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Clostridium difficile Infections (CDI) Reporting in Illinois Acute Care Hospitals, 2012 - 2014

As of January 1, 2012, all Illinois hospitals began mandated reporting of cultures positive for *Clostridium difficile* Infections (CDI) using the Center for Disease Control and Prevention's National Healthcare Safety Network (NHSN) Multidrug-Resistant Organizm (MDRO) Laboratory-identified (LabID) Event module. The LabID event surveillance method enables facilities to report proxy measures for healthcare acquisition of infections based on data obtained from the laboratory without clinical evaluation of the patient.

Clostridium difficile Infections data are summarized using the standardized infection ratio (SIR), a summary statistic used to measure relative difference in healthcare facility-onset (HO) CDI LABID Events occurrence during a reporting period, compared to a common referent period (national data collected during 2010-2011).[1] The standardized infection ratio adjusts for factors found to be significant in predicting HO CDI infections such as, the type of testing used at the facility, medical school affiliation, facility bed size, and the prevalence rate of Community Onset (CO) CDI using a risk model.[1] For additional information on Standardized Infection Ratios (SIRs), and confidence intervals (CIs), see the methodology section of the Illinois Hospital Report Card website.
http://www.healthcarereportcard.illinois.gov/contents/view/methodology

Table 1. Summary of NHSN CDI in Illinois acute care hospitals, 2012-2014

Reporting Year	# of Facilities Reported	Number of CDIs		Standardized Infection Ratio (SIR)	95% Confidence Interval (SIR)		Statistical Interpretation (compared to National baseline)
		Observed	Predicted		Lower	Upper	
2012	179	4620	4994.79	0.925	0.899	0.952	Lower
2013	183	4466	4939.25	0.904	0.878	0.931	Lower
2014	183	4640	4661.34	0.995	0.967	1.024	Similar

Table 1 provides a summary of CDI in Illinois acute care hospitals from 2012 through 2014. In 2014, there were 4640 CDI reported compared to 4661 predicted, for an SIR of 0.995 (95% CI 0.967, 1.024), which is statistically similar compared to the national referent period noted above.

Joinpoint Trend Analysis:

Trends in CDI SIR in Illinois Acute Care Hospitals were analyzed using Joinpoint regression version 4.1. Joinpoint regression program is a trend analysis software developed by the US National Cancer Institute for the analysis of data from the Surveillance Epidemiology and End Results Program.[2] The joinpoint program is used to find the best-fit line through several years of data. This method describes changes in data trends by connecting several different line segments on a log-scale at ''joinpoints.''

Analysis starts with the minimum number of joinpoints (i.e., 0 joinpoint, representing a straight line) and tests whether more joinpoints are statistically significant and must be added to the model.
Tests of significance use a Monte Carlo permutation method with each joinpoint denoting a statistically significant (p = .05) change in trend (refer to Table 3 and Figure 1 for the Joinpoint result for CDI from 2012 – 2014). [2]

In addition, an annual percent change (APC) in SIR values for each line segment and the corresponding 95% confidence interval were estimated. The APC is tested to determine whether a difference exists from the null hypothesis of no change (0%). [2] Refer to Table 3 for the APC for CDI.

NOTE: For CDI SIR, quarterly NHSN HAI data was used for joinpoint analysis. Annual percent change (or APC) references quarterly percent change throughout report.

Table 2. Trend of CDI SIRs in Illinois acute care hospitals, 2012 – 2014 (by quarter)

CDI	2012				2013				2014			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Observed	0.94	0.90	0.92	0.92	0.94	0.83	0.89	0.93	1.10	0.98	0.93	0.97
Modeled	0.90	0.91	0.92	0.92	0.93	0.94	0.94	0.95	0.96	0.96	0.97	0.98

Figure 1. Trend of CDI SIRs in Illinois acute care hospitals, 2012 – 2014 (by quarter)

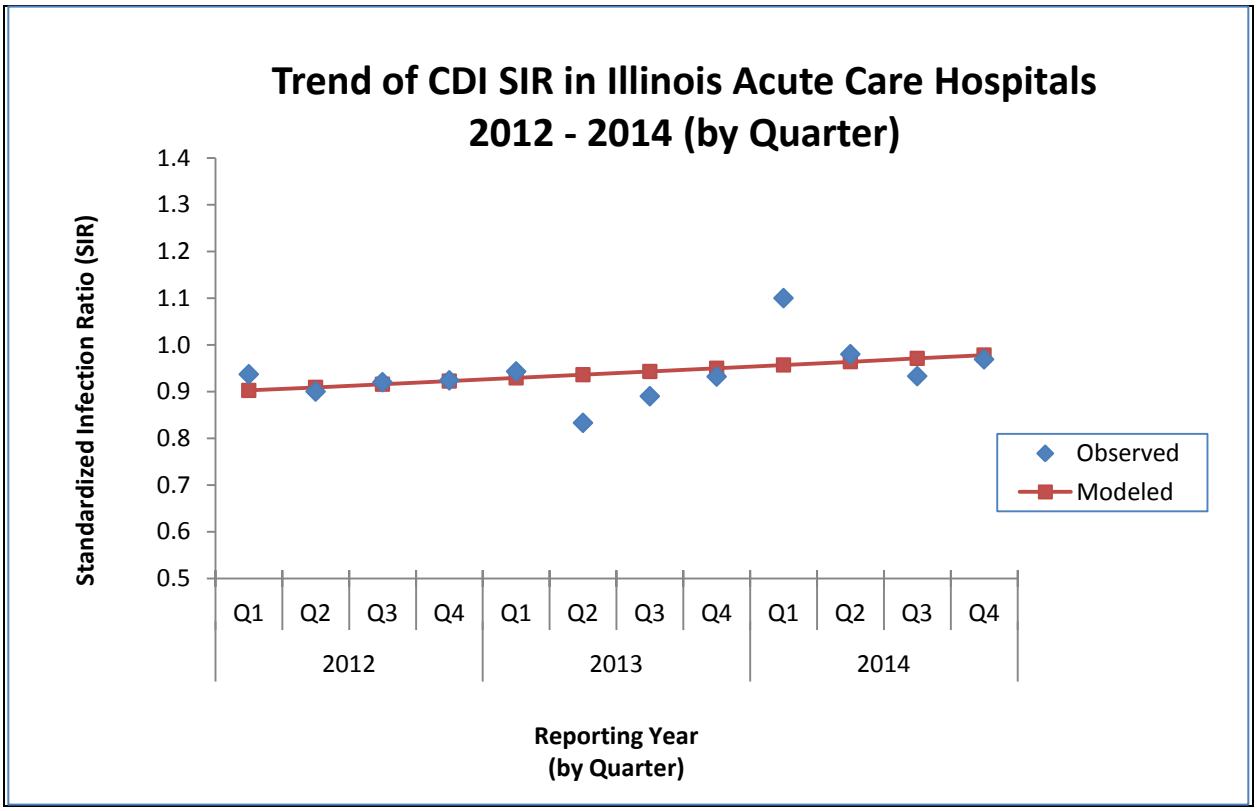

Table 3. Percent Change in CDI SIRs, 2012 - 2014

Trend Range (Reporting Year)	% change (SIR) 95% Confidence Interval	p-value (SIR)	Quarterly Percent Change (APC) * 2012 - 2014	p-value (APC)	Statistical Interpretation
2012 vs. 2013	-2.3% (0.938, 1.019)	0.279	**0.74%**	**0.1992**	The average quarterly percent increase of 0.7% is not significantly different than 0 at alpha = 0.05
2013 vs. 2014	10.1% (1.057, 1.147)	0.000 ^			
2012 vs. 2014	7.6% (1.033, 1.121)	0.0004 ^			

^ The percent change is significantly different from zero at alpha = 0.05

Summary

In 2014, there were 4640 CDI reported compared to 4661 predicted, for an SIR of 0.995 (CI 0.967, 1.024), which is statistically similar compared to the national referent period. When compared to previous years, there was a decrease of 2% from 2012 to 2013 and a significant increase of 10% from 2013 to 2014.

According to the results of the Joinpoint analysis, it was determined that Illinois SIRs for CDI have been steadily increasing on average of 0.74% per quarter for the 3-year period of 2012 through 2014 (Table 3). However, this quarterly percent increase in CDI SIR is not statistically significant (p-value = 0.199).

References:

[1] Dudeck MA, Weiner LM, Malpiedi PJ, et al. Risk Adjustment for Healthcare Facility-Onset C. difficile and CDI Bacteremia Laboratory-identified Event Reporting in NHSN. Published March 12, 2013. Available at: http://www.cdc.gov/nhsn/pdfs/CDI-cdi/RiskAdjustment-CDI-CDI.pdf

[2] Kim HJ, Fay MP, Feuer EJ, Midthune DN. Permutation tests for joinpoint regression with applications to cancer rates. Stat Med 2000;19:335–5