



## Guide to the NHSN Dialysis Event Surveillance Bloodstream Infection (BSI) Standardized Infection Ratio (SIR) Measure

### *What is a NHSN Dialysis Event Surveillance Bloodstream Infection (BSI)?*

A Dialysis Event Surveillance Bloodstream Infection (BSI) is defined as “any positive blood culture,” regardless of the suspected source of the culture (e.g., the patient’s vascular access or another source of infection).

Facilities following the [NHSN Dialysis Event Protocol](#) are required to report all positive blood cultures for their hemodialysis outpatients, including those specimens collected as an outpatient or collected on the day of or the day after a hospital admission. These positive blood cultures are reported regardless of whether a true infection is suspected or the infection is thought to be unrelated to hemodialysis.

### *What is the NHSN BSI measure?*

In the [NHSN Dialysis Event Protocol](#), the [NHSN BSI in Hemodialysis Outpatients Measure](#) is the standard for evaluating the number of positive blood cultures observed by a facility. Although other dialysis event types are reported to NHSN and calculated from the data, the BSI measure only assesses the number of positive blood cultures reported by a facility using a standardized infection ratio (SIR).

### *What is a standardized infection ratio (SIR)?*

The standardized infection ratio (SIR) is a ratio of the number of infections that are observed at a facility versus the number of infections that are predicted for that facility. The predicted values are based on national aggregate data.

$$SIR = \frac{\text{Number of Observed BSI}}{\text{Number of Predicted BSI}}$$

\*based on the [2014 national NHSN Dialysis Event baseline data](#) \*

### *What is the advantage of using a SIR instead of a rate?*

The SIR and corresponding rates serve different purposes. The SIR compares the number of BSIs that a facility reported compared to the number of infections predicted for that facility based on national aggregate data, across several vascular access type strata. Those data are summarized into a single number, which makes the SIR easier to use for evaluation purposes. In contrast, vascular access-specific BSI rates provide more detailed information about BSI occurrence in the different strata and can be meaningful in infection prevention efforts.

### *How is the SIR interpreted?*

The SIR is a ratio. If a facility reports an observed number of BSIs exactly equal to their predicted number of BSIs, the SIR is equal to 1. If a facility observed more BSIs than were predicted, the SIR is greater than 1. If a facility observed fewer BSIs than were predicted, the SIR is less than 1.

SIR > 1: more infections than predicted  
SIR = 1: same as predicted  
SIR < 1: fewer infections than predicted

### *How is the SIR calculated?*

A facility’s SIR is calculated by dividing their [Number of Observed BSIs](#) by their [Number of Predicted BSIs](#).

- **Number of Observed BSIs:** the total number of positive blood cultures that were reported by the facility to NHSN during a certain timeframe (e.g., calendar year 2017).



- **Number of Predicted BSIs:** a number calculated by multiplying the national aggregate BSI Rates Stratified by Vascular Access Type from NHSN Dialysis Event Data 2014<sup>1</sup>, by the facility’s number of patient-months for each vascular access category. The number of patient-months are equal to the summed number of patient-month denominators reported by the facility to NHSN during the timeframe of interest (e.g., calendar year 2014). The total number of patients at a facility and the number of patients in different vascular access categories factor into the calculation. For example, a facility with many patients will tend to have more predicted BSIs than a facility with few patients.

*Example Dialysis Event Bloodstream Infection (BSI) Standardized Infection Ratio (SIR) for 2016*

			<b>A</b>	<b>B</b>	<b>C = A x B</b>
<b>Summary Year</b>	<b>Vascular Access Type</b>	<b>Number of Observed BSIs</b>	<b>Patient-months</b>	<b>2014 NHSN BSI Rate/100 Patient-months</b>	<b>Number of Predicted BSIs</b>
2016	Fistula	0	114	0.26	0.30
2016	Graft	1	102	0.39	0.40
2016	Other Access	0	3	0.67	0.02
2016	Any CVC	3	72	2.16	1.56
<b>2016</b>	<b>All</b>	<b>4</b>	<b>291</b>	<b>.</b>	<b>2.28</b>

} Sum

In this example:

- In 2016, across all vascular access types, this facility observed 4 BSIs and 291 patient-months.
- Multiply (**A**) the number of patient-months for each vascular access type at the facility by (**B**) the BSI Rates Stratified by Vascular Access Type from NHSN Dialysis Event Data 2014, to calculate (**C**) the number of predicted BSIs for each vascular access type. These products (**C**) are then summed together for a total of 2.28 predicted BSIs for the facility.
- The SIR is calculated by dividing the number of observed BSIs (4) by the predicted number of BSIs (2.28).

$$SIR = \frac{\text{Number of Observed BSI}}{\text{Number of Predicted BSI}} = \frac{4}{2.28} = 1.75$$

- This ratio results in an SIR of 1.75, which means that this facility observed 75% more BSIs than were expected based on the national average.

**Can I calculate my facility’s SIR using NHSN Reports?**

The “SIR Table – Bloodstream Infection Data” report is located in the “Dialysis Events” folder and “SIR” sub-folder. It displays (**A**), (**C**), the number of observed BSIs for all access types (Events), and calculates the SIR.

SummaryYr	Months	In-Plan Patient Months	Events	Predicted BSI	SIR	95% Confidence Interval
2016	12	291	4	2.28	1.75	

\*\*\* Note: This report will include facility data that were in NHSN when data sets were generated, which may vary from what were sent to CMS for QIP if the facility’s data were modified after the quarterly reporting deadlines. \*\*\*

**How is the SIR used for the CMS ESRD QIP?**

For each facility eligible to participate in the Centers for Medicare and Medicaid Services (CMS) End Stage Renal Disease (ESRD) Quality Incentive Program (QIP), CDC may calculate a facility SIR and provide the data to CMS. CMS applies their scoring methodology, described in the year’s corresponding QIP rule. For questions about the QIP scoring methodology, please contact the QIP Helpdesk: [ESRDQIP@cms.hhs.gov](mailto:ESRDQIP@cms.hhs.gov).

<sup>1</sup> The 2014 national aggregate NHSN Dialysis Event Surveillance BSI rates are the aggregate pooled means from over 6,000 outpatient hemodialysis facilities that reported to NHSN in 2014. These data are referred to as the “baseline.”