



# The Standardized Infection Ratio (SIR) – What it is and Why you care

Healthcare Associated Infections  
Prevention Program

Florida Department of Health  
Bureau of Epidemiology  
June 23, 2011



# Outline

- NHSN Updates
- New FDOH NHSN User Group for sharing CLABSI data
- What is the SIR?
- Why use the SIR?
- How does the CLABSI SIR work?
- The SIR Analysis Output in NHSN
- How does the SSI SIR work?



# NHSN Updates – Annual Survey

- Issue with the Annual Survey since NHSN 6.4 was released at the beginning of June
- When completing annual survey, facility is asked to specify if they have an ASC location. The “No ASC operational...” box is grayed out and cannot be selected by facilities. Because ASC information is required, facilities are unable to save survey if they do not have an ASC.

# NHSN Updates – Annual Survey

If hospital includes an Ambulatory Surgery Center location, specify:  No ASC or not operational in this survey year

Setting: \*

Total number of procedures: \*

Percent of procedures that are surgical: \*  %

What percentage of your ambulatory surgery patients were discharged or transferred to the following places:

Home/Customary residence: \*  %

Recovery care center (facility other than this one): \*  %

Acute care hospital (Emergency or inpatient): \*  %

- If you do not have an ASC, do not complete the 2010 survey until further guidance is provided and a fix is identified
- Click the Cancel button on the survey pop-up and you will be able to do your other work in the system until NHSN fixes this issue and you can complete your Annual Survey



# NHSN Comparison Rates Updated

- National data for comparison in rate tables is now from 2009
- CAUTI comparison rates, which were previously unavailable due to the change in case definition in 2009, are now available

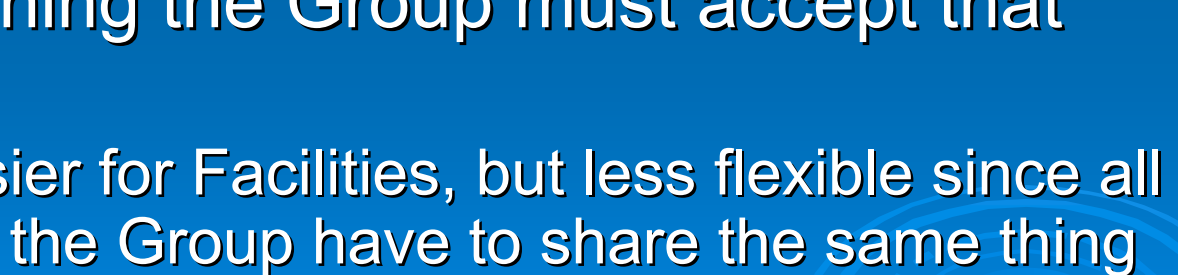


# CLABSI Data Submission Deadline

- CLABSI data must be submitted to NHSN by August 15, 2011
- There are several common errors I am still seeing in NHSN – make sure you are double checking your data!
  - Make sure you have a monthly reporting plan in place
  - After the end of the month, enter all summary data – regardless of whether or not you had any infections
- Summary data for NICUs must be entered stratified by birth weight – this includes patient-days and central line-days

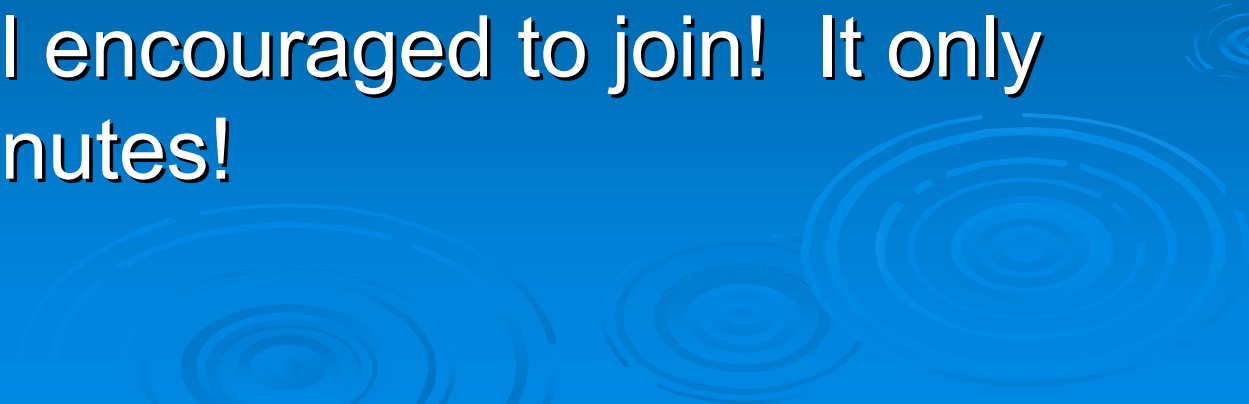


# New User Group Joining Process

- Before – when you joined a User Group, you picked which data you wanted to share
    - Good flexibility, but difficult for Groups to communicate to Facilities what data they should share and difficult for Facilities to figure out the form to select that data
  - Now – User Group creates a template and Facilities joining the Group must accept that template
    - MUCH easier for Facilities, but less flexible since all facilities in the Group have to share the same thing
- 



# New FDOH CLABSI User Group

- Solution to decreased flexibility is creating separate groups when different types of data is requested
  - SO – FDOH has created a new User Group for facilities willing to share CLABSI data from Critical Care areas
  - You are all encouraged to join! It only takes 5 minutes!
- 



# Join the FDOH CLABSI User Group

1. Sign a Data Use Agreement, fax it to FDOH and receive a copy signed by us as well
    - [http://www.doh.state.fl.us/Disease\\_ctrl/epi/HAI/NHSN\\_Data\\_Use\\_Agreement.pdf](http://www.doh.state.fl.us/Disease_ctrl/epi/HAI/NHSN_Data_Use_Agreement.pdf)
  2. Join the Group
  3. Accept the Confer Rights template
- 

# How to Join the Group

- Group ID: 20368
- Group Joining Password: FLBSI

**CDC** Department of Health and Human Services  
Centers for Disease Control and Prevention

NHSN - National Healthcare Safety Network

Logged into State Users of NHSN Memorial (ID 15634) as KATIEFL.  
Facility State Users of NHSN Memorial (ID 15634) is following the PS component.

## Memberships

Groups that have access to this facility's data

FDOH_CLABSI (20368)	Confer Rights	HELP
Health Management Associates (15834)		
NHSN State Users Test Group (15144)	Leave Group(s)	HELP
NHSN State Users Test Group #2 (20263)		

**1** ID and Password for this facility to join a new group

Group ID:

Group Joining Password:

**2** **3**

Join Group HELP

Back

**Left Sidebar:**

- NHSN Home
- Reporting Plan
- Patient
- Event
- Procedure
- Summary Data
- Import/Export
- Analysis
- Surveys
- Users
- Facility
- Group
  - Confer Rights
  - Join
  - Leave
  - Nominate
- Log Out

# Confer Rights



Department of Health and Human Services  
Centers for Disease Control and Prevention

NHSN - National Healthcare Safety Network

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Facility State Users of NHSN Memorial (ID 15634) is following the PS component.

## Confer Rights-Patient Safety

Facility 'State Users of NHSN Memorial' has successfully joined group 'FDOH\_CLABSI'. You should now confer rights to that group.

**! Please review the data rights that "FDOH\_CLABSI" is requesting from your facility:**  
- **Verify locations**  
- Press "accept" button to confer rights or [review current rights before accepting new rights](#)

[HELP](#)

**Patient Safety**    **Healthcare Personnel Safety**

General

View Options

- Patient
  - With All Identifiers
  - Without Any Identifiers
  - With Specified Identifiers  Gender  DOB  Ethnicity  Race
- Monthly Reporting Plan
  -
- Data Analysis
  -



### MDRO/CDI Events

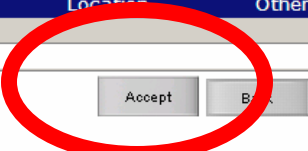
Plan	Month	Year	Month	Year	Location Type	Location	Other Location Requirements	Your Locations
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### MDRO/CDI Summary Data (Denominators)

Plan	Month	Year	Month	Year	Location Type	Location	Other Location Requirements	Your Locations
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### MDRO/CDI Process & Outcome Measures

Plan	Month	Year	Month	Year	Location Type	Location	Other Location Requirements	Your Locations
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# The Standardized Infection Ratio (SIR)



# Before the SIR



**Hospital A** is a major teaching hospital with a Med/Surgical ICU, a Level III NICU, a Trauma ICU, and a Cardiac ICU

What is the CLABSI rate in Hospital A?

# Before the SIR



Which hospital is doing  
a better job preventing CLABSI?

Hospital A is a  
major teaching  
hospital with a  
Med/Surgical ICU,  
a Level III NICU, a  
Trauma ICU, and a  
Cardiac ICU


Hospital B is not a  
teaching hospital –  
they have a  
Medical ICU and a  
Cardiac ICU

# What is the SIR?

- The Standardized Infection Ratio (SIR) is a measure that is used to compare how a hospital's infection rate or a unit's infection rate compares to a national standard
- NHSN now reports the SIR for CLABSI and SSI
- SIR may be used for CMS reporting in place of raw rates



# Why use the SIR?

- Summarize your data by more than one location or procedure
  - Adjusts for patients of varying risk within each facility
  - Easier to compare among internal and external stakeholders
- 

# What is the SIR?

- Compares the actual number of HAIs reported with the number that would be expected, based on aggregate national data, adjusting for risk factors known to be significantly associated with differences in infection incidence
- **An  $SIR > 1$  indicates that more HAIs were observed than expected**
- **An  $SIR < 1$  indicates that fewer HAIs were observed than expected**
- **An  $SIR = 1$  indicates that the number of HAIs observed was the same as the number expected**

# Interpreting the SIR

$$\text{SIR} = \frac{\text{Observed (O) HAIs}}{\text{Expected (E) HAIs}}$$

- Example: Your Medical ICU had 2 CLABSI last year but you expected to have 4.
- $\text{SIR} = 2/4 = \underline{0.5}$
- 0.5 is  $<1$ , so your Medical ICU is doing 50% better than expected!

# Interpreting the SIR

$$\text{SIR} = \frac{\text{Observed (O) HAIs}}{\text{Expected (E) HAIs}}$$

- Example: Your Surgical ICU had 7 CLABSI last year but you expected to have 5.
- $\text{SIR} = 7/5 = \underline{1.4}$
- 1.4 is  $>1$ , so your Surgical ICU is doing 40% worse than expected



# But Where Do the Numbers Come From?

- Number of Observed HAIs is straightforward
- What about number of Expected HAIs?
- We'll cover CLABSI first and then talk about the SIR for SSI...

**Don't Panic!  
NHSN does this  
math for you!**

# Number of Expected HAI - CLABSI

Type of ICU Location	# CLABSI	# Central Line-Days	CLABSI Rate	NHSN Rate	Expected # of CLABSI
Medical Cardiac	2	380	5.26	2	0.76
Medical	1	257	3.89	2.6	0.67
Med/Surgical	3	627	4.78	1.5	0.94
Neurosurgical	2	712	2.81	2.5	1.78
Total					

Unit  
Central Line-Days x NHSN Rate for Unit Type = Expected # of CLABSI

# Number of Expected HAI - CLABSI

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Sum # of CLABSI and Expected # CLABSI

# Number of Expected HAI - CLABSI

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Total	8				4.15

Sum # of CLABSI and Expected # CLABSI

# Number of Expected HAI - CLABSI

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Medical Cardiac	1	257	3.89	2.6	0.67
Med/Surgical	3	627	4.78	1.5	0.94
Neurosurgical	2	712	2.81	2.5	1.78
Total	8				4.15

$$\text{SIR} = \frac{\text{Observed (O) HAIs}}{\text{Expected (E) HAIs}}$$

$$\begin{aligned} \text{SIR} &= 8/4.15 \\ &= 1.93 \end{aligned}$$





# The CLABSI SIR Report in NHSN Analysis

- Several sections of output
- SIR for In-Plan Central Line-Associated BSI Data –
  - By OrgID (Facility wide)
  - By OrgID/Location Type
  - By OrgID/CDC Location Code
  - By OrgID/Location



Increasing  
Granularity

# The CLABSI SIR Report in NHSN Analysis

## National Healthcare Safety Network

### SIR for In-Plan Central Line-Associated BSI Data **By OrgID**

As of: June 17, 2011 at 10:23 AM

Date Range: All CLAB\_RATESALL

if {{{bsiPlan = "Y" } }}

orgid=15634

orgid	summaryYH	infCount	numExp	numCLDays	SIR	SIR_pval	SIR95CI
15634	2010H1	5	5.685	2721	0.88	0.5000	0.283, 2.052
15634	2010H2	15	5.343	2400	2.81	0.0000	1.570, 4.631

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

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

Source of aggregate data: NHSN Report, Am. Infect. C.

Data contained in this report

Look to see whether the p-value is <0.05 or whether the 95% Confidence Interval contains the value 1 to determine whether the SIR indicating "better" or "worse" is statistically significant

### Remember:

SIR < 1 means you're doing better than expected

SIR = 1 means you're doing as expected

SIR > 1 means you're doing worse than expected

# The CLABSI SIR Report in NHSN Analysis

## National Healthcare Safety Network

### SIR for In-Plan Central Line-Associated BSI Data - By OrgID/Location Type

As of: June 17, 2011 at 10:23 AM

Date Range: All CLAB\_RATESALL

if (((bsiPlan = "Y" ) ))

orgid=15634

orgid	locationtype	summaryYH	infCount	numExp	numCLDays	SIR	SIR_pval	SIR95CI
15634	ICU-OTHER	2010H1	5	5.685	2721	0.88	0.5000	0.283, 2.052
15634	ICU-OTHER	2010H2	15	5.343	2400	2.81	0.0000	1.570, 4.631

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

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

Source of aggregate data: NHSN Report, Am J Infect Control 2009;37:783-805

Data contained in this report were last generated on June 17, 2011 at 10:15 AM.

# The CLABSI SIR Report in NHSN Analysis

## National Healthcare Safety Network

### SIR for In-Plan Central Line-Associated BSI Data By OrgID/CDC Location Code

As of: June 17, 2011 at 10:23 AM

Date Range: All CLAB\_RATE\$ALL

if (((bsiPlan = "Y" ) ))

orgid=15634

orgid	loccdc	summaryYH	infCount	numExp	numCLDays	SIR	SIR_pval	SIR95CI
15634	IN:ACUTE:CC:CT_PED	2010H1	1	1.214	368	0.82	0.6600	0.011, 4.582
15634	IN:ACUTE:CC:CT_PED	2010H2	1	1.845	559	0.54	0.4500	0.007, 3.016
15634	IN:ACUTE:CC:M	2010H1	4	4.471	2353	0.90	0.5400	0.241, 2.291
15634	IN:ACUTE:CC:M	2010H2	14	3.498	1841	4.00	0.0000	2.186, 6.716

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

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

Source of aggregate data: NHSN Report, Am J Infect Control 2009;37:783-805

Data contained in this report were last generated on June 17, 2011 at 10:15 AM.

# The CLABSI SIR Report in NHSN Analysis

## National Healthcare Safety Network

### SIR for In-Plan Central Line-Associated BSI Data - By OrgID/Location

As of: June 17, 2011 at 10:23 AM

Date Range: All CLAB\_RATESALL

if (((bsiPlan = "Y" ) ))

orgid=15634

orgid	location	summaryYH	months	infcount	numExp	numcldays	SIR	SIR_pval	SIR95CI
15634	1 MICU	2010H1	6	4	4.471	2353	0.90	0.5400	0.241, 2.291
15634	1 MICU	2010H2	6	14	3.498	1841	4.00	0.0000	2.186, 6.716
15634	22ICU	2010H1	6	1	1.214	368	0.82	0.6600	0.011, 4.582
15634	22ICU	2010H2	6	1	1.845	559	0.54	0.4500	0.007, 3.016

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

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

Source of aggregate data: NHSN Report, Am J Infect Control 2009;37:783-805

Data contained in this report were last generated on June 17, 2011 at 10:15 AM.

# Things to Remember About the SIR



- The SIR output option will produce SIRs by half-year for 2009 and forward
- SIR will not be calculated for the current time period, as the time period is not yet complete
- If the number of expected HAI  $< 1$ , NHSN will not calculate the SIR – the comparison is too unstable
  - Consider using a longer time frame for your calculation to increase the # of central line-days
- If the number of observed HAI = 0, the lower bound of the 95% CI will not be calculated

# Calculating the SSI SIR

- The number of expected SSI for the SIR calculation is based on the procedure category and a logistic regression model using the national SSI data
  - This is different from how the previous SSI SIRs were calculated!
  - The new calculation allows for risk factors to be procedure-specific and to vary according to its significant association with risk

Factor	Parameter Estimate	OR	p-value
<i>Intercept</i>	-5.448	-	-
Age (≤44 vs >44)	0.520	1.659	<0.0001
ASA (3/4/5 vs 1/2)	0.425	1.529	0.0415
Duration (>100 vs ≤100)	0.501	1.650	0.0019
Med school affiliation (Y vs N)	1.069	2.912	<0.0001



# The SSI SIR Report in NHSN Analysis

- Several sections of output
  - Overall SIR
  - SIR for each procedure
  - SIR for each procedure, by outpatient (Y or N)
  - Incomplete and Custom Procedures not Included in SIR
- All SSI SIRs will include all procedures and superficial incisional primary (SIP), deep incisional primary (DIP), and organ/space SSIs. Secondary SSIs are not included (SIS, DIS).

# The SSI SIR Report in NHSN Analysis

Org ID	Summary Yr	Procedure Count	infCountAll	All SSI Model Number Expected	All SSI Model SIR	All SSI Model SIR p-value	All SSI Model 95% Confidence Interval
10018	2009	524	13	6.687	1.94	0.0196	1.150, 3.091

# Infections expected < 1

Org ID	Procedure Code	Summary Yr/Half	Procedure Count	infCountAll	All SSI Model Number Expected	All SSI Model SIR	All SSI Model SIR p-value	All SSI Model 95% Confidence Interval
10018	HPRO	2009H1	26	1	0.295	.	.	.
10018	HPRO	2009H2	102	0	1.432	0.00	.	.

# Caution with the SSI SIR!

- The All SSI SIR will exclude any procedure record that is missing  $\geq 1$  risk factor(s) relevant to that procedure category



## Appendix D: Predictive Risk Factors from the All SSI† Logistic Regression Models

NHSN Operative Procedure <sup>‡</sup>	Risk Factor(s) - ALL SSIs
AAA	duration
AMP	duration, hospital bed size*
APPY	emergency, gender, hospital bed size*, wound class
AVSD	age
BILI	asa, duration, hospital bed size*
BRST	asa, duration, hospital bed size*
CBGB/C	age, asa, duration, gender, hospital bed size*
CARD	age, asa, duration
CHOL	age, asa, duration, endoscope, wound class
COLO	age, anesthesia, asa, duration, endoscope, medical school affiliation*, hospital bed size*, wound class
CRAN	age, asa, duration, hospital bed size*, trauma
CSEC	age, anesthesia, asa, BMI, duration, emergency, labor, wound class
FUSN	approach, asa, diabetes, duration, medical school affiliation*, spinal level, trauma, wound class
FX	age, asa, duration, hospital bed size*, outpatient
GAST	asa, duration, emergency
HER	age, asa, duration, gender, outpatient
HPRO	age, anesthesia, asa, duration, total/partial/revision, hospital bed size*, trauma
HYST	age, anesthesia, asa, duration, endoscope, hospital bed size*
KPRO	age, anesthesia, asa, duration, gender, revision, hospital bed size*, trauma

# Caution with the SSI SIR!

- Obtain a detailed list of all non-Custom excluded procedures that are missing the required risk factors by using the Output Option “Line Listing – Incomplete Procedures for SSI SIR”

The screenshot displays a software interface with a tree view on the left and a list of options on the right. The tree view includes:

- Device-Associated Module
- Procedure-Associated Module
  - All Procedure-Associated Events
  - SSI
    - CDC Defined Output
- Post-Procedure PNEU
- MDRO/CDI Module - Infection Surveillance

The CDC Defined Output list includes the following options, each with 'Run' and 'Modify' buttons:

Line Listing - All SSI Events	Run	Modify
Frequency Table - All SSI Events	Run	Modify
Bar Chart - All SSI Events	Run	Modify
Pie Chart - All SSI Events	Run	Modify
SIR - Complex AR SSI Data by Procedure	Run	Modify
SIR - Complex AR SSI Data by Surgeon	Run	Modify
SIR - In-plan Complex AR SSI data by Procedure	Run	Modify
SIR - In-plan Complex AR SSI data by Surgeon	Run	Modify
SIR - All SSI Data by Procedure	Run	Modify
SIR - All SSI Data by Surgeon	Run	Modify
SIR - In-plan All SSI Data by Procedure	Run	Modify
SIR - In-plan All SSI data by Surgeon	Run	Modify
Line Listing - Incomplete Procedures for SSI SIR	Run	Modify

A red arrow points to the 'Line Listing - Incomplete Procedures for SSI SIR' option.



# More Information on the SIR

- Your Guide to the Standardized Infection Ratio (SIR) – NHSN e-News: SIRs Special Edition, October 15, 2010
- Available at:  
[http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN\\_NL\\_OCT\\_2010SE\\_final.pdf](http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN_NL_OCT_2010SE_final.pdf)



# Questions?

FDOH HAI Program

[HAI\\_Program@doh.state.fl.us](mailto:HAI_Program@doh.state.fl.us)