AMERICAN COLLEGE OF SURGEONS

NATIONAL SURGICAL QUALITY IMPROVEMENT PROGRAM

"Real Time Risk Adjustment", July 29, 2014

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Continuous Quality Improvement

American College of Surgeons

The Real Time Application

This application allows participants to get risk- and shrinkage-adjusted “projected” odds ratios, with confidence intervals, for determination of outlier status, for:

- 100 Essential models.
- With user-specified time ranges and time intervals.

What does “Real Time” mean?

While we are providing “real time” risk- and shrinkage-adjusted outcomes… must be very careful to understand just what that means.

In the previous presentation we saw what is involved in our modeling process. It takes about 6-8 weeks to move data from the Quintiles database to our internal tables, clean data, run 197 hierarchical models, and construct and post reports.

How can this be done in real time?

What does “Real Time” mean?

The simple answer is that… what you may think that the “Real Time” application is doing, may not be what the “Real Time” application actually is doing.

We are not modeling in real time; we are applying models in real time.

We are using parameters from historical models, with extra-modeling shrinkage, to approximate what the (odds ratio) results from actual, contemporaneous, hierarchical models would look like - hence “projected”.

How do we get a projected odds ratio?

- We begin with an historical logistic model (which accounts for patient and procedure risk) for each outcome
- Two essential shortcuts:
  - Fixed predictor set
  - 18 models or outcomes (not 100), followed by case filters
- When a case is complete, we use the logistic equations to generate a predicted probability (E) for each outcome
- When a "request" comes in:
  - we sum the Os and Es for the requested grouping of cases (e.g., by specialty and time interval) – yielding a real time O/E ratio
  - We apply a transformation to the logistic model O/E ratio so that it looks like an hierarchical model odds ratio – a "projected" odds ratio

“Real time” and the SAR/ISAR gold standard

Our “real time” application is limited to what we’ve determined to be a stable and well-studied set of outcomes based on the Essential models.

In addition, we will continue to provide the “gold standard” SAR/ISAR modeling results (not all vendors do this).

From a programmatic perspective, we believe that the ACS NSQIP approach of providing Real Time plus SARs/ISARs represents having the best of both worlds.

Data used in Real Time versus SAR/ISAR

		Standard SAR/ISAR Data Processing				Real Time Application
DAY	NOTES	Index Surgery Date by Quarter				
Day 0	Date of index operation	Jan 1-Mar31	Apr1-June30	July 1-Sept 30	Oct 1-Dec 31	Any Date
POD1= Index Date +1day						
POD30 until Midnight	Postop Event Follow-up Ends					
POD60	(Completed)					(Available)
POD90	(Completed)					(Available)
POD120 (Four Months)	Data lock					Available
POD150						Available
POD180 (Six Months)	POD 180-269	1st ISAR-October	1st SAR-January	1st ISAR-April	1st SAR-July	Available
POD210						Available
POD240						Available
POD270 (Nine Months)	POD 270-359	1st SAR-January	1st ISAR-April	1st SAR-July	1st ISAR-October	Available
POD300						Available
POD330						Available
POD360 (12 Months)	POD 360-449	2nd ISAR-April	2nd SAR-July	2nd ISAR-October	2nd SAR-January	Available
POD390						Available
POD420						Available
POD450 (15 Months)	POD 450-539	2nd SAR-July	2nd ISAR-October	2nd SAR-January	2nd ISAR-April	Available
POD480						Available
POD510						Available
POD540 (18 Months)	Case exits SAR reporting	Gone	Gone	Gone	Gone	Available
Beyond		(overtime)	(overtime)	(overtime)	(overtime)	Available…

The Real Time Application

This application permits hospitals to monitor risk-and shrinkage-adjusted changes in performance over time, in real time, and to anticipate profiling results as they would be reported in forthcoming SARs and ISARS.

- Monitor effects of QI initiatives
- Detect emergent quality issues
  - Both of these as adjuncts to control charts
- Anticipate SAR/ISAR performance

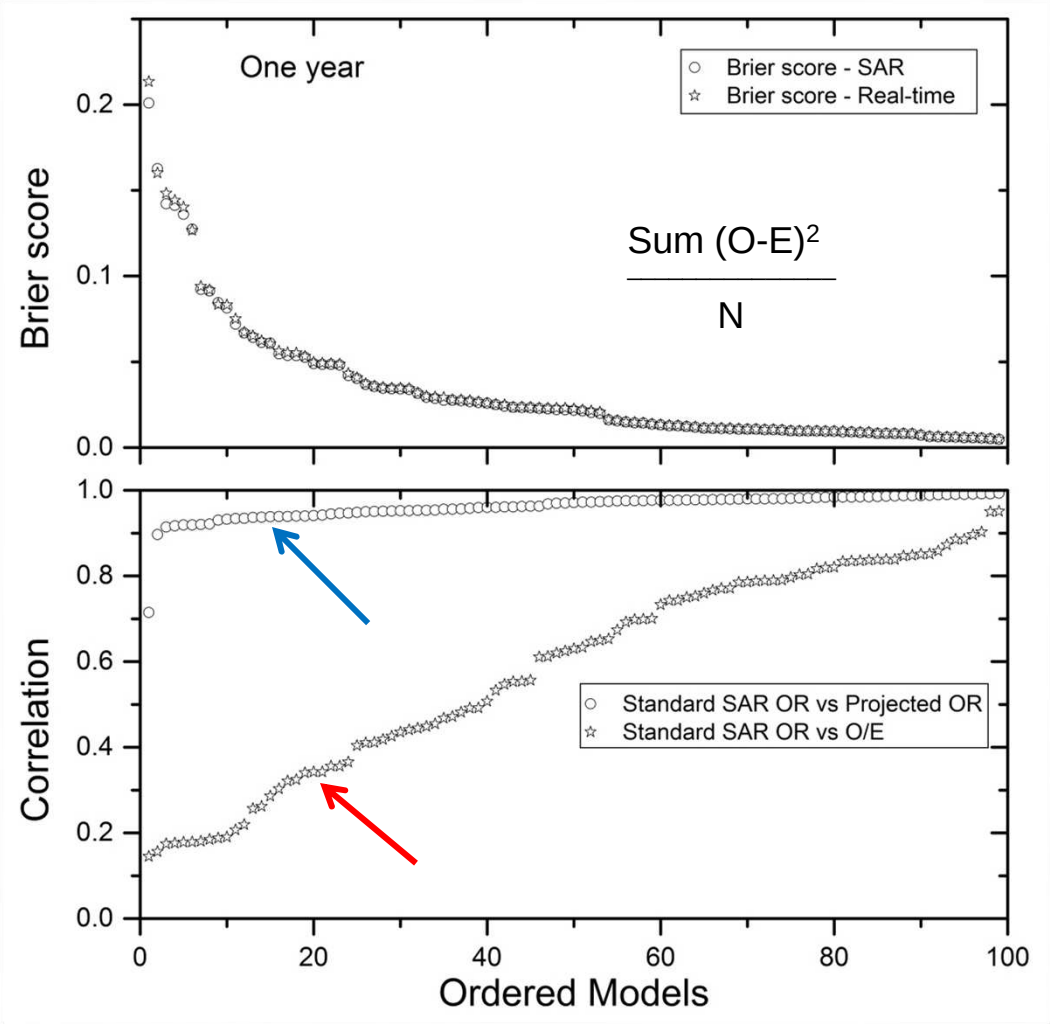
The Real Time Application - Performance

There are many reasons why real time projected odds ratios might be dissimilar to those from SAR and ISAR odds ratios.

- The data included in a particular real time date range may not be the same as in a SAR or ISAR date range.
- Criteria for eligible cases have changed over time (Ns will be different).
- Real time models use a different predictor set than used for SAR and ISAR models.
- Real time uses 18 global models plus filters rather than 100 individual models
- The real time model parameters are built from several years of data; these parameters will be different from those estimated for any SAR or ISAR period.
- Projected odds ratios are estimated by transforming logistic model O/E ratios. There is no mathematical expectation that these projected odds ratios will be identical to SAR or ISAR hierarchical model odds ratios

… So how close are projected odds ratios to standard SAR/ISAR odds ratios? Are they close enough to be useful?

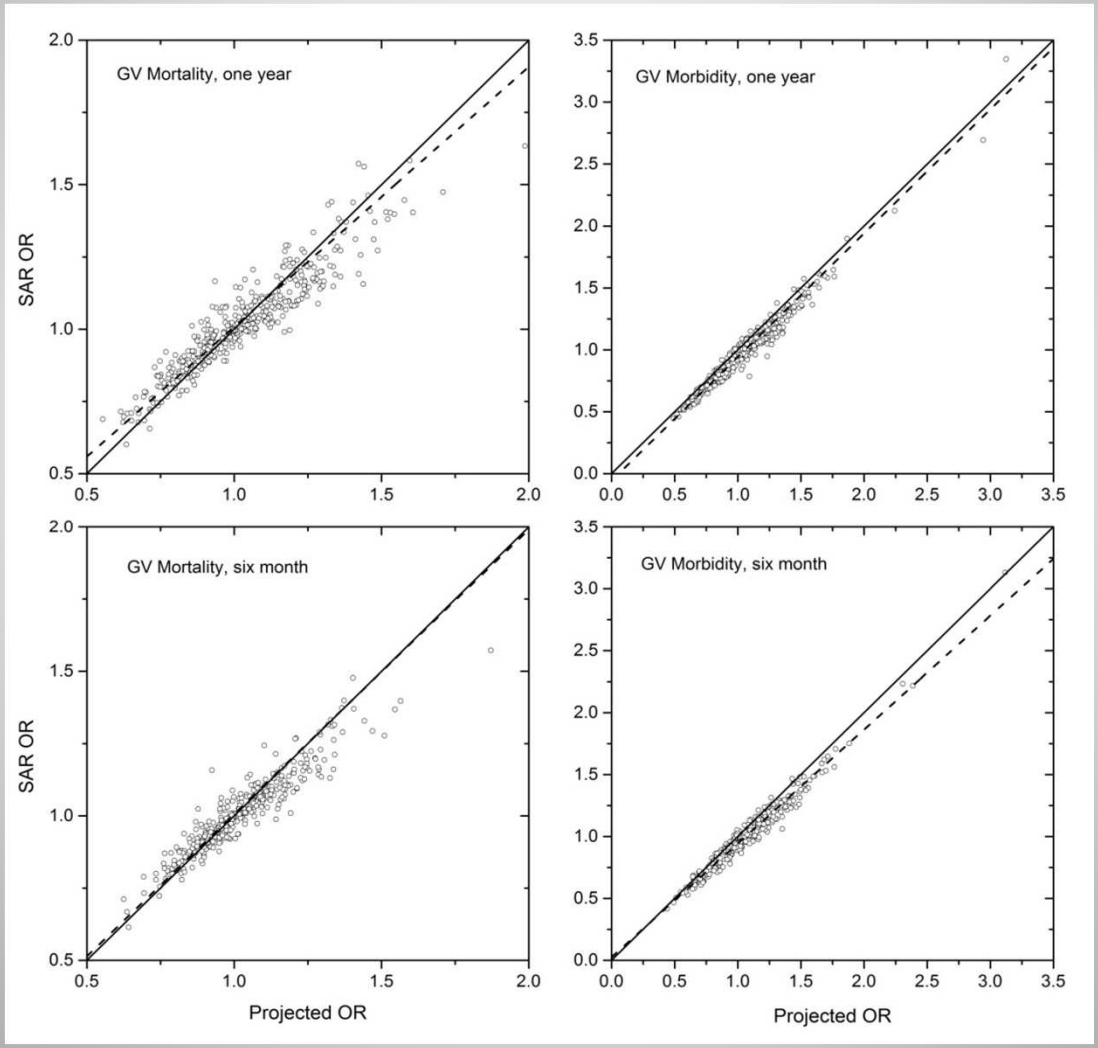
The Real Time Application - Performance



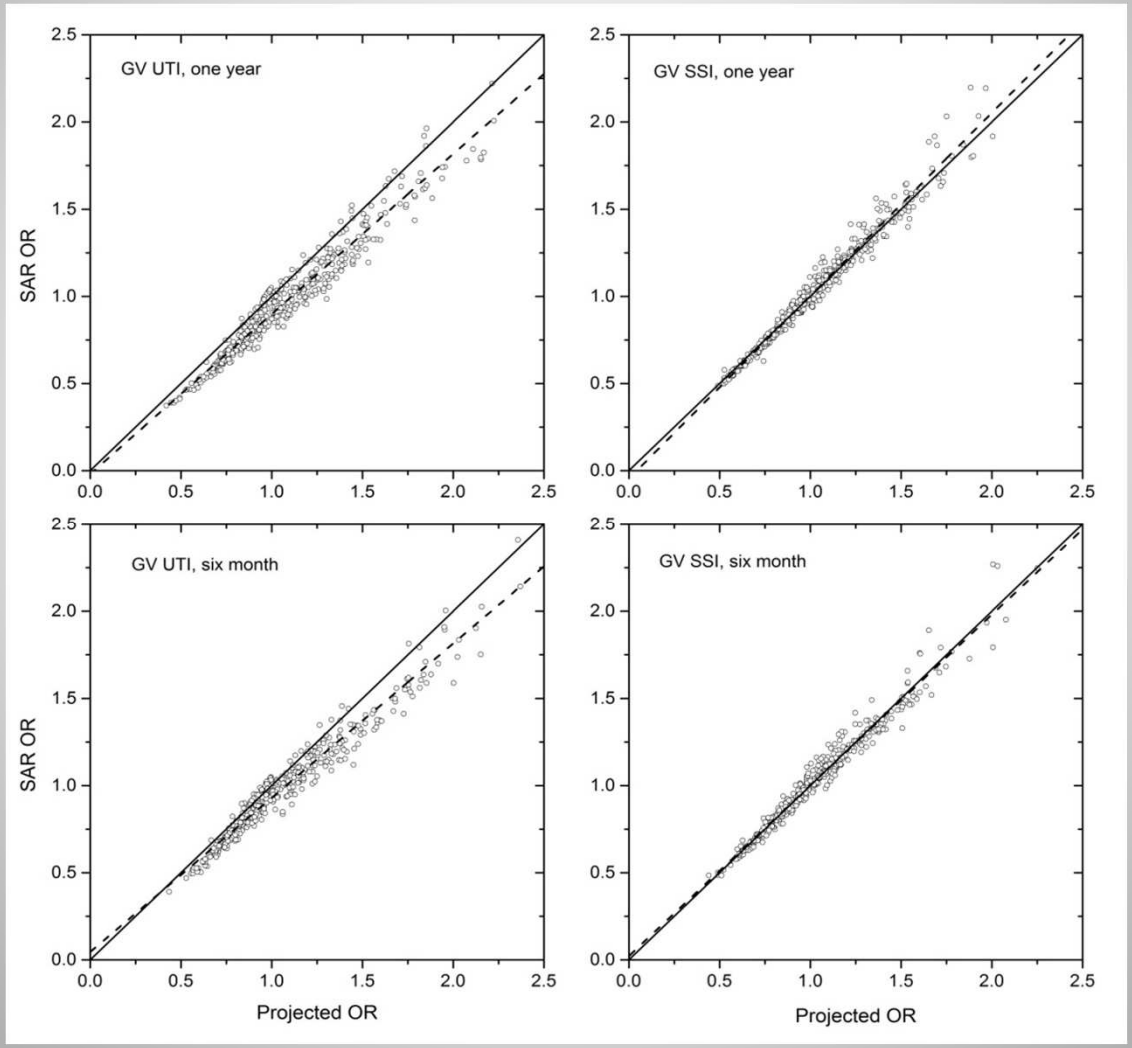
Values close to 0 are best

Values close to 1 are best

The Real Time Application - Performance



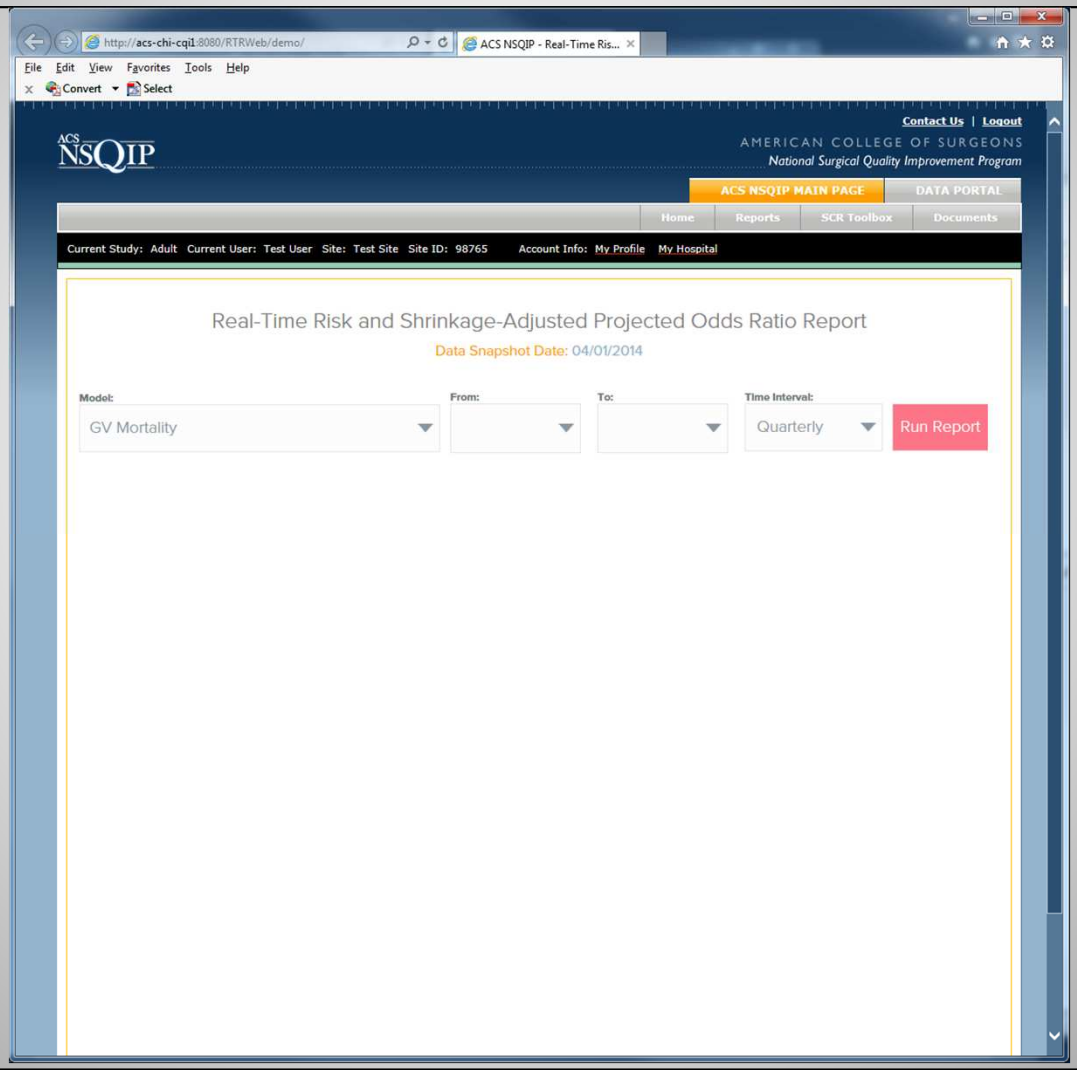
The Real Time Application - Performance



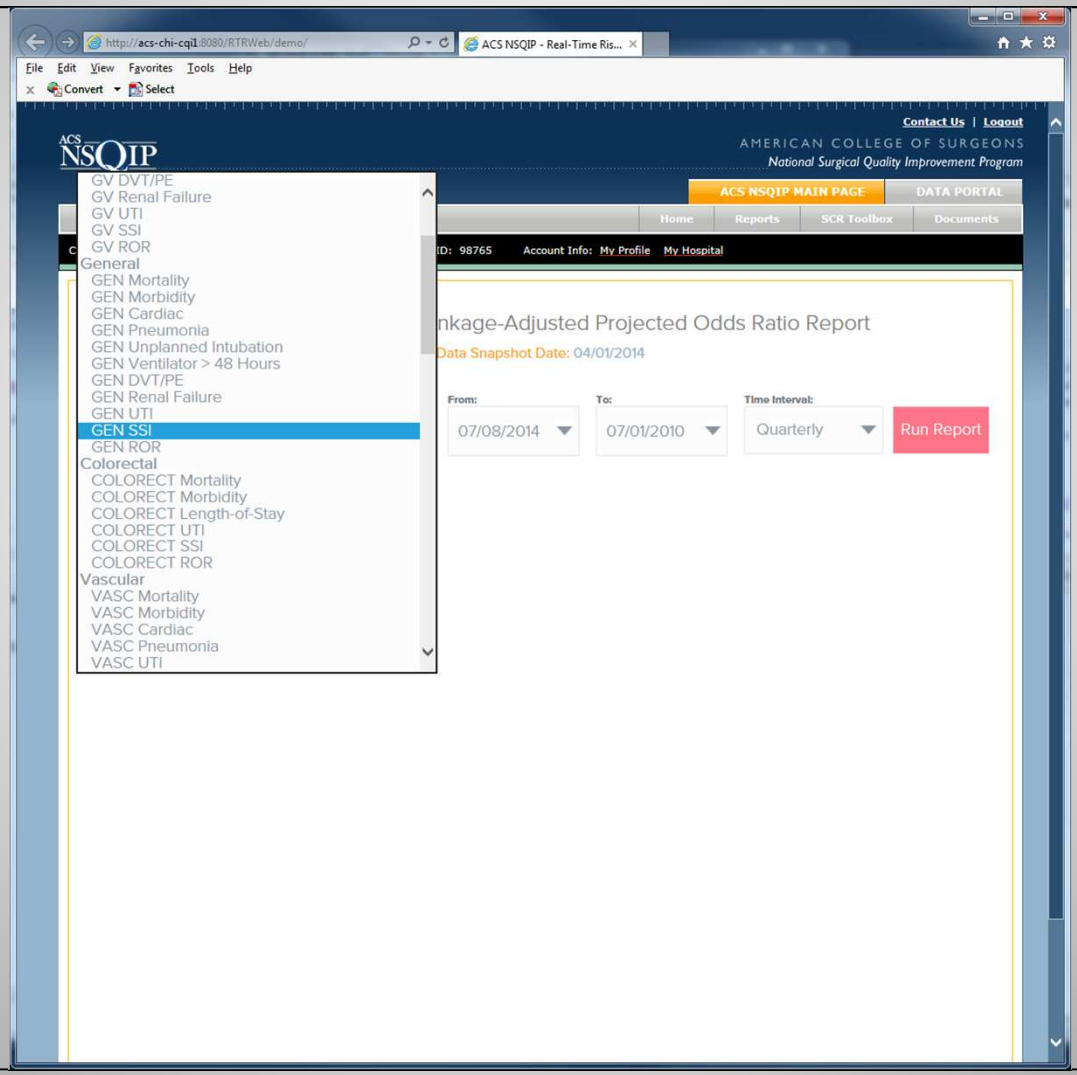
The Real Time Application - Performance

Not all models will look this good. Projected odds ratios for models with smaller N will tend to be less consistent with subsequent SAR/ISAR odds ratios.

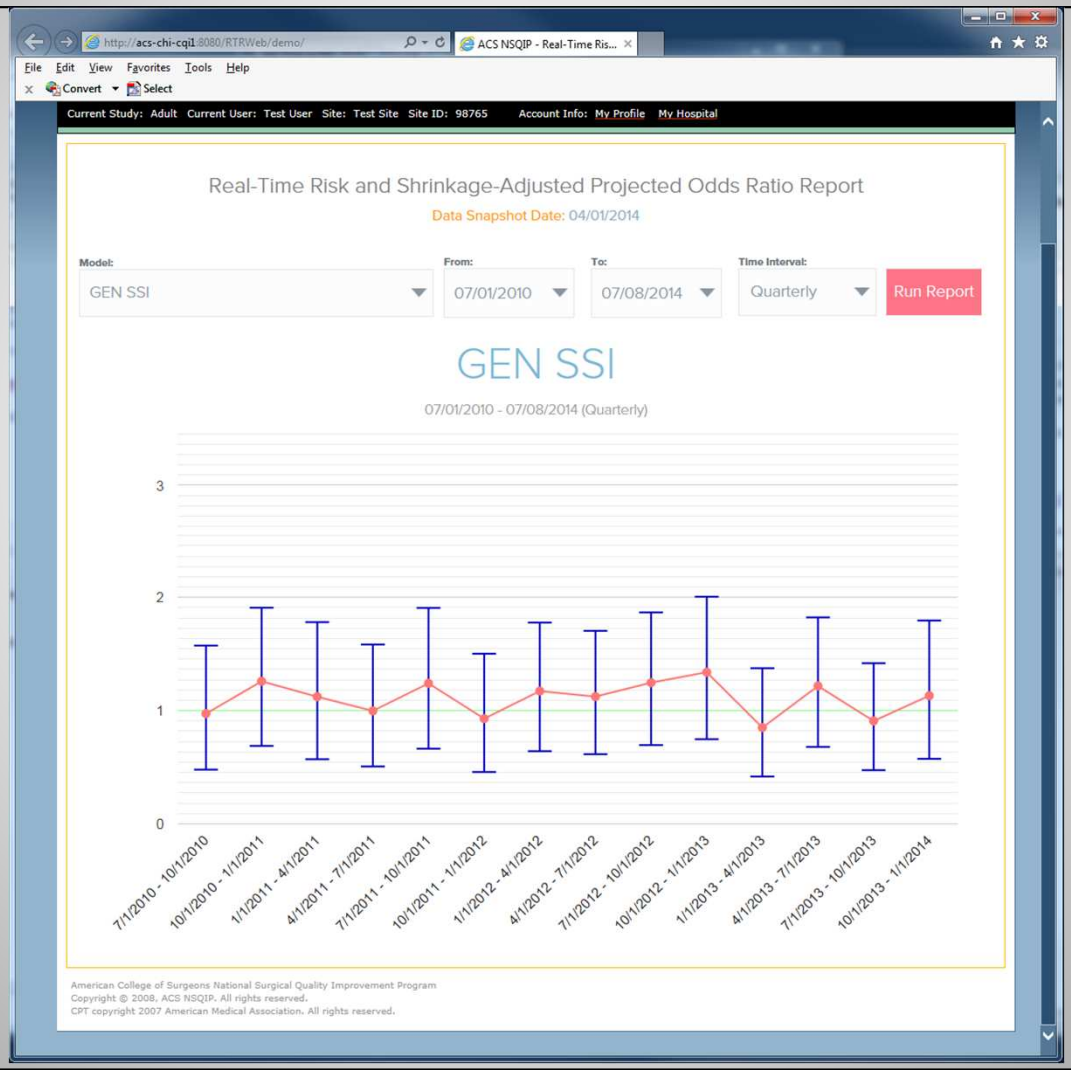
The Real Time Application



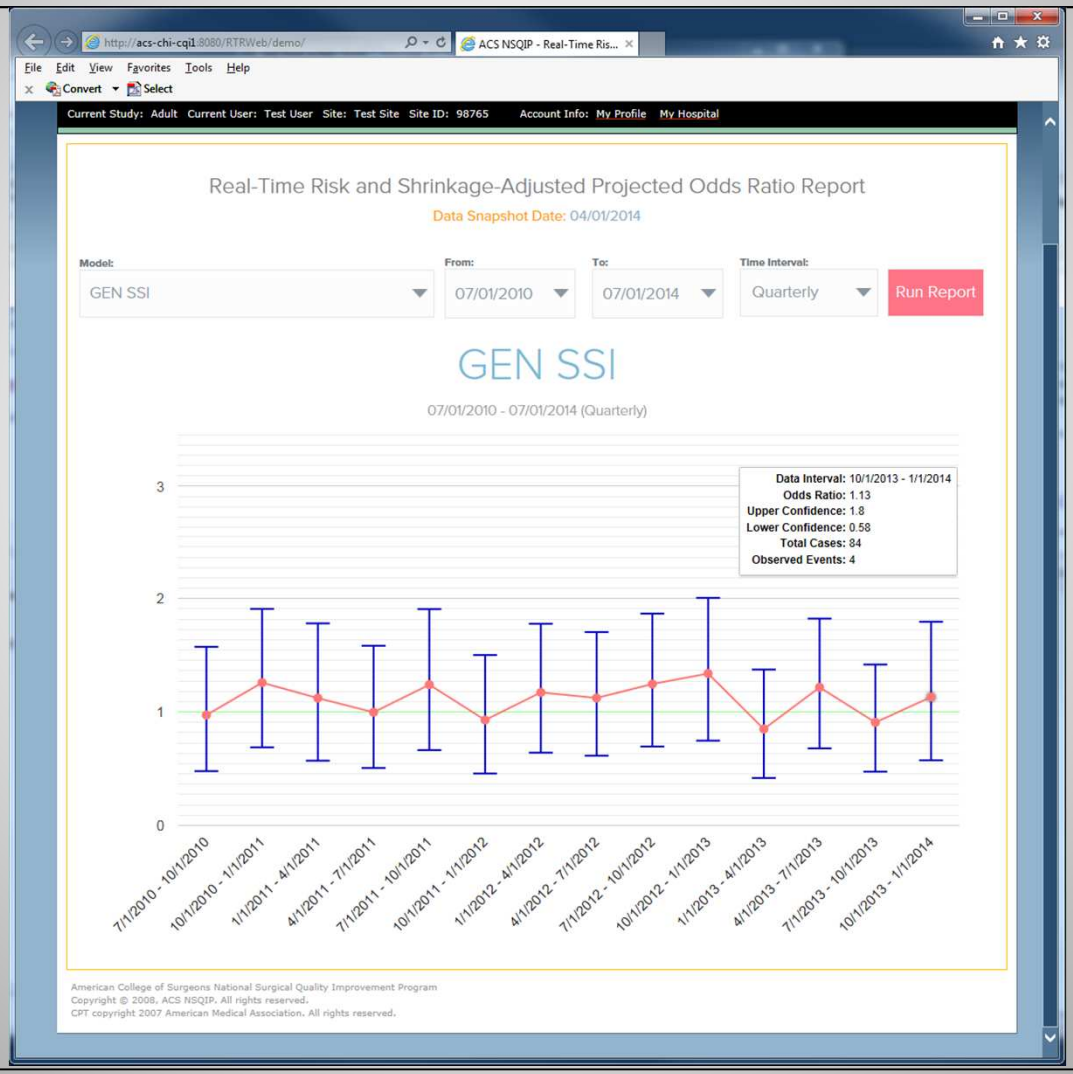
The Real Time Application



The Real Time Application



The Real Time Application



The Real Time Application

Processing time << 1 second

SAR/ISAR vesus Real time Comparison

SAR/ISAR	Real Time

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And the CQI IT team – pull cases every night, compute Es, sum Os and Es, compute projected ORs, design platform, … none of this is trivial