\$1,100	\$1,200
Non-Member — One Registry (CHSD or GTSD or ACSD)	\$800	\$900
Non-Member — Two Registries ((CHSD or GTSD) AND (ACSD))	\$1,200	\$1,300
Industry Employee	\$1,200	\$1,300
Virtual-Only Registration	Early Bird Registration Fee (through July 31, 2026)	Standard Registration Fee
STS Member Virtual Pass + Intermacs Forum	\$450	\$550
STS Member Virtual Pass Only (no Intermacs Forum)	\$350	\$450
Non-Member Virtual Pass + Intermacs Forum	\$550	\$650
Non-Member Virtual Pass Only (no Intermacs Forum)	\$450	\$550

Hilton New Orleans Riverside

★★★★☆ Based on 1651 reviews

2 Poydras St, New Orleans, LA 70130, US [See Map](#)

Hotel Arrangements

A block of rooms has been reserved at the Hilton New Orleans Riverside (2 Poydras Street, New Orleans, LA 70140). The special AQO group rate of \$259, plus state and local taxes, is guaranteed **through Tuesday, Sept. 8**, or until the group block is sold out. Guest rooms reserved after the cutoff date or when the room block is sold out are subject to hotel availability. [Reserve your room online](#).

STS- Advances in Quality & Outcomes: A Data Managers Meeting (AQO) - Start your reservation



Welcome to STS- Advances in Quality & Outcomes: A Data Managers Meeting (AQO)

Book your hotel room for the event at special rates, available here on an exclusive basis.

Select attendee type

Attendee



Make reservation

[Manage existing reservation](#)

Recent Database Enhancements

Parameters

 Time Period ●  Procedures ●

Procedures

Select one or more

☐ Multivalve + CABG
☐ Aorta Procedures
☐ Aorta Procedures - Bentall
☐ Aorta Procedures - AVR + Ascending
☐ Aorta Procedures - VSRR + Ascending
☐ Aorta Procedures - Isolated Ascending
☐ Non-analyzable procedures

▼ Case Mix Index Report

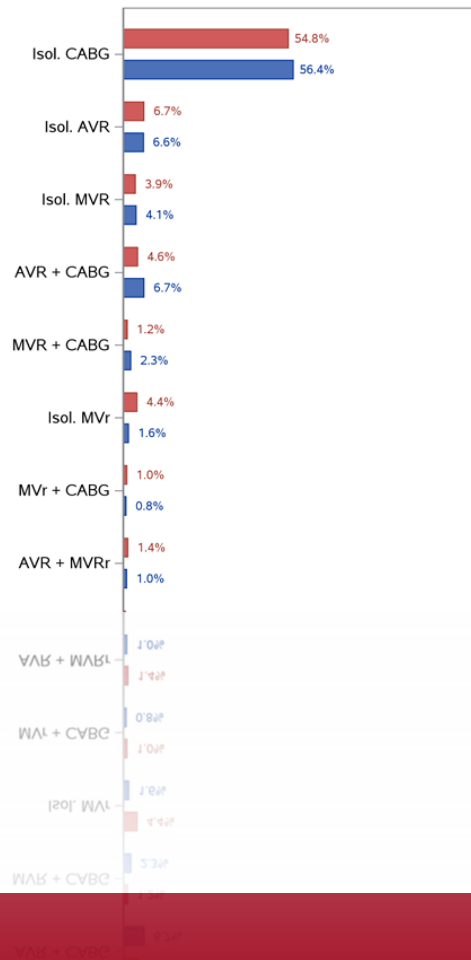
[ACSD 2026 Harvest 1 Case Mix Report](#)

▼ Risk Adjusted Results Slide Presentations

[ACSD Risk Adjusted Results Slides – 2026H1](#)

Case Mix Index Report

Case Frequency by Surgery Type



Surgery Type	Frequency	Percent
Isol. CABG	822	56.38%
Isol. AVR	96	6.58%
Isol. MVR	60	4.12%
AVR + CABG	98	6.72%
MVR + CABG	34	2.33%
Isol. MVR	23	1.58%
MVR + CABG	11	0.75%
AVR + MVR	14	0.96%
AVR + MVR + CABG	6	0.41%
AVR + CABG + CABG	0	0.00%
AVR + CABG	14	0.96%
AVR + CABG	11	0.75%
Isol. CABG	53	3.72%
AVR + CABG	24	1.72%
AVR + CABG	28	2.00%

In addition to frequency by surgery type for all analyzed procedures, the report displays:

- STS PROM% by surgery type
- Sex assigned at birth, age and other patient characteristics by surgery type

Report Period: Jan 2023 – Dec 2025

Domain	Rating	Participant		STS				
		Score	95% CI	Score	Min – Max	10 th	50 th	90 th
Overall	★★★★ Better Than Expected	98.57%	(98.10-98.96)	97.20%	(88.59-99.22)	95.82%	97.39%	98.37%
Absence of Mortality	★★★★ Better Than Expected	98.85%	(98.22-99.32)	97.77%	(92.11-99.43)	96.57%	97.94%	98.77%
Absence of Morbidity	★★★★ Better Than Expected	94.37%	(92.88-95.71)	91.17%	(73.22-97.05)	87.48%	91.63%	94.35%
Use of IMA	★★★☆☆ As Expected	99.65%	(99.20-99.91)	99.53%	(80.01-99.99)	99.09%	99.77%	99.95%
Medications	★★★★ Better Than Expected	99.22%	(98.52-99.67)	96.14%	(16.82-99.98)	91.30%	98.22%	99.69%

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Report Period: Jan 2023 – Dec 2025

Quality Domain	Eligible Procedures	Detail	Count	% of Morbidity/Failure
Absence of Mortality	821	Mortality	7	
Absence of Morbidity	822	Any Morbidity	45	
		Cerebrovascular Accident Only	6	13.3%
		Deep Sternal Infection / Mediastinitis Only	0	0.0%
		Multiple Morbidities	11	24.4%
		Prolonged Ventilation Only	15	33.3%
		Renal Failure Only	2	4.4%
		Reoperation Only	11	24.4%

Report Period: Jan 2023 – Dec 2025

Quality Domain	Eligible Procedures	Detail	Count	% of Morbidity/Failure
Use of IMA	809	IMA Failures	3	
Medications	822	Failed to Prescribe All Eligible NQF Endorsed Medications	6	
		Failed to Prescribe Multiple Medications	0	0.0%
		Only Failed to Prescribe Discharge Anti-Lipids	4	66.7%
		Only Failed to Prescribe Discharge Anti-Platelets	0	0.0%
		Only Failed to Prescribe Discharge Beta Blockade	1	16.7%
		Only Failed to Prescribe Preoperative Beta Blockade	1	16.7%

Database Enhancements for 2026 Harvest 2

- Surgical Treatment of Atrial Fibrillation Process Measure

Process and Outcome Measures

CABG Process Measures

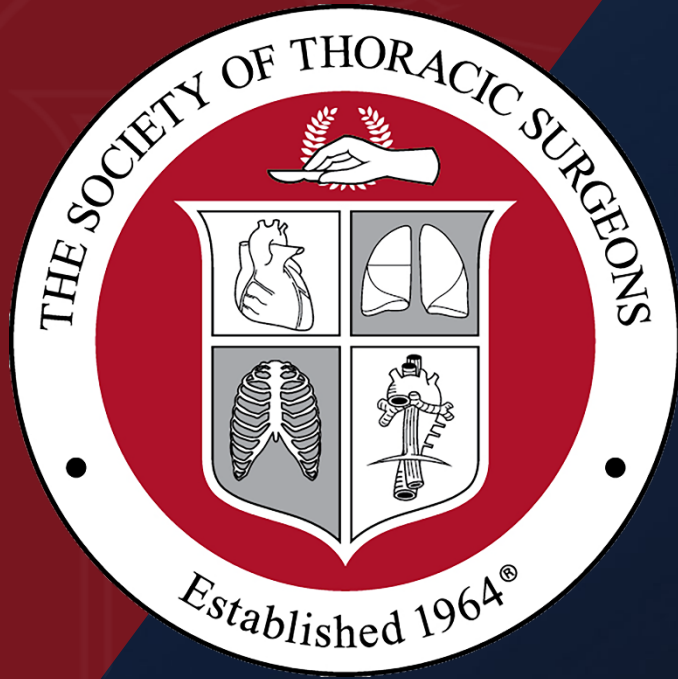
CABG Outcome Measures

All Cardiac Surgeries Process Measures

Mortality Outcome Measures

Surgical Treatment of A-Fib Process Measures

Domain	Participant				STS				
	Elig Proc	Score	95% CI	Percentile	Score	Min-Max	10th	50th	90th
ALL Atrial Fibrillation (Any*)	126	71.43%	(62.70-79.12)	33.20%	76.61%	(0.00-100.00)	50.00%	79.40%	95.24%
Mitral Valve Atrial Fibrillation (Any*)	33	93.94%	(79.77-99.26)	51.30%	87.32%	(0.00-100.00)	69.23%	93.75%	100.00%
Mitral Valve Atrial Fibrillation (Ablation**)	33	84.85%	(68.10-94.89)	80.50%	64.15%	(0.00-100.00)	22.22%	66.67%	95.45%
Non-Mitral Valve Atrial Fibrillation (Any*)	93	63.44%	(52.81-73.19)	31.90%	71.30%	(0.00-100.00)	40.54%	73.68%	94.74%
Non-Mitral Valve Atrial Fibrillation (Ablation**)	93	33.33%	(23.89-43.87)	50.50%	37.34%	(0.00-100.00)	4.44%	33.33%	65.22%



Using The STS Risk Score API

Paul Meehan

Senior Manager, Quality and Research Center

July 15, 2026

What is involved with calculating risk scores

- Determine procedure type (ProcID)
- Look at the values in the clinical fields
- Apply weights to different parameters
- Apply coefficients
- Generate scores



A word about coefficients

- Each harvest provides more data on which to base the risk models
- Changes to the coefficients fine tune the model based on latest data
- Changes from one harvest to the next are not statistically significant
- Over time, the differences become larger

Original approach to performing calculations

- Vendors were given the algorithms for doing the calculations
- Software was certified by STS prior to being released to users
- Vendor software performed the calculations and stored the results within their database
- These values are included in export files submitted to STS
 - However, see below...

Historically, New Data Specifications = New risk score calculations

- ProclD determination was updated
- Risk Score calculations were updated
- Vendors received new coefficients
- Vendor software got recertified on calculations



Problems with this approach:

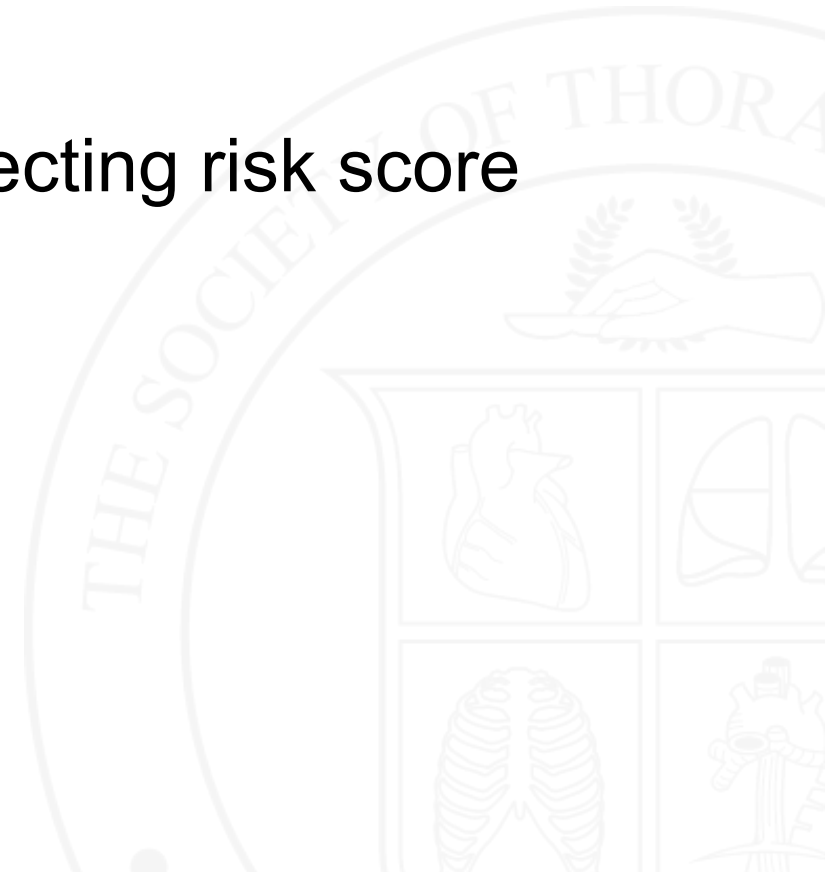
- Each vendor has different program to generate risk scores
- Changes in programming could inadvertently affect calculations
 - Risk score match report
- Coefficients being used by vendor become outdated

What is used in analysis?

- STS always has, and always will, recalculate risk scores before generating analysis reports
 - Ensures all scores were generated from the same program
 - Used the latest-and-greatest coefficients

Improvements needed:

- More consistent scores across vendors
- Remove possibility of software updates affecting risk score calculations
- Use updated coefficients in calculations



New approach: using an API

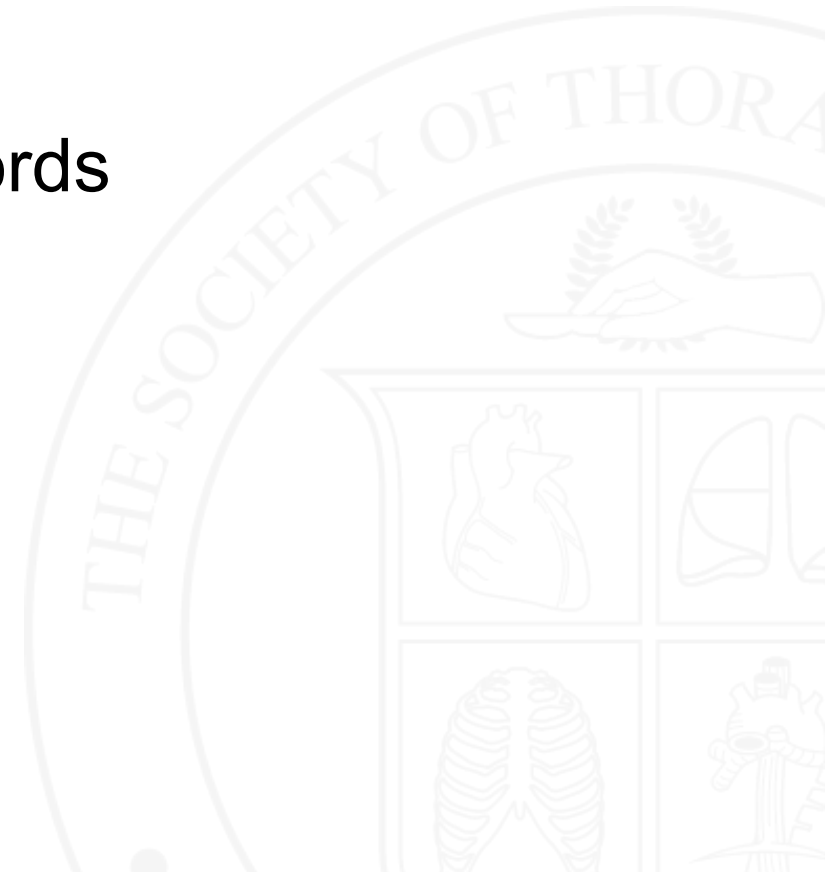
- API: Application Programming Interface
- When triggered, local workstation packages some data and send it through the internet to a server (located at STS)
- Server software uses the data to perform calculations or tasks
- Server packages the results and sends it back to the local workstation

How does the STS Risk Score API work?

- When record is saved, vendor software sends data to the API at STS
 - Includes ParticID and RecordID and clinical data
 - No PHI included
- STS runs the data through the risk model program
 - Same program used for the on-line calculator
 - Uses the latest coefficients
- Sends the ParticID, RecordID, ProcID and risk scores back to the vendor software
- Vendor software puts results into the data record
- Total process takes a few seconds

Vendor software might provide other features:

- Examples:
 - Recalculating scores for batches of records
 - Providing reports based on ProclD, etc.



Vendors started using API in the Fall of 2025:

- Exact date depends on your vendor



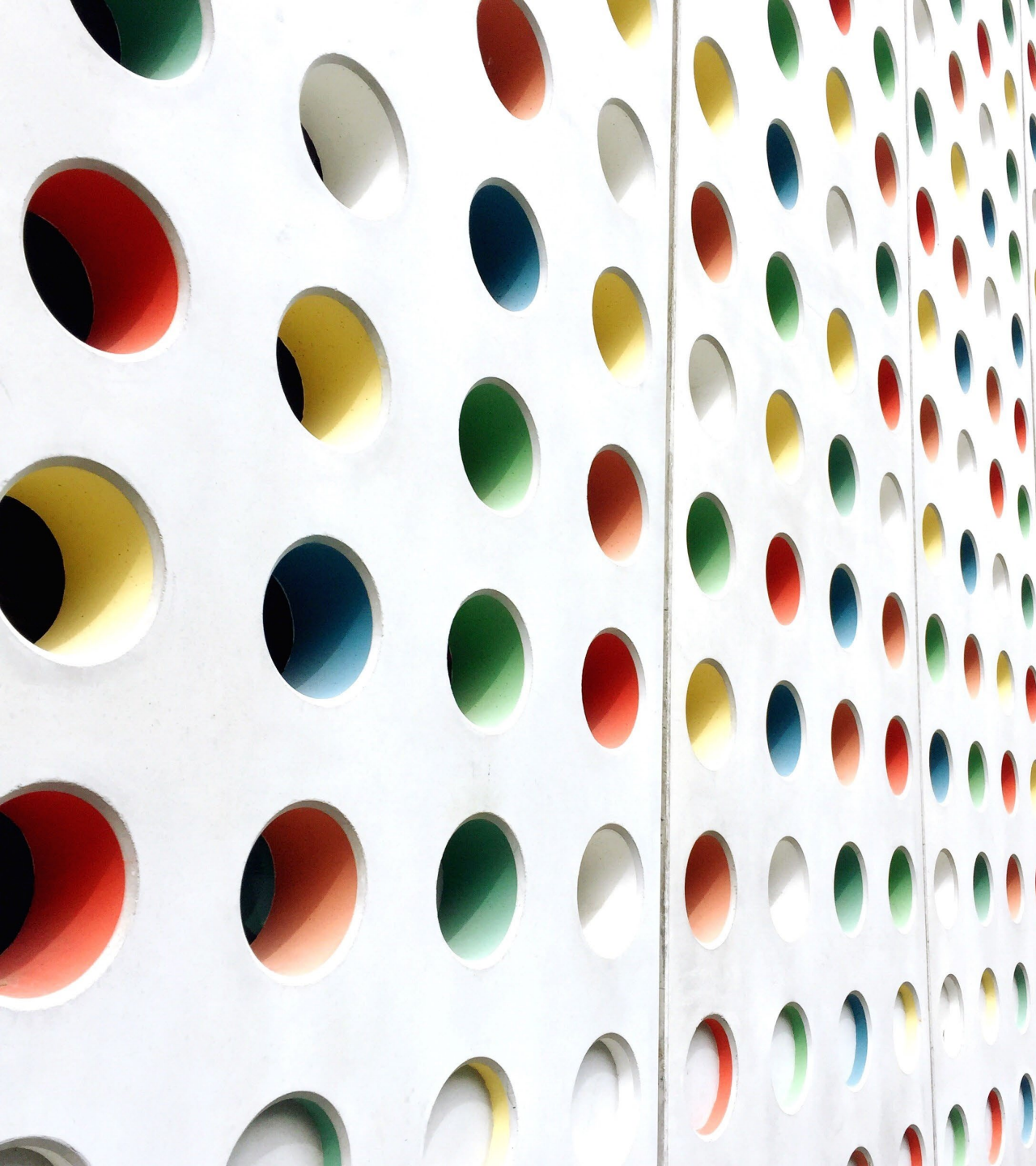
Future changes:

- New risk models can be included without needing data specification upgrade or vendor certifications
- Reporting results might need updates



Questions?

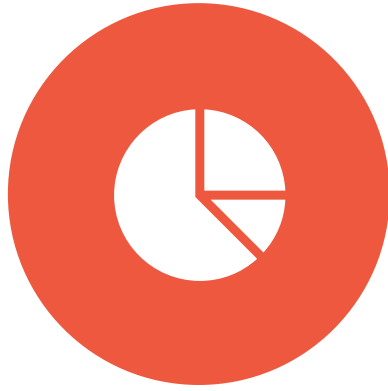




How to Calculate an O:E with and without the API RISK Scores and other fun facts...

A “HOW TO” GUIDE

Objectives



STATE WHERE TO FIND THE
MULTIPLIER TABLE AND RISK
MODEL VARIABLES



EXPLAIN HOW A MULTIPLIER IS
DIFFERENT FROM HOW THE API
SCORES ARE CALCULATED AT STS



DESCRIBE HOW CALCULATING
YOUR LOCAL O:E'S IS DIFFERENT
WITH API SCORES

Why does STS risk adjust?

The purpose is to allow each site to compare their performance against the national average or reference group for “quality measurement, clinical practice improvement, voluntary public reporting, and research.” ¹

Risk Models control for factors that are present PRIOR to surgery.

Raw event rates are affected by patient case mix and disease severity which will be different between each site. Comparing unadjusted event rates would penalize participants who operate “sicker” patients.

Risk Modeling makes it easier to compare “apples to apples” instead of “apples to oranges.”

Why would I ever want to risk adjust at my site?

You might present data at your quality meetings?

You might be helping with quality projects like Prolonged vent?

Your administration might want a prediction for a score for Anthem or Blue Cross/Blue Distinction award before the STS report is published?

Your surgeon might ask you for a specific report?

You just wonder how the multiplier will affect your raw O:E?? Or how the API scores might affect your O:E?

How did they decide what to include in the risk models?

Short answer: Fancy math

Long answer: Fancy math

<https://pubmed.ncbi.nlm.nih.gov/29577925/>

<https://pubmed.ncbi.nlm.nih.gov/29577924/>

The 2008 models were based on patient data from 2002-2006 and cardiac surgery outcomes have improved significantly since then. We needed a new model, hence, so more fancy math. But, in essence, they look how each of the variables affected an outcome and tried to chose the least, more impactable variables in the models. These models were first published in 2018 and certified in by our vendors in July 2020.

Where can find which fields are used in the risk model?

Right there on your data manager home page; you do have to log in and pick version 4.20.

It's under additional resources:

Additional Resources - Updated June 30, 2020

- [Data Specifications v4.20.2](#)
- [Software Specifications v4.20.2](#)
- [Itemized Changes from v4.20.1 to v4.20.2](#)
- [Change Summary v4.20.2](#)
- [Itemized Changes v4.20.2](#)
- [Procedure Identification Chart \(ProclD\) - Updated March 2022](#)
-  [Risk Model Variable Chart](#)
- [Risk Model Endpoint Chart - Updated February 2021](#)
- [Congenital Diagnoses and Procedure List](#)
- [Case Inclusion Guide](#)
- [NQF Endorsed Measures - Updated August 2021](#)

CABG	Operative Mortality	Stroke	Renal Failure	Prolonged Ventilation	Deep Stern Inf	Reop			
B. Demographics									
Age (70)	x	x	x	x	x	x			
Gender (75)	x	x	x	x	x	x			
RaceBlack (160)	x	x	x	x	x	x			
RaceAsian (165)		x	x	x	x	x			
Ethnicity (185)		x	x	x	x	x	x	x	x
RaceNativeAm (170)			x	x	x	x	x	x	x
RacNativePacific (175)			x	x	x	x	x	x	x
C. Hospitalization									
SurgDt (310)			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	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	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
InfEndTy (840)					x				

Case Mix Index Report

ACSD 2026 Harvest 1 Case Mix Report

Risk Adjusted Results Slide Presentations

ACSD Risk Adjusted Results Slides – 2026H1

Interested in the risk model outcomes and denominators and numerators?

Visit the Risk Model Endpoint chart...

Additional Resources - Updated June 30, 2020

- [Data Specifications v4.20.2](#)
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DEFINITION OF ENDPOINTS – Update 2/17/2021

****Operative Mortality: Decision made 6/17/2020**, conference call with STS and IQVIA. Discharge to Hospice it is considered the same as Died in Hospital. That means that any patient with DischMortStat=Discharge to Hospice is considered as an Operative Death, regardless of MTDate, MTOpD and MT30Stat (Discharge to Hospice overrules any information in these fields). In the rare event of a patient surviving hospice, it is the site responsibility to submit data to verify survival and to change status at discharge for this patient accordingly in the next data submission. / **Decision made on February 2021:** new 4.2 field ExpiredInOR [6546] needs to be included in Operative Mortality Definition.

Also, worth to note that if ExpiredInOR=Yes, patient is not eligible for Post-operative Complications – all are set to MISSING.

Endpoint	Description	Code for STS v4.2	
		Numerator	Denominator
Operative Mortality**	See definition for STS v4.2 MTOpD SeqNo 7124	(ExpiredInOR is YES) or (MTOpD is YES) or (DischMortStat is Died in hospital) or (DischMortStat is Discharged to hospice)** or (0 =< MtDate < DischDt) or ((MTOpD is missing) and ((MT30Stat is Dead) or (0 =< MtDate - SurgDt <=30)))	Numerator is YES or (MT30Stat is Alive) and ((MTOpD is NO) or (DischMortStat is Discharge alive, LKS is Alive))
Permanent Stroke	See definition for STS v4.2 CNStrokP SeqNo 6810	(CNStrokP is YES)	Numerator is YES or (CNStrokP is NOT MISSING)
Renal Failure	See definition for STS v4.2 CRenFail SeqNo 6870	(CRenFail is YES) and (Dialysis is NOT YES) and (CreatLst is NOT >= 4.0)	Numerator is YES or (CRenFail is NOT MISSING) and (Dialysis is NOT YES) and (CreatLst is NOT >= 4.0)
Prolonged Ventilation	See definition for STS v4.2 CPVntLng Seq No 6835	(CPVntLng is YES)	Numerator is YES or (CPVntLng is NOT MISSING)
Deep Sternal Wound Infection / Mediastinitis	See definition for STS v4.2 DeepSternInf SeqNo 6700	(DeepSternInf is YES, within 30 days of procedure) or (DeepSternInf is YES, >30 days after procedure but during hosp. for surgery)	Numerator is YES or (DeepSternInf is NOT MISSING)
Reoperation For Any Cardiac Reason	Reoperation for bleeding/tamponade (SeqNo 6755), valvular dysfunction (SeqNo 6765), unplanned coronary artery intervention (SeqNo 6771), aortic reintervention (SeqNo 6774), or other cardiac reason (SeqNo 6778)	(COPReBld is YES) or (CREintMI is sYES) or (COPReOth is YES) or (COPReVlv is YES, surgical) or (COPReVlv is YES, transcatheter) or (CAortReint is YES)	Numerator is YES or ((COPReBld is NO) and (CREintMI is NO) and (COPReOth is NO) and (COPReVlv is NO) and (CAortReint is NO))
Major Morbidity or Operative Mortality	A composite endpoint defined as any of the outcomes listed in the first six rows.	Any one or more of the following endpoints as defined above: - Operative Mortality - Permanent Stroke - Renal Failure - Prolonged Ventilation - Deep Sternal Wound Infection / Mediastinitis - Reoperation For Any Cardiac Reason	Numerator is YES or Included in ALL of the denominators as defined above [Note: include in this denominator if denominator for Renal Failure is Missing due to Dialysis=YES or CreatLst<4.0]
Short Stay: PLOS < 6 days	Discharged alive and within 5 days of surgery	(0 <= (DischDt - SurgDt) < 6) and NOT ((DischMortStat is Died in hospital)	DischDt is not MISSING
Long Stay: PLOS >14 days	Prolonged post-operative length of stay greater than 14 days.	(14 < (DischDt - SurgDt) <= 365))	No exclusions. ALL included.

So, we know we want to risk adjust, how do we do it?

Observed/Expected or O:E is a “statistic that allows the participant to gauge whether its observed outcomes were better, the same, or worse than what would be expected given the existing underlying risk factors of the patients.”

By using the fancy math risk models, STS can predict how many events they expected to happened in your group of patients.

IMPORTANT POINT: the O:E takes into account ONLY the patient factors in the risk model, nothing else! (stand by for more)

Observed:Expected

Say the models predicted 10 patients to die; and, you had 10 patients who died.

Observed=10, Expected=10 $10/10 = 1$ STS report for everybody will ALWAYS be ONE

What if only 5 patients died and the model predicted 10 pts to die?

Observed=5, Expected=10 $5/10=0.5$ or better than the average of all STS participants

What if 15 patients died and the model predicted 10 patients

Observed=15, Expected=10 $15/10=1.5$ or worse than the average of all STS participants

But there is no way for the risk models to be perfect!

The models were built on a specific set of patients from 2011 to 2014, so the patients are different.

It's the nature of cardiac surgery outcomes to improve and sometimes the 2018 model can under or over predict based on the population it was based on.

What Happened with CABG Operative Mortality in the last data submission?

So....when STS works their magic and calculates the O:E for the entire nation...guess what they got for operative mortality for this last harvest?

1.23 (e.g. the model predicted 1000 deaths, but 1230 died)

$$1230/1000=1.23$$

Now, STS can't publish a report with that number. The STS nationally has to do something to make it 1.0!

ACSD Analyses Overview

page 22 IQVIA library

Calibration: A model is said to be well calibrated if there is a close match between the observed number of deaths and the number of deaths predicted by the model. Typically, calibration is assessed on the population of interest overall, as well as in several subgroups. For example, it is common to compare observed vs. predicted event rates within 10 subgroups based on deciles of predicted risk.

In the past, we have found that risk-adjustment models that were developed several years ago are not well calibrated when applied to a contemporary data set. In general, older models tend to over-estimate risk relative to contemporary experience because outcomes have improved over time. **To make the models more accurate, each model is re-calibrated each harvest.** This recalibration ensures that the total number of “events” predicted by the model will exactly match the actual number of events that was observed in the data. After this initial recalibration, calibration is then assessed graphically by plotting and comparing observed vs. predicted event rates within several patient subgroups

There can't be a O:E of 1.23 on the STS report! they always have to ONE!! STS can recalibrate every single risk variable!! That's what the API ends up being!

It needs to be one or as close to 1 as they can get it...

Mortality Risk-Adjustment							
Outcome		My Site 2021	My Site 2022	My Site 2023*	Like Group 2023	Region 2023	STS 2023
In-hospital Mortality	OR (95% CI)	0.75 (0.36-1.57)	0.89 (0.42-1.88)	0.71 (0.33-1.56)	1.05 (0.86-1.27)	0.84 (0.66-1.08)	1.00
	O/E (95% CI)	0.47 (0.08-1.65)	0.76 (0.20-2.14)	0.00 (0.00-1.56)	0.89 (0.76-1.04)	0.78 (0.56-1.08)	1.00
	Risk-adjusted Rate (95% CI)	0.88%	1.39%	0.00% (0.00-2.48)	1.41% (1.20-1.65)	1.25% (0.88-1.72)	1.59%
	Observed Rate	0.72%	1.31%	0.00%	1.36%	1.24%	1.55%
Operative Mortality	OR (95% CI)	0.84 (0.44-1.60)	0.98 (0.51-1.89)	0.87 (0.43-1.75)	1.05 (0.88-1.24)	0.88 (0.69-1.11)	1.00
	O/E (95% CI)	0.71 (0.23-1.76)	0.96 (0.36-2.16)	0.63 (0.11-2.20)	0.88 (0.76-1.00)	0.86 (0.65-1.12)	0.99
	Risk-adjusted Rate (95% CI)	1.75%	2.31%	1.34% (0.23-4.68)	1.86% (1.62-2.13)	1.82% (1.37-2.37)	2.11%
	Observed Rate	1.44%	2.19%	1.12%	1.82%	1.83%	2.10%

But STS can't change 1000's of variables every harvest and certify vendors every quarter on them, so we have a simpler way to do it from STS, though not as perfect as what STS can do with each quarterly report or with the API scores! It's called a multiplier....
How would you (if ever even wanted to) make an O:E of 1.23 an O:E of 1?

You have to multiply it by something to make it a 1?? HMMM...

Dig back to your algebra day...or not...

1.23 multiplied by what will equal 1?

$$1.23X = 1$$

$$X = 1/1.23$$

$$X = 0.812$$

Table 1. Observed/Expected Ratio Multipliers for Recalibration

Procedure / Outcome	2023	2024	2025
Isolated CABG			
Operative Mortality	0.776	0.806	0.812
In-hospital Mortality	1.042	1.080	1.104
Morbidity: Permanent Stroke	0.915	0.895	0.940
Morbidity: Renal Failure	0.861	0.842	0.832
Morbidity: Prolonged Ventilation	1.257	1.309	1.364
Morbidity: Deep Sternal Wound Infection	0.878	0.924	0.909
Morbidity: Any Re-Operation	0.837	0.822	0.780
Morbidity: Combined Morbidity/Mortality Outcomes	1.155	1.178	1.200
Morbidity: PLOS > 14 days	0.822	0.799	0.816
Morbidity: PLOS < 6 days	1.058	1.072	1.074

Where do I get the multiplier table?

It's on the data managers page...(you don't even have to log in!)



So here's the good news...

You can calculate your Observed:Expected locally!

Wait>>>how do I do that??

1. You find out how many “events” you had...(this becomes your “observed” rate)
2. And you divide that by what the model predicted by adding up ALL the risk scores for every pt in the model you are calculating it e.g. CABG for that particular event. This gives you the Observed/Expected from original 2018 model.
3. You multiply what you go in step 2 by the multiplier to get the recalibrated O:E.

Here we go...let's do it...

Step 1: find out how many events you had from your software.

2 events/3.2 predicted=0.625

But, we know that the model way underpredicted mortality b/c the multiplier is less than one—to have a multiplier less than one, means that STS nationally had more events than the model predicted.

STS had to multiply their O:E by 0.812 to recalibrate it; so I do to IF I chose to recalibrate my O:E.

(You don't have to do it, as long as you are consistent in the reports you run locally for your teams.)

How do I now how many the model predicted? Step 2

STEP 1: You down run a query on your software (remember direct data entry user will not be able to do this, but the other vendors will have some sort of software to run reports.)

I ran a data table for all the isolated CABGs in 2026 and got their risk score as an integer.

It adds up to 3.2

28	0.00838
29	0.00711
30	0.00721
31	0.01061
32	0.00669
33	0.02467
34	0.03451
35	0.01506
36	0.00455
37	0.01193
38	0.00685
39	0.02212
40	0.01039
41	3.2 is the sum of all these probabilities

Step 3: find the multiplier from the table

Table 1. Observed/Expected Ratio Multipliers for Recalibration

Procedure / Outcome	2023	2024	2025
Isolated CABG			
Operative Mortality	0.776	0.806	0.812
In-hospital Mortality	1.042	1.080	1.104
Morbidity: Permanent Stroke	0.915	0.895	0.940
Morbidity: Renal Failure	0.861	0.842	0.832
Morbidity: Prolonged Ventilation	1.257	1.309	1.364
Morbidity: Deep Sternal Wound Infection	0.878	0.924	0.909
Morbidity: Any Re-Operation	0.837	0.822	0.780
Morbidity: Combined Morbidity/Mortality Outcomes	1.155	1.178	1.200
Morbidity: PLOS > 14 days	0.822	0.799	0.816
Morbidity: PLOS < 6 days	1.058	1.072	1.074

Step 4: do some math

Observed/Expected times the multiplier=recalibrated O:E

2 deaths observed /3.2 predicted by the risk model=0.625

0.625 (raw O:E) X 0.812 (multiplier)=0.5075

0.5075 is the recalibrated O:E and something close to that should be on our end of year report.

Recalibrated O:E for PV for ISO CAB

Step 1: find out how many events you had in that date range

Step 2: add up all your probabilities for PV for your date range

Step 3: find the multiplier

Step 4: raw O/E multiplied by the multiplier=recalibrated O:E

We observed 13 events and all the probabilities add up to 15.39

$$13/15.39=0.84$$

The multiplier for PV of ISO CAB is 1.364

$$13/15.39 \times 1.364=1.15 \text{ ☹️}$$



2023	0.00001
2024	0.03194
2025	0.1232
2026	0.18446
2027	0.06753
2028	0.0218
2029	0.05717
2030	0.03183
2031	0.05588
2032	0.07871
2033	15.39

Table 1. Observed/Expected Ratio Multipliers for Recalibration

Procedure / Outcome	2023	2024	2025
Isolated CABG			
Operative Mortality	0.776	0.806	0.812
In-hospital Mortality	1.042	1.080	1.104
Morbidity: Permanent Stroke	0.915	0.895	0.940
Morbidity: Renal Failure	0.861	0.842	0.832
Morbidity: Prolonged Ventilation	1.257	1.309	1.364

The online risk calculator is updated each quarter with ALL the co-efficient changes for each variable!

The risk model on online that the LIPs use to tell the patients their risk scores have the multipliers already applied! It's great for informed decision making!!! They have a more accurate risk score.

Sadly, the vendors will never be able to apply the risk scores b/c STS would have to recertify them every 3 months when the multipliers change. It just can't happen. That's why our records go out to STS to get the API scores.

*Because of this calibration, **STS certified software cannot directly produce the O/E Ratios in this report.** However, we have used a re-calibration method that makes it easy for participants to reproduce our results, if desired.*

Data Analysis of the STS Adult Cardiac Surgery Database pg 21

Found in the IQVIA library

The online risk calculator was updated in 2023 to include the recalibration! This accounts for the difference you see in your vendor software score and what the providers calculate on the STS website with the exact same fields.

STS ACSD Operative Risk Calculator

STS is excited to announce the launch of its next-generation Risk Calculator to assess risk of operative mortality, major morbidity, and short-term outcomes after the vast majority of adult cardiac surgeries. This new mobile-friendly calculator features a simplified, intuitive user design to improve physician-patient decision-making.

The dynamic new Risk Calculator allows surgeons and multidisciplinary medical providers to estimate a patient's risk in real time. Risk calculations are based on the most current nationwide 2023 data from the STS Adult Cardiac Surgery Database informed by robust risk models that continuously update every three months.

We don't get multipliers for all the risk models' outcomes though!
But...you might see your API scores for them!! Our vendor has them, but not sure how the other vendors handle them?

The risk of the models just have the multipliers for mortality.

Isolated AV Replacement			
Operative Mortality	0.802	0.813	0.903
In-hospital Mortality	1.115	1.077	1.237
Isolated MV Replacement			
Operative Mortality	0.829	0.823	0.942
In-hospital Mortality	0.980	0.983	1.147
AV Replacement + CABG			
Operative Mortality	0.836	0.837	0.905
In-hospital Mortality	1.060	1.056	1.130
MV Replacement + CABG			
Operative Mortality	0.729	0.700	0.816
In-hospital Mortality	0.824	0.804	0.942
Isolated MV Repair			
Operative Mortality	0.903	0.822	0.831
In-hospital Mortality	1.153	1.024	1.143
MV Repair + CABG			
Operative Mortality	0.888	0.613	0.715
In-hospital Mortality	1.074	0.710	0.826

O:E's do have their limitations

That being said, we have been cautioned by STS about comparing 2 participants' O:E's unless we know their patients populations are similar. ²

<https://www.ahajournals.org/doi/full/10.1161/CIRCULATIONAHA.107.747873>

Unless study design or post hoc adjustments have resulted in reasonable overlap of case-mix distributions, such risk-adjusted outcomes should not be used to directly compare one institution with another.

HOW do the API scores affect our local O:E calculations?

How do I even know if our vendor gives us the API scores????

Our Vendor does give us the API scores, but you have to use the “ALL versions-nightly snapshot” or an export to get them.

They do give us ALL the API risk scores even for the valve models major morbidity...

Procedure Type	Predicted Risk of Mortality	Predicted Reoperation	Predicted Prolonged Ventilation	Predicted Renal Failure	Predicted Morbidity or Mortality
AV Replacement + CAB	0.01222	0.03619	0.03820	0.00791	0.06299

HOW do the API scores affect our local O:E calculations?

They make it easier and more accurate. Do you know how to find them in your software? Does your vendor even have them? They may not!! But, if they do...you can calculate your O:E

1. add up all the observed events you had, like number of CABG Mortalities.
2. adding up all the API risk probabilities for the outcomes you want, like CABG Mortalities
3. Divide the number of events/total of the API scores
4. Ta Da! You have as closely recalibrated O:E as possible to share with your team.

The **ONLY** thing that changes with the API score is that you will **NOT** use the multipliers from the table.

Why does STS also give the STS event rate?

STS EVENTS RATES

Table 2. STS Event Rates (%)

Procedure / Outcome	2021	2022	2023
Isolated CABG			
Operative Mortality	2.474	2.404	2.123
In-hospital Mortality	1.880	1.841	1.589
Morbidity: Permanent Stroke	1.357	1.352	1.256
Morbidity: Renal Failure	2.205	2.138	1.929
Morbidity: Prolonged Ventilation	6.601	6.225	5.697
Morbidity: Deep Sternal Wound Infection	0.342	0.306	0.239
Morbidity: Any Re-Operation	2.590	2.547	2.556
Morbidity: Combined Morbidity/Mortality Outcomes	10.544	10.094	9.362
Morbidity: PLOS < 6 days	47.446	46.572	47.139
Morbidity: PLOS > 14 days	5.488	5.600	5.317
Isolated AV Replacement			
Operative Mortality	2.319	2.207	2.034
In-hospital Mortality	1.673	1.668	1.493

RISK ADJUSTED PERCENTS

Take YOUR STS O:E and multiply by the STS percent and you will get your risk adjusted event in a percent form.

Here's how:

Step 1: find your O:E for the event you want

Step 2: multiplier it by the STS event rate for that event

Step 3: here's your risk adjusted percent! So $0.63 \text{ times } 2.123\% = 1.34\%$

Operative Mortality	OR (95% CI)	0.84 (0.44-1.60)	0.98 (0.51-1.89)	0.87 (0.43-1.75)	1.05 (0.88-1.24)	0.88 (0.69-1.11)	1.00
	O:E (95% CI)	0.71 (0.23-1.76)	0.96 (0.36-2.16)	0.63 (0.11-2.20)	0.88 (0.76-1.00)	0.86 (0.65-1.12)	0.99
	Risk-adjusted Rate (95% CI)	1.75%	2.31%	1.34% (0.23-4.68)	1.86% (1.62-2.13)	1.82% (1.37-2.37)	2.11%
	Observed Rate	1.44%	2.19%	1.12%	1.82%	1.83%	2.10%

Table 2. STS Event Rates (%)

Procedure / Outcome	2021	2022	2023
Isolated CABG			
Operative Mortality	2.474	2.404	2.123

What the STS Analysis pg 22

Risk-adjusted rates

Risk-adjusted rates are calculated by multiplying the O/E Ratio by the overall STS unadjusted event rate for that time period (See the Report Overview Risk Adjustment Supplement for more details on calculation of the risk-adjusted rate). Because the risk-adjusted rate is so closely related to the O/E Ratio, the information provided by these two statistics is similar and the choice of which statistic to use is really only a choice of unit of measure. Although one advantage of the O/E Ratio is that it is centered around 1.0 regardless of the outcome being measured, the risk-adjusted rates have the advantage that they can be easily interpreted as a clinically meaningful outcome event percent on a familiar scale.

But there is even another way to look at your risk adjusted outcomes: ODDS RATIO

Odds Ratio: this is also a statistic that allows you to compare your performance against all the other participants by adjusting for more than patient risk factors!!!

This is a ratio of the predicted odds (similar to probability) of an outcome for a pt relative to what it would be if the surgery was performed at an “average” STS participant. But, it assumes that the outcome is affected by patient characteristics as well as the participant characteristics.

Odds Ratio measures the effect the participant themselves has on a patient’s chance of having an adverse event.

WE CANNOT calculate this locally because it uses all the data from the entire national database to calculate it with a hierarchical logistic regression model.

Both have their advantages!

Observed:Expected are familiar to the surgeons and simple to calculate locally, especially since there is no way for the vendors to include the formulas for hierarchical models

Odds Ratio is the most beneficial for smaller sites who had a couple of events and have really high O:E's that most likely aren't reflected of their true performance.

Odds Ratio will generally be higher than the O:E b/c they look at information from all participants when they calculate your OR. If you did 50 CABS and none died (O:E of 0) the reality is that if you kept operating over and over, you would most likely have a death.

Conversely, if you did 50 CABG and 3 died and your had an O:E of 7, your OR would much lower than 7 b/c OR's will always be closer to the STS mean.

Likewise, if you did 1500 isolated CABS and had zero deaths you OR will much closer to zero b/c it's more likely that to be not be chance. ³

What the STS Analysis report says re:OR pg 20

Estimated Odds Ratio

The other main summary statistic, the estimated Odds Ratio, is obtained by fitting a set of hierarchical logistic regression models to the harvested data. These models are estimated every quarter in conjunction with generating the report. They are only used for the current report and are not used subsequently. Unlike the STS risk-adjustment models these models cannot be incorporated into your STS certified software.

In a hierarchical logistic regression model, the probability that a patient experiences an adverse event is assumed to depend on both patient characteristics (e.g., patient risk factors) as well as the participant (e.g., performance). The Odds Ratio measures the effect that the participant has on a patient's probability of experiencing an adverse event. The interpretation of the Odds Ratio is similar to that of the O/E Ratio in that smaller Odds Ratios imply better performance

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Questions?



Please use the
raise-hand
function.

Please use the
Q&A Function.

We will answer
as many
questions as
possible.

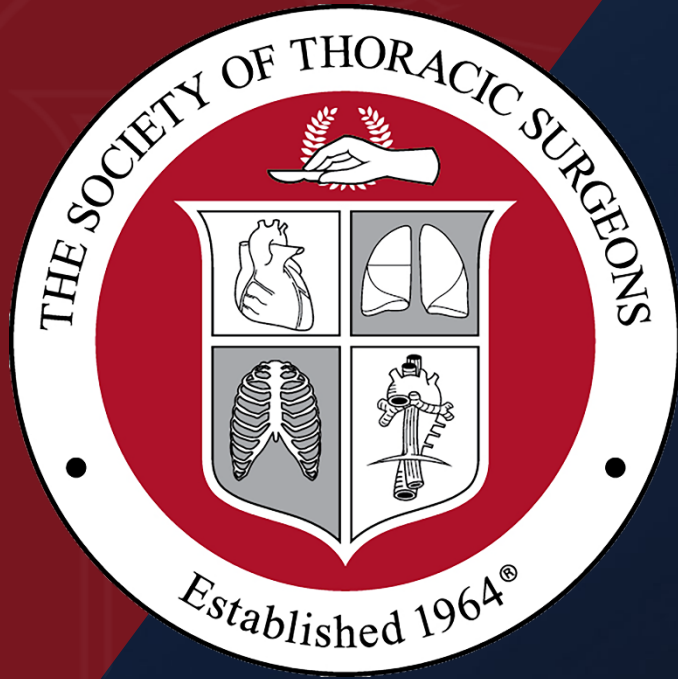
We encourage
your feedback
and want to hear
from you!

We Need You!

If you have implemented a QI project at your
site, we want to hear about your work!

Please reach out to

Nancy Honeycutt @ nhoneycutt@sts.org.



Thank You for Joining!

ACSD Monthly Webinar
Wednesday, August 5, 2026, at
2pm CT/3pm ET