Meaningful Definition of the Standardized Infection Ratio

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To be useful to consumers, data for hospital associated infections (HAI) must be both understandable and meaningful. Currently, the Standardized Infection Ratio (SIR) is used to clarify the data. This is a ratio of the number of “Observed HAI” to the number of “Expected HAI”, and thus, the expected or predicted SIR for a facility is equal to 1.0.1

It is our contention that in risk adjustments, only metrics for patient care factors should be factored into the equation. Metrics which primarily reflect facility factors which are associated with a high risk of infection should not be used to adjust the data. One of the purposes of public reporting is to identify differences in facilities not to adjust for those differences. Thus, the use of factors such as bed size of patient care location and medical school affiliation should be questioned.

Surgical Site Infections (SSI): Risk factors used to adjust Surgical Site Infection (SSI) rates include but are not limited to age, ASA, duration, hospital bed size, BMI, emergency, gender, trauma, and medical school affiliation. 2 The risk factors vary with the type of procedure.1,2 Overlapping risk factors which can be highly correlated, such as age and ASA, should only be used to gather with caution. Researchers have recommended incorporating both factors into a combined grading system.3 A major adjustment factor to be factored in the calculation of SIRs for surgical site infections is affiliation with a medical school. One could interpret this to mean that there is a significant risk of infection if a patient is admitted to a University Hospital. An example of an logistic regression model similar to that used to calculate SIRs for SSIs is shown below:

\[
\logit (\beta) = a + \hat{b}_1 X_1 + \hat{b}_2 X_2 + \hat{b}_3 X_3 + \ldots + \hat{b}_n X_n
\]

Central Line Associated Blood Stream Infections (CLABSI):

Both affiliation with a medical school and bed size of patient care location are used to adjust the SIRs for CLABSI.2,4 The adjustment for affiliation with a medical school is considerable, effectively erasing more than one in five CLABSI’s reported in “Medical Major Teaching” facilities as compared to “Medical All Others”.5 The following baseline data is used to adjust facility CLABSI SIRs:

- Medical, major teaching – 2.6 CLABSI per 1,000 central line days
- Medical, all others – 1.9 CLABSI per 1,000 central line days

Data from 2006 through 2008 is currently used to determine the expected rate for CLABSI in Intensive Care Units. One could argue that this data was collected before the widespread adoption of public reporting and protocols used to prevent CLABSI and that these rates are too high to reflect current clinical outcomes.

The 2010 CDC risk-adjusted aggregate state data (all bed locations) varied widely with a median of 0.685 and a 2.5 times difference between the best and worst performing state (See Figure 1).4,6 The “Expected SIR” is set such that 95% of the states fall into an accepted category (SIR < 1).

The data in Figure 1 was derived from both states that have a high percentage of reporting facilities and from states that are virtual Data Deserts. An analysis was performed on the 2010 aggregate state CLABSI data reported by the CDC to control for a possible bias that in Data Desert states only high functioning facilities report data. No significant difference was observed between Data Desert states having less than or equal to 20.7% of facilities reporting (N=12). The SIRs were 0.678 and 0.715, respectively (See Figure 3).

A clearer and more useful consumer definition is recommended. The SIR should reflect what is “Obtainable” and not “Expected”. To estimate an “Obtainable SIR”, individual facility “Expected SIRs” from 1599 facilities from 50 States and the District of Columbia with at least 1 predicted CLABSI were analyzed. Facility data was reported to the NHSN in 2011. A skewed distribution was found with the peak approximating an SIR of 0.35. In 473 facilities, the SIR equalled zero and in 49 facilities the SIR was greater than 2 (See Figure 2).

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Such an analysis should be used to calculate an “Obtainable SIR” whose value is set to 1.0. The remainder of the facility SIRs can then be adjusted accordingly to facilitate meaningful use of the data.

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