Advanced NHSN Analysis: Focus on Surgical Site Infections (SSI)

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NHSN Training Course

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Objectives

- Review the standardized infection ratio (SIR) and its use in the interpretation of SSI data.
- Demonstrate the use of advanced analysis reports to support interpretation of SIRs and assess the implication of data quality issues.
- Discuss how to make internal comparisons of SIRs and assess HAI trends within a facility.

REVIEW THE STANDARDIZED INFECTION RATIO (SIR) AND ITS USE IN THE INTERPRETATION OF SSI DATA

Background

- **SSIs were measured using rates calculated from the Basic Risk Index**
- **Limitations to using the Basic Risk Index**
  - Relies on three risk factors only
  - Same risk factors for all procedure categories
  - The relative contribution of these factors are constrained to be equal
- **SSI Rates have been replaced by SSI SIRs**
  - Uses several risk factors in improved risk models*
  - http://www.cdc.gov/nhsn/PDFs/pscManual/SSI_ModelPaper.pdf

*Mu Y et al. Infect Control Hosp Epidemiol 2011;32(10):970-986.

Standardized Infection Ratio (SIR)

- **Risk-adjusted summary measure**
- **Compares observed number of infections to <u>expected</u> number of infections**
- **Expected number of infections is**
  - Calculated by summing the procedure risk for all procedures included in the summarized calculation
  - The procedure risk is calculated from improved risk models*
- **Based on NHSN aggregate data (2006-2008)**

*Mu Y et al. Infect Control Hosp Epidemiol 2011;32(10):970-986.

Available NHSN Risk Factors
2006-2008 NHSN Data

Procedure Type	Risk Factors		
For All Procedures	General anesthesia Age Gender Emergency	Trauma Wound class ASA Score Duration of procedure	Bed size‡ Medical School Affiliation‡ Endoscope
For C-section	Duration of labor Weight Height Estimated blood loss		
For Spinal fusion	Spinal level Diabetes Mellitus Approach/Technique		
For Hip/Knee	Total/Partial Primary/Revision		

‡Hospital Level Information

Calculating Procedure Risk

- **Calculated using a Logistic Regression model***
- **logit($\hat{p}$) = $\alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots \beta_i X_i$**
  - Where α = intercept
  - β_i = parameter estimate
  - X_i = presence of risk factor
  - (For these risk factors, if present = 1; if not = 0)

*Mu Y et al. Infect Control Hosp Epidemiol 2011;32(10):970-986.

Calculating Procedure Risk

- $\text{logit}(\hat{p}) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots \beta_i X_i$

- $\text{Logit}(\hat{P}) = -3.89 + -0.176(1) + 0.38(1) + 0.30(1) + 0.24(1) + 0.13(1) + 0.14(1) + 0.26(1) + 0.09(1) = -2.53$

- Solve for $\hat{p}$: $\hat{p} = e^{\text{logit}(\hat{p})} / (1 + e^{\text{logit}(\hat{p})})$
  $\hat{p} = e^{-2.53} / (1 + e^{-2.53}) = \underline{0.074}$

- Procedure risk for Patient 1 = <u>0.074 or 7.4% risk</u>

Colon Surgery: Risk Model to Predict SSI*

Risk Factor	Parameter Estimate	Patient 1
Intercept	-3.89	
Age10	-0.02	88
Anesthesia (Y)	0.38	Y
ASA (>2)	0.30	3
Duration10	0.03	80 mins
Endoscope (N)	0.13	N
Med School affiliation (N)	0.14	N
Bedsize (>500)	0.26	578
Wound class (CO/D)	0.09	CO

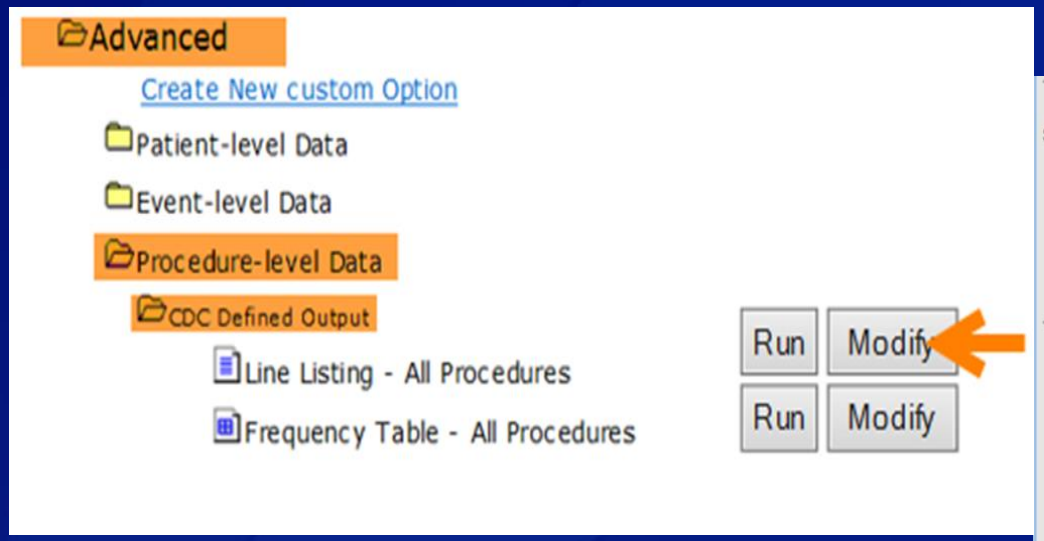
*Mu Y et al. Infect Control Hosp Epidemiol 2011;32(10):970-986.

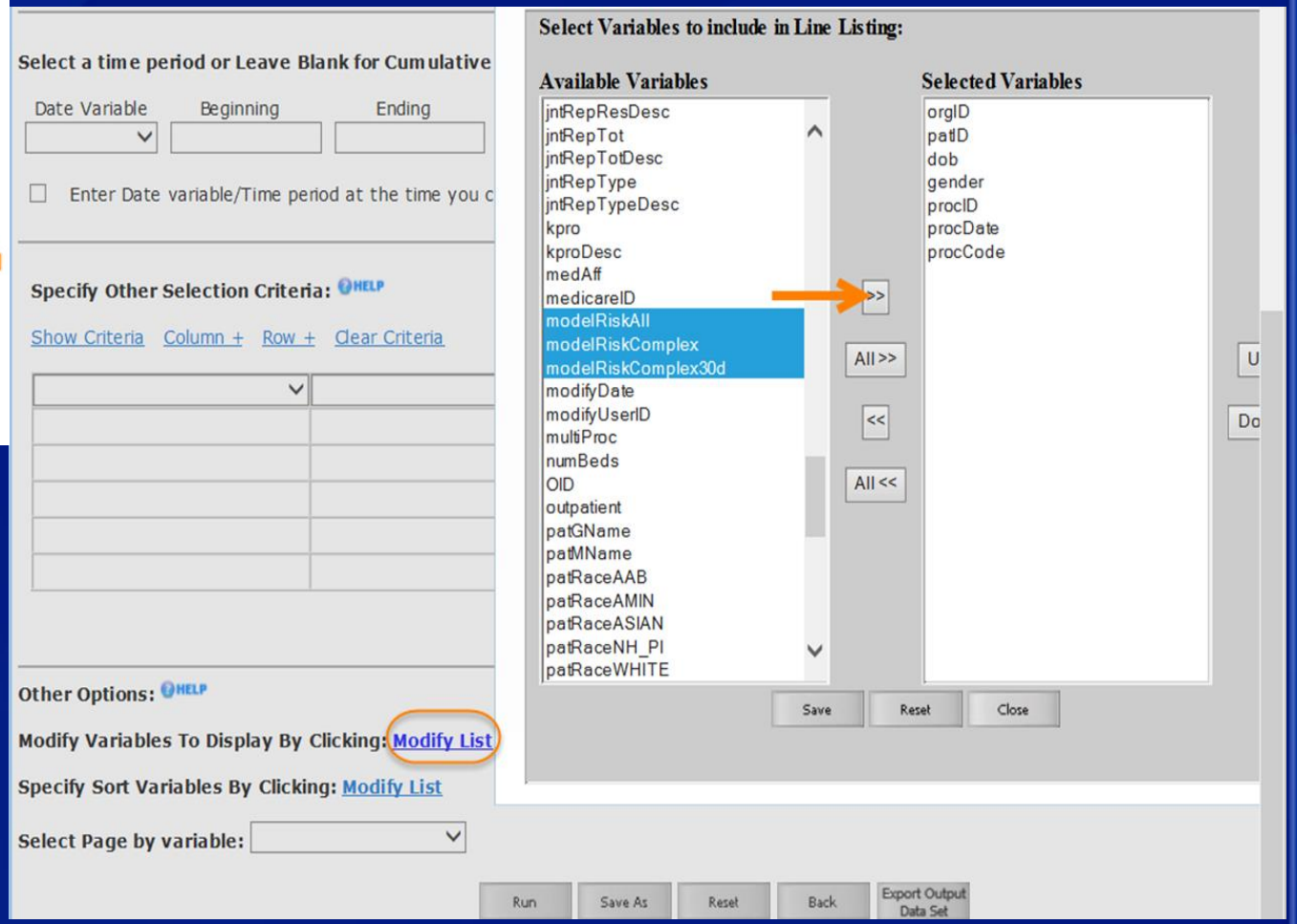
List of Patient Risk Factors
SSI after COLO

Patient	Age	Anesthesia	ASA	Duration	Endoscope	Med School Affiliation	Bed size	Wound class	SSI	Prob of SSI($\hat{P}$)
1	88	Y	3	360	N	N	578	CO	1	0.074
2	83	Y	3	280	N	N	578	CC	0	0.065
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
200	72	Y	3	125	N	N	578	CO	1	0.070
Total									O=2	E=2.09

Standardized Infection Ratio (SIR) = 2 /2.09=0.96

Pulling Procedure Risk* in NHSN





* Mu Y et al. Infect Control Hosp Epidemiol 2011;32(10):970-986.

Pulling Procedure Risk* in NHSN

National Healthcare Safety Network

Line Listing for All Procedures

As of: November 28, 2015 at 8:45 PM

Date Range: PROCEDURES procDateYQ 2015Q1 to 2015Q1

orgID	procID	procDate	procCode	ageAtProc	asa	anesthesia	approach	numBeds	trauma	swClass	medAff	risk	procDurationHr	procDurationMin	modelRiskAll
10000	18332397	01/12/2015	COLO	67	2	Y		174	Y	CC	N	0	1	10	0.0398
10000	18400729	03/09/2015	COLO	54	3	Y		174	N	CC	N	1	2	57	0.0716
10000	18400730	03/10/2015	COLO	67	3	Y		174	N	CC	N	1	2	15	0.0555
10000	18400733	03/31/2015	COLO	61	2	Y		174	N	CC	N	0	1	7	0.0399
10000	18400734	03/24/2015	COLO	46	3	Y		174	N	CC	N	1	1	58	0.0554
10000	18400740	03/26/2015	COLO	54	3	Y		174	N	CC	N	1	1	34	0.0579
10000	19219711	02/22/2015	COLO	58	3	Y		174	N	CO	N	2	1	38	0.0633
10000	19292226	03/06/2015	COLO	69	3	Y		174	N	D	N	3	3	15	0.0792

* Mu Y et al. Infect Control Hosp Epidemiol 2011;32(10):970-986.

Calculating the # expected SSI for a procedure category*

modelRiskAll
0.0398
0.0716
0.0555
0.0399
0.0554
0.0579
0.0633
0.0792

Model Risk for each patient in a procedure category	
Procedure ID	Procedure Risk
1	0.0398
2	0.0716
3	0.0555
4	0.0399
5	0.0554
6	0.0579
7	0.0633
8	0.0792
Total	0.4626

The sum of the procedure risks is the expected number of infections

* Mu Y et al. Infect Control Hosp Epidemiol 2011;32(10):970-986.

The Good News Is…

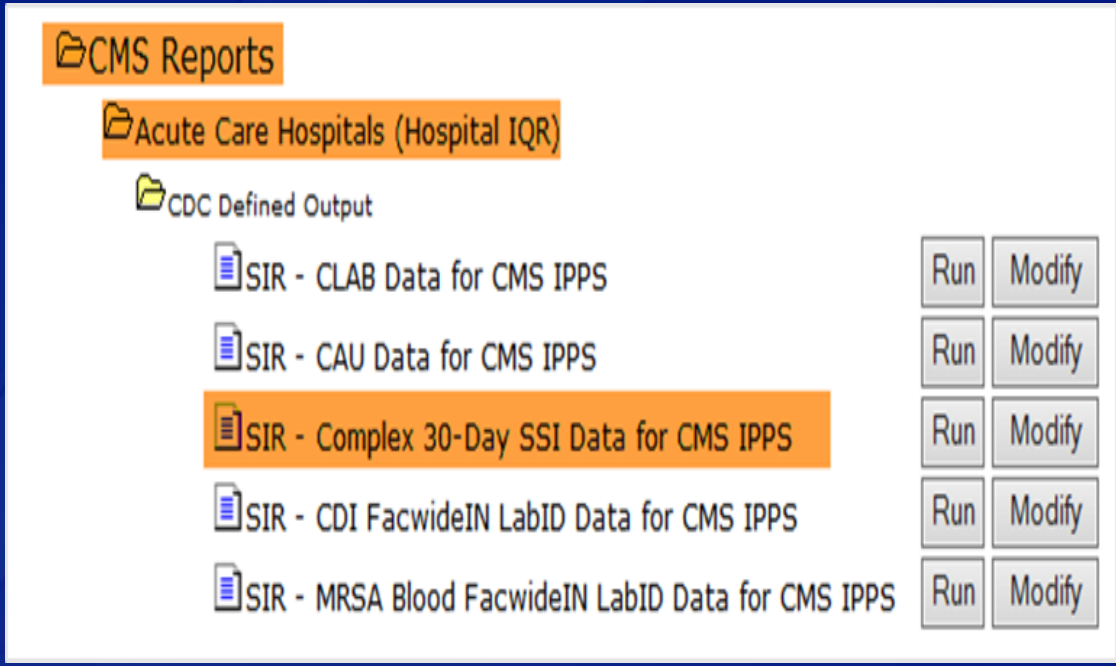
- **NHSN will calculate the expected number of infections and the SIR for you!**
- **There are three SSI SIR models to choose from depending on specific needs**
  - All SSI Data SIR
  - Complex A/R SSI SIR
  - Complex 30day SSI SIR
- **Which one should you use?**

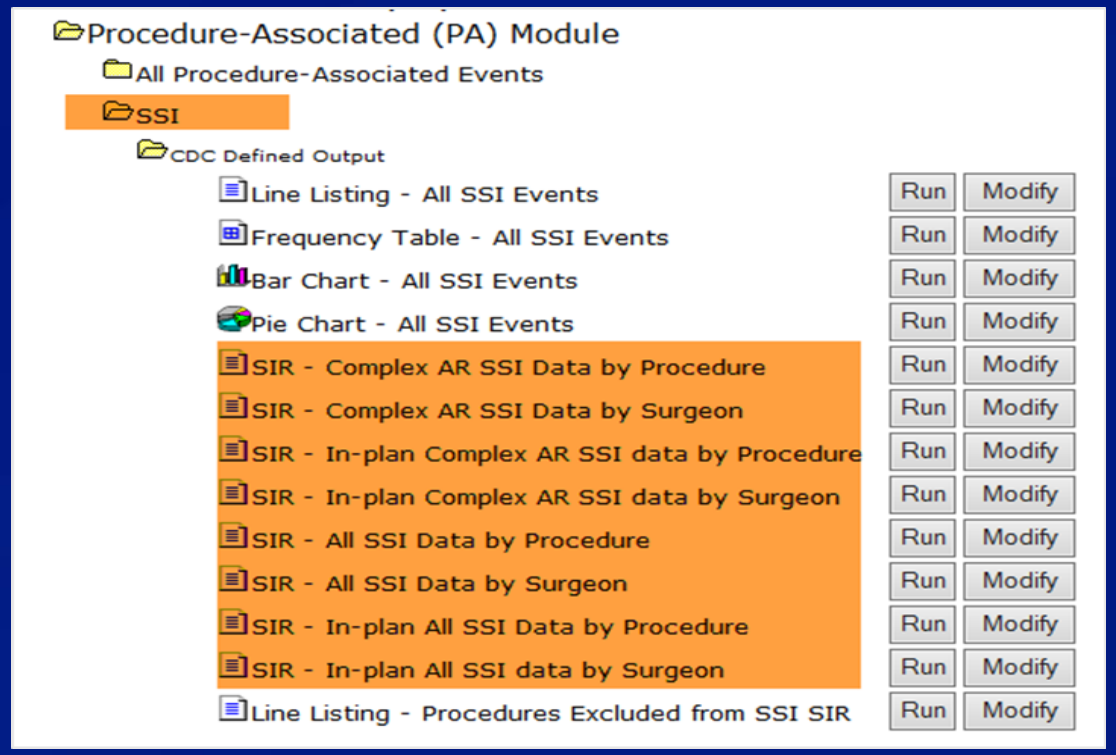
Let's Use an Example

- **In light of recently released HAI report, your facility has decided to review progress in your SSI prevention project after 3 years (2012-2014)**
- **You have been charged with providing supporting data for SSI incidence in your facility**
- **The data will be presented to Infection Preventionists and Hospital Administrators**
- **What do you do?**
  - What data should you present?
  - How much detail is necessary?
  - How can NHSN support your process?

SSI SIR in NHSN

- **Navigate to Procedure-Associated Module**
  - For All SSI and Complex A/R Data
- **Navigate to CMS Reports**
  - For Complex 30-Day SSI Data





Which SSI SIR Option to Use?

All SSI SIR Model	• Includes Superficial, Deep & Organ/Space • Superficial & Deep incisional SSIs limited to primary only • Includes SSIs identified on admission, readmission & via post-discharge surveillance
Complex A/R SSI Model	• Includes only SSIs identified on Admission/Readmission to facility where procedure was performed • Includes only inpatient procedures • Includes only Deep incisional primary & Organ/Space SSIs
Complex 30-day SSI model (used for CMS IPPS)	• Includes only in-plan, inpatient COLO and HYST procedures in adult patients (i.e., ≥ 18 years of age) • Includes only deep incisional primary and organ/space SSIs with an event date within 30 days of the procedure • Uses only age and ASA to determine risk

Interpretation from individual year SIR to Overall SIR

SIR by Individual Year

National Healthcare Safety Network

SIR for All SSI Data by Procedure - By OrgID

As of: December 1, 2015 at 1:26 PM

Date Range: SIR_ALLSSIPROC summaryYr 2012 to 2014

summaryYr	procCount	infCountAll	numExpAll	SIRAll	SIRAll_pval	SIRAll95CI
2012	776	9	21.247	0.424	0.0033	0.207, 0.777
2013	789	17	23.570	0.721	0.1676	0.434, 1.131
2014	793	21	25.517	0.823	0.3767	0.523, 1.237
Totals	2358	47	70.334			

You can calculate the overall SIR for the time period by:

- Taking a sum of the number of expected infections and
- The number of observed infections
- Then dividing the total number of observed infections by the total number of expected infections
- SIR= $\frac{\text{No. of observed infection}}{\text{No. of expected infections}}$
- **SIR= 47/70.334 = 0.668**

All SSI SIR for All Procedures Overall and by Year

Overall SIR: 2012-2014

National Healthcare Safety Network
SIR for All SSI Data by Procedure - By OrgID
As of: December 1, 2015 at 9:13 AM
Date Range: SIR_ALLSSIPROC summaryYr 2012 to 2014

procCount	infCountAll	numExpAll	SIRAll	SIRAll_pval	SIRAll95CI
2358	47	70.334	0.668	0.0033	0.497, 0.881

SIR by Individual Year

National Healthcare Safety Network
SIR for All SSI Data by Procedure - By OrgID
As of: December 1, 2015 at 1:26 PM
Date Range: SIR_ALLSSIPROC summaryYr 2012 to 2014

summaryYr	procCount	infCountAll	numExpAll	SIRAll	SIRAll_pval	SIRAll95CI
2012	776	9	21.247	0.424	0.0033	0.207, 0.777
2013	789	17	23.570	0.721	0.1676	0.434, 1.131
2014	793	21	25.517	0.823	0.3767	0.523, 1.237

In our example SIR output, the number of SSIs represents:

A. The number of SSIs with an event date within that year.

✓ B. The number of SSIs linked to a procedure performed within that year.

C. The number of SSIs with an event <u>and</u> a procedure date within that year.

National Healthcare Safety Network

SIR for All SSI Data by Procedure - By OrgID

As of: December 1, 2015 at 9:13 AM

Date Range: SIR_ALLSSIPROC summaryYr 2012 to 2014

procCount	infCountAll	numExpAll	SIRAll	SIRAll_pval	SIRAll95CI
2358	47	70.334	0.668	0.0033	0.497, 0.881

SIR Interpretation

- In the past 3 years, your facility identified 47 SSIs attributed to 2,358 performed procedures
- Based on statistical evidence, we can conclude that our OVERALL SIR of 0.668 (with a p-value of 0.0033) is different from 1.

National Healthcare Safety Network
SIR for All SSI Data by Procedure - By OrgID
As of: December 1, 2015 at 9:13 AM
Date Range: SIR_ALLSSIPROC summaryYr 2012 to 2014

procCount	infCountAll	numExpAll	SIRAll	SIRAll_pval	SIRAll95CI
2358	47	70.334	0.668	0.0033	0.497, 0.881

SIR Interpretation

- There were 9 SSIs in 2012, 17 in 2013 and 21 in 2014
- The number of expected SSIs for 2012, based on the 2006-2008 national baseline data, was 21.247; 23.570 for 2013; and 25.571 for 2014

National Healthcare Safety Network
SIR for All SSI Data by Procedure - By OrgID
As of: December 1, 2015 at 1:26 PM
Date Range: SIR_ALLSSIPROC summaryYr 2012 to 2014

summaryYr	procCount	infCountAll	numExpAll	SIRAll	SIRAll_pval	SIRAll95CI
2012	776	9	21.247	0.424	0.0033	0.207, 0.777
2013	789	17	23.570	0.721	0.1676	0.434, 1.131
2014	793	21	25.517	0.823	0.3767	0.523, 1.237

SIR Interpretation

- **The SIR increased from 0.424 in 2012 to 0.721 in 2013 then to 0.823 in 2014.**
  - In 2012, your facility observed about 58% fewer infections than expected
  - And 28% fewer infections than expected for 2013
  - And in 2014, your facility observed 20% fewer infections than expected

National Healthcare Safety Network
SIR for All SSI Data by Procedure - By OrgID
As of: December 1, 2015 at 1:26 PM
Date Range: SIR_ALLSSIPROC summaryYr 2012 to 2014

summaryYr	procCount	infCountAll	numExpAll	SIRAll	SIRAll_pval	SIRAll95CI
2012	776	9	21.247	0.424	0.0033	0.207, 0.777
2013	789	17	23.570	0.721	0.1676	0.434, 1.131
2014	793	21	25.517	0.823	0.3767	0.523, 1.237

Which year has a statistically significant SIR? Why?

A. 2013 and 2014, because the 95% CI includes 1

B. 2014, because the number of expected infections is highest

✓ C. 2012, because the p-value is less than 0.05

D. All of the above

National Healthcare Safety Network
SIR for All SSI Data by Procedure - By OrgID
As of: December 1, 2015 at 1:26 PM
Date Range: SIR_ALLSSIPROC summaryYr 2012 to 2014

summaryYr	procCount	infCountAll	numExpAll	SIRAll	SIRAll_pval	SIRAll95CI
2012	776	9	21.247	0.424	0.0033	0.207, 0.777
2013	789	17	23.570	0.721	0.1676	0.434, 1.131
2014	793	21	25.517	0.823	0.3767	0.523, 1.237

How do I Present and Interpret my SIR?

- **Data can be presented graphically *(Not available in NHSN)***
  - Bar charts
  - Run charts
  - Stock charts
- **When you interpret the SIR**
  - How many SSIs?
  - Over what period of time?
  - SIRs
- **Interpret the statistical results**
  - What is the p-value and what does it mean?
  - What is the 95% CI and how is it applied?

How do I Present and Interpret my SIR? (cont'd)

- **Highlight successes or pitfalls**
  - For which procedure types were there 0 SSIs?
  - Are the trends in the data?
  - Progress towards target SIR
- **Provide supplementary information**
  - Has there been operational changes that may have impacted data?
  - Highlight prevention activities and education campaigns performed during this time period
  - Has surveillance improved based on better/clearer understanding of NHSN definitions and protocols?
  - Have there been any internal, or external validation programs that have taken place during this time period?

DEMONSTRATE THE USE OF ADVANCED ANALYSIS REPORTS TO SUPPORT INTERPRETATION OF SIRS.

What is contributing to the increasing SIR?

- **Based on the results from your first data run, you decide to take a deeper look**
- **Review SIR reports for 'All SSI SIR' and 'Complex A/R SSI SIR' models**
  - When you run the SSI SIR reports, you will find on the output:
    - The overall SIR for the year
    - The procedure-specific SIRs
    - The procedure-specific SIR by outpatient status, and
    - If applicable, a list of the incomplete and custom procedures not included in the SIR
- **Examine the procedure-specific SIRs**

Procedure-specific SIRs: All SSI SIR

- The report shows that colon surgery has the highest number of expected infections in all 3 years
- There are more SSIs attributed to colon surgeries in the three years combined than any other surgery
- COLO shows the highest SIR in each year
  - Overall, an increasing 'trend' in SIR (based on practical not statistical evidence)

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SIR for All SSI Data by Procedure - By OrgID/ProcCode/Outpatient

As of: December 1, 2015 at 1:26 PM

Date Range: SIR_ALLSSIPROC summaryYr 2012 to 2014

proccode	outpatient	summaryYr	months	procCount	infCountAll	numExpAll	SIRAll	SIRAll_pval	SIRAll95CI
CBGB	N	2012	12	173	1	3.526	0.284	0.1626	0.014, 1.399
CBGB	N	2013	12	147	2	3.099	0.645	0.5864	0.108, 2.132
CBGB	N	2014	12	132	0	2.981	0.000	0.0507	, 1.005
CBGC	N	2012	7	11	0	0.236	.	.	
CBGC	N	2013	1	2	0	0.036	.	.	
CBGC	N	2014	4	5	0	0.103	.	.	
COLO	N	2012	12	130	4	7.077	0.565	0.2439	0.180, 1.363
COLO	N	2013	12	178	10	10.514	0.951	0.9145	0.483, 1.695
COLO	N	2014	12	224	16	13.576	1.179	0.4980	0.698, 1.873
HPRO	N	2012	12	169	2	3.419	0.585	0.4809	0.098, 1.933
HPRO	N	2013	12	163	2	3.307	0.605	0.5156	0.101, 1.998
HPRO	N	2014	12	129	0	2.489	0.000	0.0830	, 1.204
HYST	N	2012	12	293	2	6.988	0.286	0.0373	0.048, 0.946
HYST	N	2013	12	299	3	6.615	0.454	0.1437	0.115, 1.234
HYST	N	2014	12	303	5	6.368	0.785	0.6273	0.288, 1.740

Procedure-specific SIRs: Complex AR Model

- The report shows that colon surgery has the highest number of expected infections in all 3 years.
- There are more SSIs attributed to colon surgeries in the three years combined than any other surgery
- COLO shows the highest SIR in each year
  - Overall, an increasing 'trend' in SIR for COLO (based on practical not statistical evidence)

National Healthcare Safety Network

SIR for Complex AR SSI Data by Procedure - By OrgID/ProcCode

As of: December 1, 2015 at 2:03 PM

Date Range: SIR_COMPLEXSSIPROC summaryYr 2012 to 2014

proccode	summaryYr	months	procCount	infCountComplex	numExpComplex	SIRComplex	SIRComplex_pval	SIRComplex95CI
CBGB	2012	12	173	0	2.265	0.000	0.1039	, 1.323
CBGB	2013	12	147	1	1.984	0.504	0.5479	0.025, 2.486
CBGB	2014	12	132	0	1.883	0.000	0.1521	, 1.591
CBGC	2012	7	11	0	0.147	.	.	
CBGC	2013	1	2	0	0.022	.	.	
CBGC	2014	4	5	0	0.061	.	.	
COLO	2012	12	130	3	3.979	0.754	0.6787	0.192, 2.052
COLO	2013	12	178	7	5.986	1.169	0.6456	0.511, 2.313
COLO	2014	12	224	11	7.851	1.401	0.2711	0.737, 2.435
HPRO	2012	12	169	2	2.723	0.734	0.7324	0.123, 2.426
HPRO	2013	12	163	1	2.653	0.377	0.3277	0.019, 1.859
HPRO	2014	12	129	0	1.984	0.000	0.1376	, 1.510
HYST	2012	12	293	0	2.655	0.000	0.0703	, 1.128
HYST	2013	12	299	1	2.530	0.395	0.3608	0.020, 1.949
HYST	2014	12	303	2	2.417	0.827	0.8698	0.139, 2.733

If infCount in this table is less than you reported, aggregate data are not available to calculate numExp.

Excludes Superficial Incisional Secondary (SIS) and Deep Incisional Secondary (DIS) SSIs.

Includes only procedures and associated SSIs that are reported with primary closure technique.

Lower bound of 95% Confidence Interval only calculated if infCount > 0. SIR values only calculated if numExp >= 1.

Source of aggregate data: 2006-2008 NHSN SSI Data

How would you calculate the overall SIR from the procedure-specific SIRs?

A. Take a sum of all the procedure-specific SIRs

✓ B. Divide the sum of the procedure-specific observed infections by the sum of the procedure-specific expected infections

C. By taking an average of the procedure-specific SIRs

D. None of the above

Example Continued

- **Using our example above, we notice a couple things:**
  - The number of observed infections is different (per year) for the two models
  - While the number of expected is different, the number of procedures is the same between the two models
- **<u>Let's examine these differences using the 2014 data</u>**

Investigating the differences in COLO data for SSI Models

- **What steps should you take to investigate the difference?**
- **Evaluate the details of the SSI events**
  - Run a line list of the SSI events and include event-specific details, or
  - Run a frequency table and examine the distribution of SSI events
  - NOTE: Limit your time frame to the **procedure date** in order to align with the SIR when you run the line list and frequency reports

2014 COLO SIR							
All SSI SIR Model				Complex AR SSI SIR Model			
Procedure Count	Observed infCount	Expected infCount	SIR	Procedure Count	Observed infCount	Expected infCount	SIR
224	16	13.576	1.179	224	11	7.851	1.4

Line List of 2014 COLO SSIs

eventID	eventDate	eventType	spcEvent	procDate	procCode	procDurationHr	procDurationMin	anesthesia	asa	emergency	scope	swClass	trauma	closure	whenDetected	whenDetectedDesc
12965287	01/07/2014	SSI	IAB	01/01/2014	COLO	2	19	Y	5	Y	N	CC	N	PRI	A	A - Admission
15969943	09/29/2014	SSI	IAB	09/16/2014	COLO	7	0	Y	3	N	N	CC	N	PRI	RF	R - Readmission
13862966	03/24/2014	SSI	SIP	03/19/2014	COLO	2	45	Y	3	N	N	CC	N	PRI	A	A - Admission
13612894	02/28/2014	SSI	IAB	02/20/2014	COLO	3	19	Y	3	N	Y	CC	N	PRI	A	A - Admission
16612749	10/20/2014	SSI	IAB	10/06/2014	COLO	3	12	Y	3	N	N	CC	N	PRI	RF	R - Readmission
13948896	04/01/2014	SSI	SIP	03/14/2014	COLO	2	1	Y	4	N	N	CC	N	PRI	RF	R - Readmission
15040313	07/07/2014	SSI	IAB	06/26/2014	COLO	4	52	Y	3	N	Y	CC	N	PRI	A	A - Admission
14346816	05/13/2014	SSI	SIP	05/01/2014	COLO	2	54	Y	2	N	N	CC	N	PRI	RF	R - Readmission
13861671	03/19/2014	SSI	IAB	03/12/2014	COLO	2	24	Y	4	N	N	CO	N	PRI	A	A - Admission
15741739	08/31/2014	SSI	DIP	08/21/2014	COLO	6	43	Y	2	N	N	CC	N	PRI	RF	R - Readmission
17056316	12/22/2014	SSI	SIP	12/12/2014	COLO	8	16	Y	4	N	N	D	N	PRI	A	A - Admission
13265247	01/31/2014	SSI	IAB	01/21/2014	COLO	2	57	Y	2	N	N	CC	N	PRI	A	A - Admission
14346830	05/10/2014	SSI	IAB	04/17/2014	COLO	6	3	Y	2	N	N	CC	N	PRI	RF	R - Readmission
14605972	06/09/2014	SSI	IAB	05/12/2014	COLO	3	0	Y	3	N	N	CC	N	PRI	RF	R - Readmission
15260336	07/28/2014	SSI	SIP	07/21/2014	COLO	3	10	Y	2	N	N	CC	N	PRI	A	A - Admission
16278501	11/04/2014	SSI	IAB	10/17/2014	COLO	4	20	Y	3	N	N	CC	N	PRI	RF	R - Readmission

COLO SSI Occurrence by Type

Frequency
Percent
Row Pct
Col Pct

Table of whenDetected by spcEvent

whenDetected	spcEvent			
	DIP	IAB	SIP	Total
A	0	5	3	8
	0.00	31.25	18.75	50.00
	0.00	62.50	37.50	
	0.00	50.00	60.00	
RF	1	5	2	8
	6.25	31.25	12.50	50.00
	12.50	62.50	25.00	
	100.00	50.00	40.00	
Total	1	10	5	16
	6.25	62.50	31.25	100.00

Frequency
Percent
Row Pct
Col Pct

Table of closure by spcEvent

closure	spcEvent			
	DIP	IAB	SIP	Total
PRI	1	10	5	16
	6.25	62.50	31.25	100.00
	6.25	62.50	31.25	
	100.00	100.00	100.00	
Total	1	10	5	16
	6.25	62.50	31.25	100.00

All procedures were primary closure and are therefore included in the SIR. If closure technique is ‘other than primary’, when using the 2006-2008 baseline - those procedures and corresponding SSIs will be excluded from the SIR calculation

Data Quality Checks and Balances

- **KNOW YOUR DATA**
  - Know the changes in data that can potentially impact your SIR
  - Know what is excluded from your SSI SIR calculation*
  - Then know how to troubleshoot your SSI SIR*
- **Know what is being measured for what time period**
  - Procedure category
  - Targeted SIR
- **Understand what risk factor(s) contribute to the measure**
- **Know what goes into the SSI risk adjustment**

*NHSN Quick Learn: Surgical Site Infection Exclusion Criteria for SIR Calculation

Knowing your data: Excluded Procedures from the SIR

- **If you notice a discrepancy in procedure count, scroll to the bottom of the SSI SIR output**
- **Table included in the output shows number of excluded procedures and any associated SSIs**
  - Note: This table will only include procedures that were excluded due to the exclusion criteria listed in 2010 NHSN Newsletter Related to potential data quality issues

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Incomplete and Custom Procedures not Included in SIR

As of: December .1, 2015 at 1:26 PM

Date Range: SIR_ALLSSIPROC summaryYr 2012 to 2014

summaryYr		procCode	outpatient	procCount	infCountAll
2014		HPRO	N	1	0
2012		HYST	N	2	0
2013		HYST	N	1	0
2014		HYST	N	3	0

Includes only procedures and associated SSIs that are reported with primary closure technique.

Source of aggregate data: 2006-2008 NHSN SSI Data

Data contained in this report were last generated on November 19, 2015 at 10:01 AM.

Excluded Procedures and SSI Events from the SIR

- **All of the SSI SIRs will exclude**
  - Superficial incisional secondary (SIS) SSIs
  - Deep incisional secondary (DIS) SSIs
  - Procedures with ‘other than primary’ closure techniques (under the current 2006-2008 baseline)
- **If SSI event count is less than you’re expecting, keep in mind which model you are using**
  - Example: Complex A/R and Complex 30-day models will NOT include superficial incisional primary infections (i.e., specific Event = “SIP”)
- **If a procedure is excluded from the SIR, any associated SSI will also be excluded**

Universal Exclusion Criteria for SSI SIR Calculation:

Related to potential data quality issues*

- Missing one or more of the required risk factors.
- Procedure date is ≤ patient date of birth.
- Patient's age at procedure is ≥ 109 years.
- Procedure duration is <5 minutes or >IQR5
- The IQR5 is defined as five times the interquartile range above the 75th percentile
  - For example, if the interquartile range is 30 minutes (Q3-Q1) and the 75th percentile is 100 minutes, the IQR5 would be 100 +(5*30) = 250 minutes.
- Quick Reference Guide on procedure duration for each NHSN operative procedures can be found at http://www.cdc.gov/nhsn/PS-Analysis-resources/reference-guides.html

*2010 SIR Newsletter: http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN_NL_OCT_2010SE_final.pdf

Example of Excluded Procedure: Long Procedure Duration

In our example, 1 HYST and 1 COLO procedures were excluded from the 2015 Q2 SIR

- **Line list shows procedure duration was extreme outlier**
  - HYST cut-off procedure duration = 479 minutes
  - COLO cut-off procedure duration = 668
- **If this is a data entry error:**
  - Edit the procedure record and click Save
  - Generate datasets prior to running any analysis reports
- **If not a data entry error, procedure will still be excluded from the SIR**

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Line Listing for Procedures Excluded from SSI SIR

As of: November 13, 2015 at 11:37 AM

Date Range: PROCEDURES procDateYQ 2015Q2 to 2015Q2

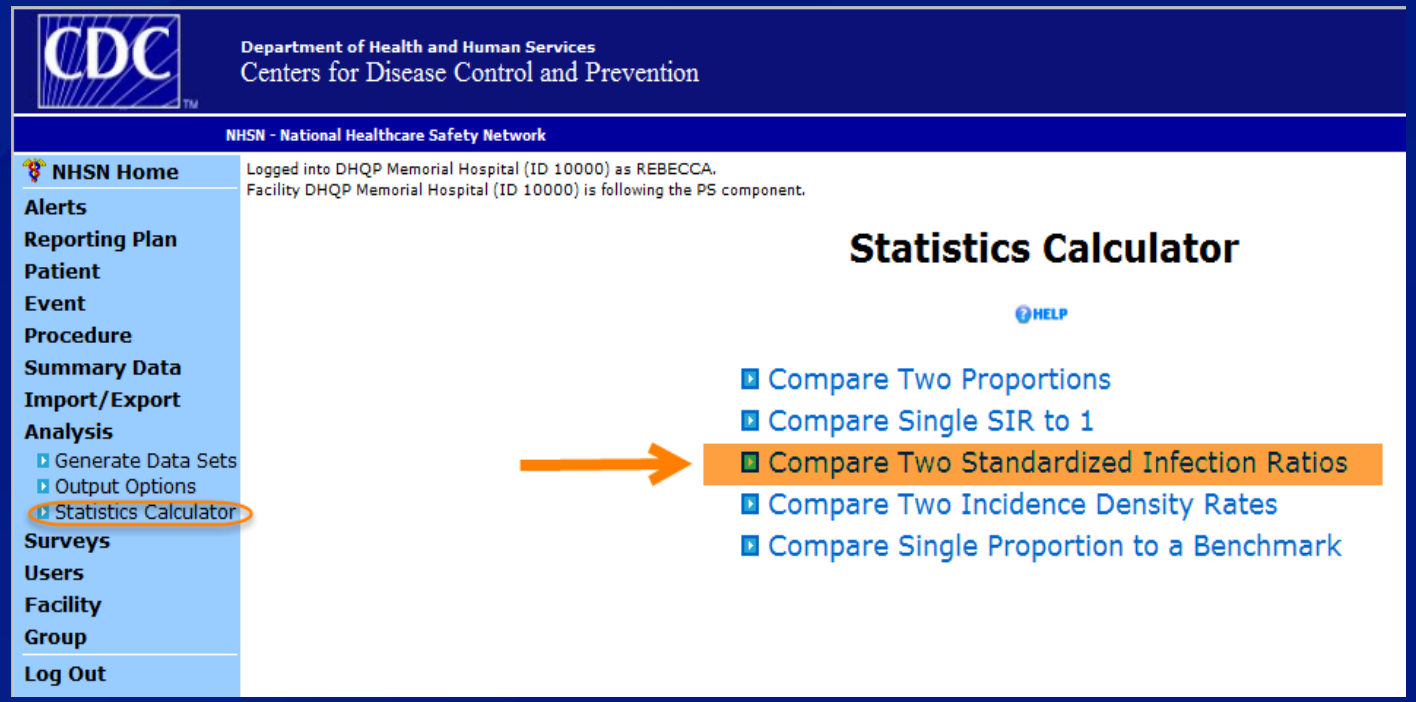
HYST: 1200 minutes
COLO: 1213 minutes

procDate	procCode	procDurationHr	procDurationMin	anesthesia	approach	asa	emergency	scope	swClass	trauma
04/22/2015	HYST	20	0	Y		2	N	Y	C	N
05/03/2015	COLO	20	13	Y		3	Y	N	CC	N

DISCUSS HOW TO MAKE INTERNAL COMPARISONS OF SIRS AND ASSESS HAI TRENDS WITHIN A FACILITY.

Comparing SIRs

- You can compare two SIRs by using the Statistics Calculator
- Can be used for any SIR in NHSN
- Lets examine the difference between the 2013 and 2014 SIRs using our example



summaryYr	procCount	infCountAll	numExpAll	SIRAll	SIRAll_pval	SIRAll95CI
2012	776	9	21.247	0.424	0.0033	0.207, 0.777
2013	789	17	23.570	0.721	0.1676	0.434, 1.131
2014	793	21	25.517	0.823	0.3767	0.523, 1.237

Comparing SIRs

- Both years have similar data
- The hypothesis is that the two SIRs are not Different
- To test a hypothesis and calculate p-value, enter
  - Number of observed events
  - Number of expected events

Compare Two Standardized Infection Ratios

HELP

When comparing two standardized infection ratios, the hypothesis is that the two ratios are not different from each other. To perform a hypothesis test and calculate a p-value, enter the number of observed events and the number of expected events. The standardized infection ratio (SIR) for each data source will be displayed automatically. Press calculate.

	Data Source #1	Data Source #2
Group Labels:	2013	2014
Number observed:	17	21
Number expected:	23.570	25.517
Standardized Infection Ratio:	0.721	0.823

Title: COLO SSI Reduction Project_2013 vs 2014 ×

Calculate Back

Making decisions based on statistical comparisons

- **Difference between the two years was not statistically significant, but don't stop there**
  - Consider previous trends of SSIs in your facility
  - Do you notice a pattern of SSIs occurrence
- **Use 'practical significance' to inform prevention measures**
- **Consider aspects of your operation that could be improved**

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COLO SSI Reduction Project_2013 vs. 2014

As of: December 8, 2015 at 9:59 AM

	2013	2014
Observed	17	21
Expected	23.57	25.517
SIR	0.721	0.823

Relative ratio of SIRs (data column 2 / data column 1): 0.823/0.721 = 1.141 (114.1%)

Two-tailed p-value: 0.6914

95% Conf. Interval: 0.599, 2.196

In Summary…

- **SIR is a summarized measure of SSIs in your facility**
- **There is usually more to the story, so explore your data**
- **Utilize NHSN reports to provide more details on your SIRs**
  - Look at the big picture

Resources

- **Improving Risk-Adjusted Measures of Surgical Site Infection for the National Healthcare Safety Network (Infect Control Hosp Epidemiol 2011;32(10):970-986)**
  - http://www.cdc.gov/nhns/PDFs/psManual/SSI_ModelPaper.pdf
- **SIR Newsletter**
  - http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN_NL_OCT_2010SE_final.pdf
- **NHSN Patient Safety Analysis Resources**
  - http://www.cdc.gov/nhsn/ps-analysis-resources/index.html
- **NHSN Patient Safety Component SSI Protocol**
  - http://www.cdc.gov/nhsn/PDFs/pscManual/9pscSSIcurrent.pdf
- **How to run a Procedure Line List**
  - http://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/faq-procedure-line-list.pdf
- **SSI Exclusion Criteria for SIR Calculation**
  - http://www.cdc.gov/nhsn/ps-analysis-resources/index.html
- **Troubleshooting your SSI SIR**
  - http://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/ssi-sir_tips.pdf

Thank you!

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.