

Understanding Your Surgical Site Infections (SSIs) Standardized Infection Ratio (SIR) Using the Patient Safety Component Part One

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2021 Mini-Learning Video Series

Learner Objectives

- After viewing this Quick Learn, the learner will be able to
 1. Describe the surgical site infections (SSI) standardized infection ratio (SIR)
 2. Describe the inclusion criteria of the SSI SIR numerator
 3. Describe the universal exclusion criteria of the SSI SIR denominator
 4. Generate and interpret the Complex 30-day SSI SIR report

What is the SSI SIR?

- A summary statistic that compares the **number of reported SSI events** to the **number of predicted SSI events**, based on a **calculation** using data for healthcare-associated infection (HAI) events, that occurred in a given referent time period
- The equation below is used to perform the **calculation**

$$\text{SSI SIR} = \frac{\text{Number of observed SSI Event}(s)}{\text{Number of predicted SSI Event}(s)}$$

A Closer Look at the SIR

$$\text{SIR} = \frac{\text{Number of observed Event}(s)}{\text{Number of predicted Event}(s)}$$

- **Number of observed SSI events**
 - SSI events entered into NHSN that meet SIR criteria by model/report
 - Number of observed SSI events may vary depending on SIR report
- **Number of predicted SSI events**
 - Calculation based on national 2015 aggregate data
 - Calculation performed using a logistic regression calculation
 - SIR is not calculated if events predicted is less than 1.0
 - This is called the minimum precision criterion

Interpreting the SSI SIR

- **>1.0** - more SSI events observed than predicted
- **<1.0** - fewer SSI events observed than predicted

Using Statistical Data for Interpretation:

- p-value and 95% confidence interval (CI) describe statistical significance of the SIR
 - SSI SIR is **different from 1.0** if p-value less than 0.05
 - SSI SIR is **different from 1.0** if 95% CI does not include 1.0

Value of SIR Reports

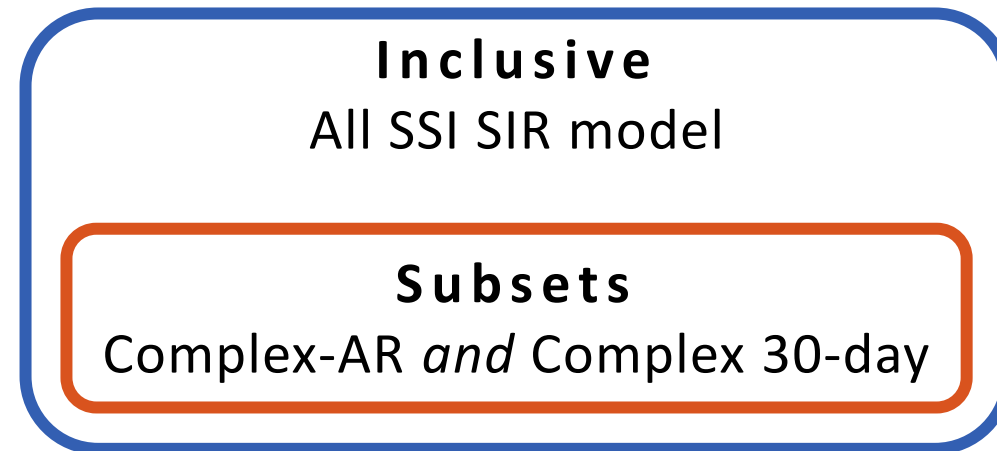
SIR reports may be used for

- Public health disease surveillance
- Quality improvement (internal to a specific organization and external benchmarking involving multiple organizations)
- Public Reporting
- Pay for performance programs
- National and State HAI Progress Report

SSI SIR Models

About the SSI SIR Models

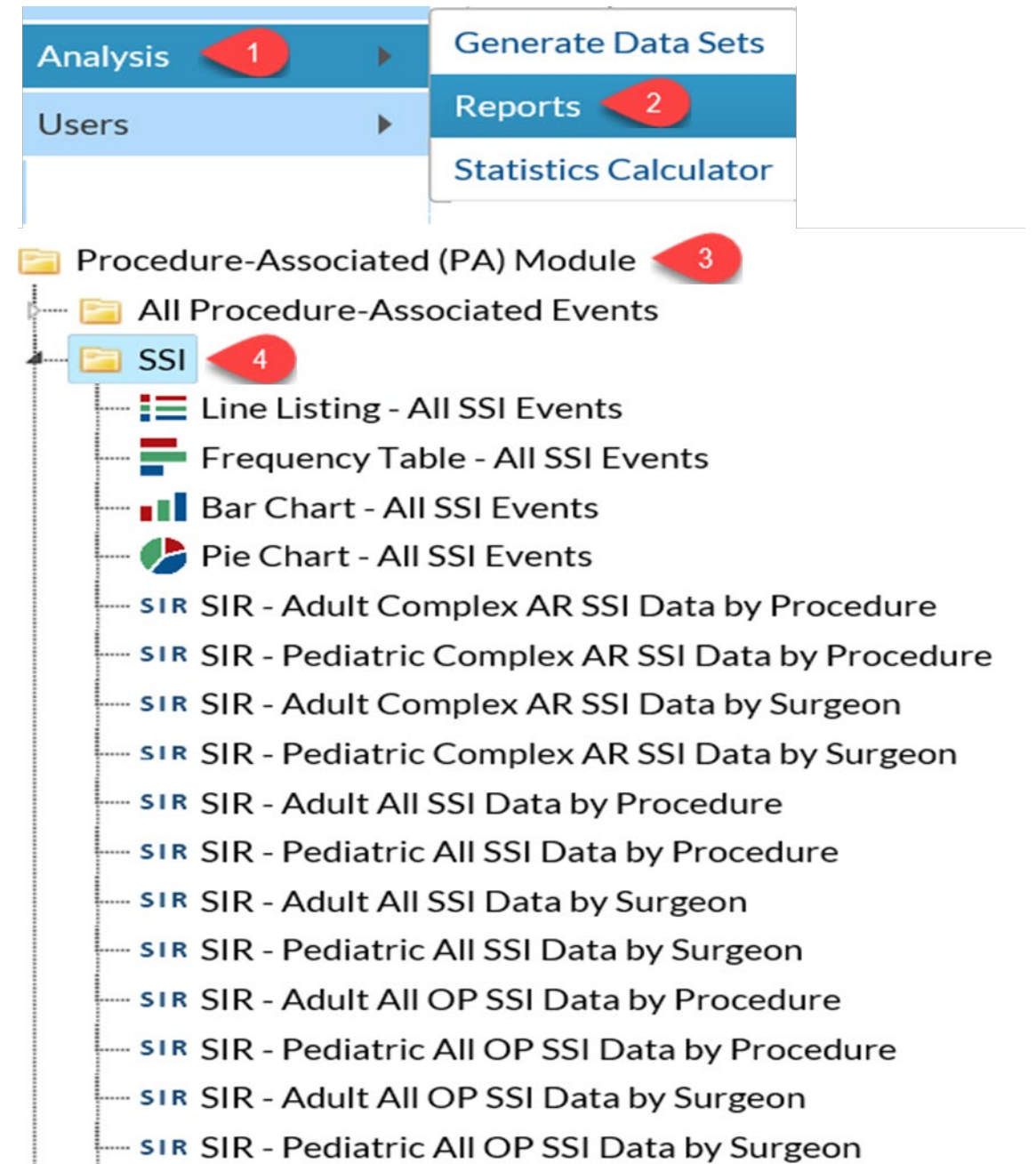
- Three main SSI SIR models in NHSN
 1. All SSI SIR model
 2. Complex Admission-Readmission (AR) SSI SIR model
 3. Complex 30-day SSI SIR model



- These SSI SIR models have their own set of inclusion criteria for the SIR numerator

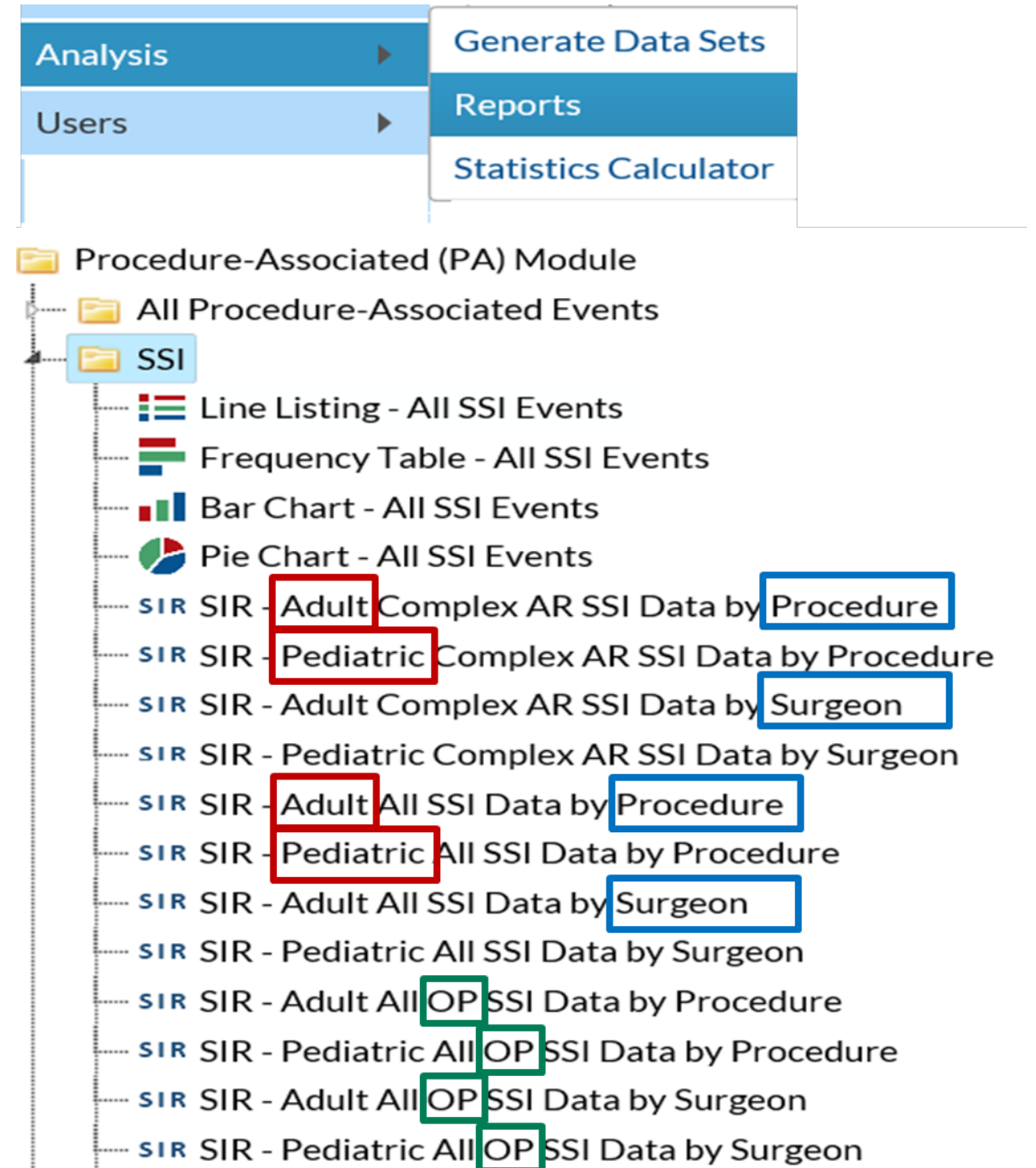
About the SSI SIR Models

- Access 'All SSI SIR model' & 'Complex AR SSI SIR model' analysis reports in NHSN
 1. Select analysis on left-hand navigation bar
 2. Select Reports
 3. Select Procedure-associated Module folder
 4. Select SSI subfolder



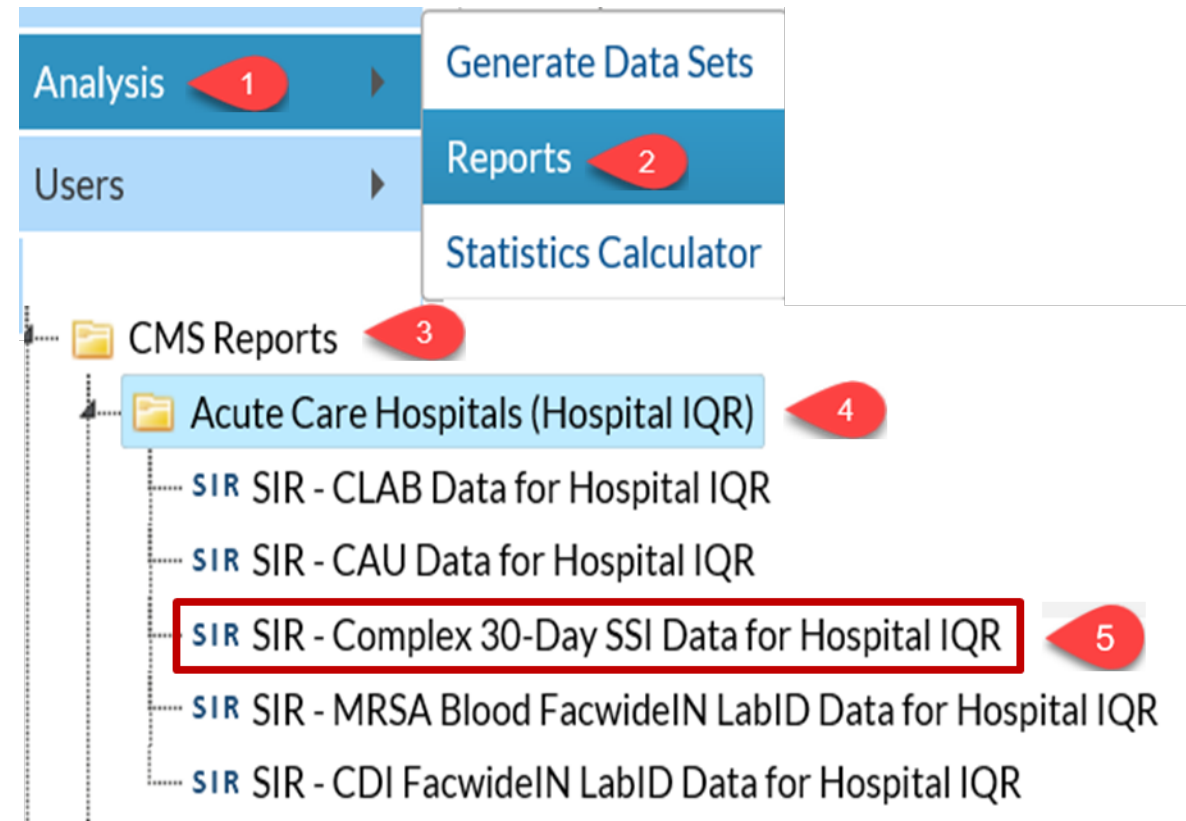
About the SSI SIR Models

- The All SSI SIR and Complex AR models are separated by **adult & pediatric** data
- Both models have separate reports by **procedure** and **surgeon** code
- All SSI SIR model is also separated by inpatient and outpatient procedures
 - Outpatient procedure analysis report names are marked with “OP”



About the SSI SIR Models

- Complex 30-Day SSI SIR model analysis report is separated by procedure category and surgeon code
 - Access report by procedure category
 1. Select Analysis on left-hand navigation bar
 2. Select Reports
 3. Select CMS folder
 4. Select Acute Care Hospitals
 5. Select Complex 30-Day SSI Data for Hospital IQR



About the SSI SIR Models

- Complex 30-Day SSI SIR model analysis reports by surgeon code can be accessed:
 1. Select Analysis on left-hand navigation bar
 2. Select Reports
 3. Select Advanced folder
 4. Select Procedure-level data subfolder
 5. Select Complex 30-day SSI Data for Surgeon



SSI SIR Numerator Inclusion Criteria

SSI SIR Numerator Inclusion Criteria –All SSI SIR Model

INCLUSION CRITERIA: Under 2015 Baseline INPATIENT PROCEDURES ONLY MODELS	All SSI Model-Adult	All SSI Model- Pediatric
All NHSN procedure categories	☑	☑
Procedures in patients <18 years		☑
Procedures in patients >=18 years	☑	
Superficial incisional primary (SIP) SSIs	☑	☑
Deep incisional primary (DIP) SSIs	☑	☑
Organ/space (O/S) SSIs	☑	☑
DIP and O/S SSIs identified within 30 days after procedure (per protocol)	☑	☑
DIP and O/S SSIs identified > 30 days after procedure (per protocol)	☑	☑
SSIs detected on current admission (A) 1	☑	☑
SSIs detected on follow-up admission to the same facility (RF) 2	☑	☑
SSI detected on follow-up admission to different facility (RO) 3	☑	☑
SSIs detected through post-discharge surveillance efforts (P) 4	☑	☑

All SSI SIR model
numerator includes
events regardless of when
they are detected

SSI SIR Numerator Inclusion Criteria –Complex AR SSI SIR Model

INCLUSION CRITERIA: Under 2015 Baseline INPATIENT PROCEDURES ONLY MODELS	Complex AR SSI Model- Adult	Complex AR SSI Model- Pediatric
All NHSN procedure categories	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Procedures in patients <18 years		<input checked="" type="checkbox"/>
Procedures in patients >=18 years	<input checked="" type="checkbox"/>	
Superficial incisional primary (SIP) SSIs		
Deep incisional primary (DIP) SSIs	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Organ/space (O/S) SSIs	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DIP and O/S SSIs identified within 30 days after procedure (per protocol)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DIP and O/S SSIs identified > 30 days after procedure (per protocol)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SSIs detected on current admission (A) ★	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SSIs detected on follow-up admission to the same facility (RF) ★	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SSI detected on follow-up admission to different facility (RO)		
SSIs detected through post-discharge surveillance efforts (P)		

Complex AR model only
includes events detected
during current & follow-up
admission to facility where
procedure was done

SSI SIR Numerator Inclusion Criteria – Complex 30-Day SSI SIR Model

- Used for CMS reporting
- Applies to in-patient colon and abdominal hysterectomy procedures in adults 18 years or older
- Numerator includes DIP SSIs & O/S SSIs identified > 30 days after procedure

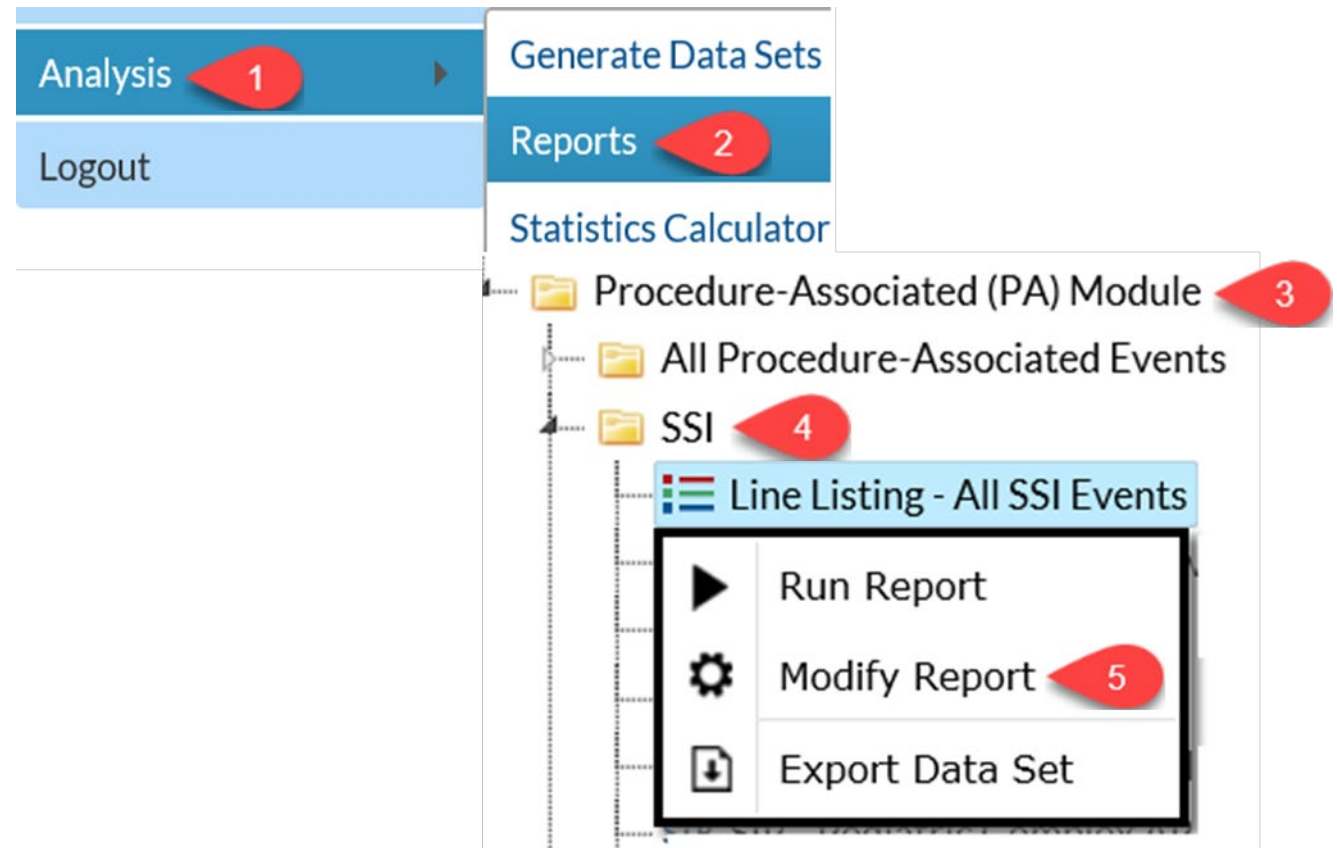
**Complex 30-Day SSI SIR
model includes events
regardless of when they
are detected**

INCLUSION CRITERIA: Under 2015 Baseline INPATIENT PROCEDURES ONLY MODELS	Complex 30-Day
All NHSN procedure categories	COLO and HYST
Procedures in patients <18 years	
Procedures in patients >=18 years	<input checked="" type="checkbox"/>
Superficial incisional primary (SIP) SSIs	
Deep incisional primary (DIP) SSIs	<input checked="" type="checkbox"/>
Organ/space (O/S) SSIs	<input checked="" type="checkbox"/>
DIP and O/S SSIs identified within 30 days after procedure (per protocol)	<input checked="" type="checkbox"/>
DIP and O/S SSIs identified > 30 days after procedure (per protocol)	
SSIs detected on current admission (A)	<input checked="" type="checkbox"/>
SSIs detected on follow-up admission to the same facility (RF)	<input checked="" type="checkbox"/>
SSI detected on follow-up admission to different facility (RO)	<input checked="" type="checkbox"/>
SSIs detected through post-discharge surveillance efforts (P)	<input checked="" type="checkbox"/>

Utility of SSI Event Indicators in Generating Analysis Reports

More About the SSI SIR Numerator: SSI Event Indicator

- Generate analysis report to identify SSI SIR numerator
 1. Select Analysis
 2. Select Reports
 3. Select Procedure-Associated Module folder
 4. Select SSI subfolder
 5. Select and Modify Line Listing-All SSI Events Report
- The Line Listing All SSI Events report may be modified for:
 - Time period
 - Procedure category
 - Any other modification option



More About the SSI SIR Numerator: SSI Event Indicator

- SSI event indicators help determine:
 - When SSI events are **included** in or **excluded** from the SSI SIR model numerator
 - SSI event indicators are SSI SIR model specific

Model-specific SSI Event Indicator	Description
Bs2_SSIAll	The indicator for All SSI SIR model for adult patients
Bs2_SSIPedAll	The indicator for All SSI SIR model for pediatric patients
Bs2_SSIComplex	The indicator for Complex A/R SSI SIR model for adult patients
Bs2_SSIPedComplex	The indicator for Complex A/R SSI SIR model for pediatric patients
Bs2_SSIComplex30d	The indicator for Complex 30-day SSI SIR model for adult patients

- SSI event indicator of **1** → SSI **included** in SIR model numerator count
- SSI event indicator of **0** → SSI **excluded** from SIR model numerator count

**SSI SIR Denominator Universal
Exclusion Criteria**

About the SSI SIR Denominator: Procedures

- SSI SIR denominator is calculated via procedure & facility details
- To minimize impact of data issues, universal exclusion criteria are applied to all procedures, prior to calculation
- **Universal exclusion criteria excludes procedures if:**
 - Patient age > 109 years at procedure date
 - Patient sex is not 'Female' or 'Male'
 - Adult patient body mass index (BMI) < 12 or BMI > 60
 - *Pediatric patient BMI < 10.49 or BMI > 65.79
- Separate analysis reports are available for outpatient procedures

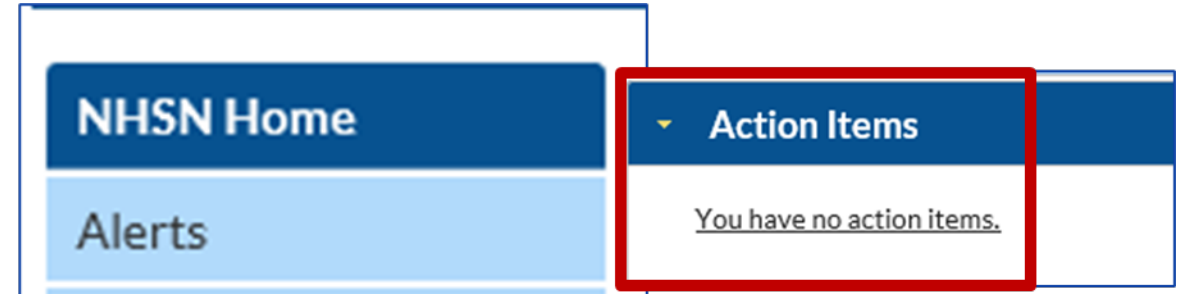
Universal Exclusion Criteria continued...

- Hip and knee procedures performed Jan 1, 2015-thru-Dec 31, 2015 if:
 - Procedure type is hemi joint replacement reported as a total revision or a total joint replacement reported as a partial revision
- Procedure form missing risk factors used in risk adjustment of SSI SIR denominator
- Procedures with duration less than 5 minutes or greater than IQR5 value
 - List of procedure duration cutoff points in the new SIR Guide:
<https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf>
- Procedures linked to event reported as PATOS = Yes

Complex 30-Day SSI SIR Report

Running NHSN Analysis Reports: Housekeeping Items

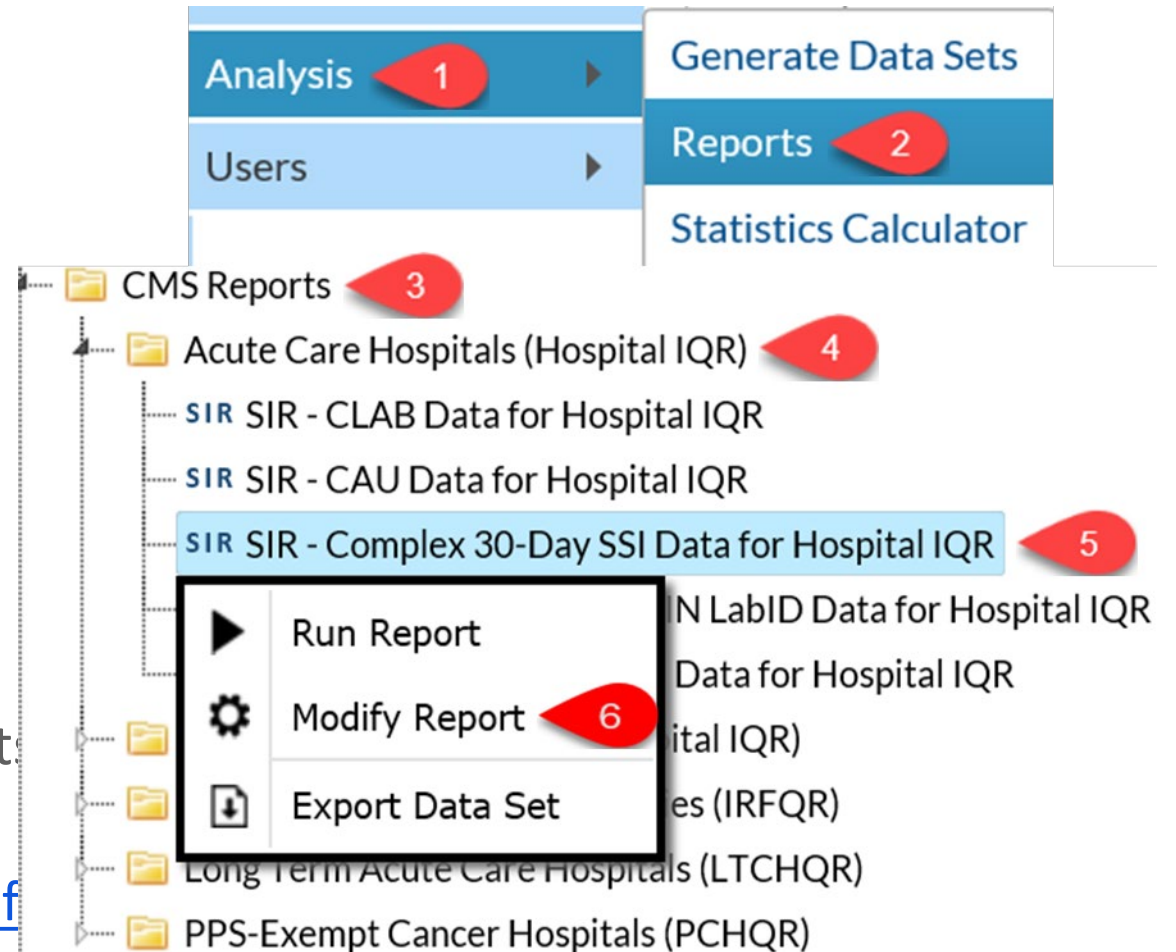
- Confirm all alerts are addressed
- New datasets are generated



A screenshot of the 'Generate Data Sets (Patient Safety)' interface. The title bar is light blue with a circular icon of a person in a blue uniform. Below the title bar, there is a green tab labeled 'Reporting Data Sets'. Under this tab, there is a section with a gear icon and the text 'Include data for the following time period:'. This section contains two date pickers: 'Beginning' with the date '01/2005' and 'Ending' with the date '09/2020'. Both date pickers have a small calendar icon and a '1' in a box. To the right of the date pickers is a blue button with a white 'X' icon and the text 'Clear Time Period'. Below the date pickers, there is a blue button labeled 'Generate Reporting Data Sets'. To the right of this button, there is a yellow box containing the text 'Last Generated: September 9, 2020 3:42 PM to include data beginning 01/2005 and ending 09/2020'.

How to Generate the Complex 30-Day SSI SIR Report

1. Select Analysis
 2. Select Reports
 3. Select CMS Reports
 4. Select Acute Care Hospitals (Hospital IQR)
 5. Select SIR Complex 30-Day SSI Data for Hospital IQR
 6. Click Modify Report
- Guidance on How to Modify Analysis Report
 - <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/howtomodifyreport.pdf>



How to Modify and Generate the Complex 30-Day SSI SIR Report

Modify "SIR - Complex 30-Day SSI Data for Hospital IQR"

☒ Show descriptive variable names ([Print List](#))

Analysis Data Set: bs2_SIR_Cmpx30dSSIProc

Type: SIR

Last Generated: [September 9, 2020 3:40 PM](#)

Title/Format

Time Period

Filters

Display Options

Time Period:

Date Variable

Beginning

Ending

Summary~Yr/Qtr

2019Q2

2019Q2

x

Clear Time Period

☐ Enter Date variable/Time period at the time you click the Run button

Modify "SIR - Complex 30-Day SSI Data for Hospital IQR"

☒ Show descriptive variable names ([Print List](#))

Analysis Data Set: bs2_SIR_Cmpx30dSSIProc

Type: SIR

Last Generated: [September 9, 2020 3:40 PM](#)

Title/Format

Time Period

Filters

Display Options

SIR Options:

Group by: Summary~Yr/Qtr

Run

Save...

Export...

Close

A Few Notes About the SSI SIR Reports

National Healthcare Safety Network

SIR for Complex 30-Day SSI Data for Hospital IQR by Procedure (2015 Baseline) - By OrgID/ProcCode

As of: November 12, 2020 at 5:45 PM

Date Range: All BS2_SIR_CMPX30DSSIPROC

orgid=15331 medType=G

Facility OrgID	CMS Certification Number	Procedure Code	Procedure Count	Summary Yr/Qtr	infCountComplex30d	numPredComplex30d	SIRComplex30d	SIRComplex30d_pval	SIRComplex30d95CI
15331	999999	COLO	11	2020Q2	0	0.213	.	.	.
15331	999999	HYST	32	2019Q2	0	0.249	.	.	.

1. Includes in-plan, inpatient COLO and HYST procedures in patients ≥ 18 years of age.
2. The SIR is only calculated if numPred is ≥ 1 . Lower bound of 95% Confidence Interval only calculated if infCount > 0 .
3. The number of predicted events is calculated based on 2015 national aggregate data. COLOs are risk adjusted for sex, age, ASA, BMI, diabetes, closure, and HOSP-ONC. HYSTs are risk adjusted for age, ASA, BMI, diabetes and HOSP-ONC.
4. Includes SSIs with an event date within 30 days of the procedure date.
5. Excludes all Superficial Incisional SSIs and Deep Incisional Secondary (DIS) SSIs.
6. Excludes SSIs reported as 'present at time of surgery' (PATOS).
7. Includes procedures and associated SSIs that are reported with either primary or other than primary closure techniques.

Source of aggregate data: 2015 NHSN SSI Data

Data contained in this report were last generated on November 12, 2020 at 4:54 PM to include data beginning January 2019 through November 2020 .

How to Interpret the Complex 30-Day SSI SIR Report

National Healthcare Safety Network

SIR for Complex 30-Day SSI Data for Hospital IQR by Procedure (2015 Baseline) - By OrgID/ProcCode

As of: September 14, 2020 at 3:07 PM

Date Range: BS2_SIR_CMPX30DSSIPROC summaryYQ 2019Q2 to 2019Q2

Facility Org ID=10000 Type of Affiliation=M

Facility Org ID	CMS Certification Number	Procedure Code	Procedure Count	Summary Yr/Qtr	infCountComplex30d	numPredComplex30d	SIRComplex30d	SIRComplex30d_pval	SIRComplex30d95CI
10000	31C0001043	COLO	★ 19	2019Q2	0	★ 0.465	.	.	.
10000	31C0001043	HYST	★ 10	2019Q2	0	★ 0.07	.	.	.

- SIR not calculated
- Minimum precision criterion for SIR denominator (\geq to 1) not met

1. Includes in-plan, inpatient COLO and HYST procedures in patients ≥ 18 years of age.
2. The SIR is only calculated if numPred is ≥ 1 . Lower bound of 95% Confidence Interval only calculated if infCount > 0 .
3. The number of predicted events is calculated based on 2015 national aggregate data. COLOs are risk adjusted for sex, age, ASA, BMI, diabetes, closure, and HOSP-ONC. HYSTs are risk adjusted for age, ASA, BMI, diabetes and HOSP-ONC.
4. Includes SSIs with an event date within 30 days of the procedure date.
5. Excludes all Superficial Incisional SSIs and Deep Incisional Secondary (DIS) SSIs.
6. Excludes SSIs reported as 'present at time of surgery' (PATOS).
7. Includes procedures and associated SSIs that are reported with either primary or other than primary closure techniques.

Source of aggregate data: 2015 NHSN SSI Data

Data contained in this report were last generated on September 9, 2020 at 3:38 PM to include data beginning January 2005 through September 2020.

Listen to Part Two: Understanding the Surgical Site Infection (SSI) Standardized Infection Ratio (SIR)

www.cdc.gov/nhsn/training/patient-safety-component/ssi.html

Resources

- SIR Guide
 - <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf>
- How to Modify a Report
 - <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/howtomodifyreport.pdf>
- How to run the SIR report: Standardized Infection Ratio (SIR) Table *Surgical Site Infections*
 - <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/sirtablelessi.pdf>
- Using the “SIR – Complex 30-Day SSI Data for Hospital IQR” Output Option
 - <https://www.cdc.gov/nhsn/pdfs/cms/ssi/cms-ipps-ssi-sir.pdf>

Additional Resources

- SSI SIR Troubleshooting Guides
 - <https://www.cdc.gov/nhsn/PS-Analysis-resources/reference-guides.html>
- Reporting Height and Weight for Procedures in NHSN
 - <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/Reporting-Height-and-Weight-for-Procedures-508.pdf>
- How do I create a line list of procedures?
 - <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/faq-procedure-line-list.pdf>
- Using the Statistics Calculator
 - <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/StatsCalc.pdf>
- Detailed Guides for Specific Analysis Options
 - <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/line-list-procedures-excluded-sir.pdf>
 - <https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/ssi-events-line-list-qrg.pdf>

Thank You

For any questions or concerns, contact the NHSN Helpdesk at nhsn@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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.

