National Center for Emerging and Zoonotic Infectious Diseases

Introduction to the NHSN Re-baseline

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Objectives

- Describe the history and current status of the rebaseline
- Understand the high-level aspects of the new risk-adjustment methods and models
A “Warm Up”

- Consider the next 30 minutes a “warm-up” for the analysis presentations you’ll hear this week
  - Overarching analysis and implementation methods for the 2015 SIR baseline
  - Reasoning behind some changes
The Rebaseline: A brief history

- Rebaseline: CDC’s term for the process of determining a new baseline year, as well as the assessment and employment of new risk models, for the calculation of SIRs.
- Planning began in 2014, when 2015 was determined to be the new baseline year for SIRs.
  - 2015: Preparations began – education, communications, implementation process, data quality work, etc.
  - 2016: Analysis year – included preliminary and final risk modeling, validation, implementation of models
  - 2017: Ongoing education, production of manuscripts, etc.
"The Rebaseline 200": New Models Developed at CDC

<table>
<thead>
<tr>
<th>HAI</th>
<th>ACHs</th>
<th>CAHs</th>
<th>LTACHs</th>
<th>IRFs</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLABS (non-MBI)</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Central Line SUR</td>
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<tr>
<td>MBI</td>
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<tr>
<td>CAUTI</td>
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<tr>
<td>Urinary Catheter SUR</td>
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<tr>
<td>VAE</td>
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<tr>
<td>Ventilator SUR</td>
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<tr>
<td>&quot;All SSI&quot; Models – Adults</td>
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<tr>
<td>&quot;All SSI&quot; Models - Peds</td>
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<tr>
<td>&quot;Complex A/R&quot; Models – Adults</td>
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<tr>
<td>&quot;Complex A/R&quot; Models – Peds</td>
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<tr>
<td>&quot;Complex 30-day&quot; Models – Adults (COLO and HYST)</td>
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<tr>
<td>CDI LabID</td>
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</table>

Each procedure category assessed separately, inpatient only.
Basis for Using SIRs

- The SIR is a risk-adjusted composite measure that allows for scalability
  - For Example: An overall CLABSI SIR can be provided for a hospital with multiple ICUs. Without the SIR, CLABSI data would have to be provided in the form of location-specific rates.

- Use of the SIR requires a baseline, from which progress can be measured
  - The baseline remains static for a number of years

- At some point, the baseline must be updated
  - No set standard on when to update a baseline
  - Decision on the timing of updating a baseline may be driven by policy, HAI surveillance definitions, etc.
The Baseline

- Data reported to NHSN for CY2015 is the new baseline for SIRs
  - CY2015 data were used to develop new risk models
- Will the baseline be updated every year?
  - CDC does not have plans to update the baseline every year
  - Contributing facilities and HAI surveillance definitions and protocols are expected to remain stable for a number of years
  - Frequently updating the baseline would hinder the ability to measure progress and assess trends at the local, state, and national level
New Risk-adjustment

- “Do the new models take into account…”
  - We can assess what we collect, at the level it’s collected
  - NHSN provides and maintains standard surveillance protocols used to report data to NHSN
- Risk-adjustment is performed at the national level (i.e., using data from all facilities reporting to NHSN throughout the U.S.)
- Not all collected factors were found to be statistically significant, therefore, not all potential factors were kept in the final models
- Significant factors differ depending on the HAI and/or setting
The Rebaseline: Modeling Approach

- Used in-plan data reported to NHSN for January – December 2015 (reported by May 16, 2016)
  - Why May 16th? 2015Q4 Deadline for CMS QRPs, representing most complete data available
- Included facilities from all states, territories, and DoD installations
- Decisions made a priori regarding which factors should or should not be considered potential risk factors in the model
- Data cleaning and outlier detection was performed prior to modeling work
- Lead analysts applied consistent overarching methods and analytic approach
Consistency Explained: Methods vs. Models

- Consistency was applied in the methods used to develop models
  - Includes consistency in which variables were *not* considered due to a priori decisions
- During modeling, each HAI and setting was considered independently from the rest
  - Significant risk factors, and the manner in which they are used, differ across the models
The Rebaseline: Modeling Approach

- Modeling approach consisted of three phases:
  - Phase 1: Forward Stagewise Selection
  - Phase 2: Backward Elimination Validation
  - Phase 3: Bootstrap Validation

- Two types of models used:
  - **Negative binomial regression**: CLABSI, MBI, CAUTI, VAE, MRSA LabID, CDI LabID
  - **Logistic regression**: SSI, SURs
Intercept-only Models

- A few models developed with the 2015 baseline are intercept-only
- “Fancy” term for a model with no statistically significant risk factors (i.e., a regression model without predictors)
  - Think of this like a crude, unadjusted rate
- SIRs are still calculated when an intercept-only model is available
The Case of “No Model”...

- No outcome = no model
- Some cases where there were no in-plan HAIs reported, therefore no risk models were produced:
  - VAE (incl. Total VAE and IVAC Plus): IRF
  - IVAC Plus: CAH
  - MBI: IRF, LTACH, CAH
  - Up to 18 procedure categories with no Pediatric SSI model
- In these scenarios, no SIRs are available/produced.
Beyond Pooled Mean Rates and DURs

- For some events, NHSN has relied on SIRs for national comparison:
  - SSIs: SIRs in use since 2010
  - MRSA bacteremia and CDI LabID: SIRs in use since 2012
- With implementation of 2015 baseline, DA data are produced in the same way
  - Risk models for DA events provide improved risk-adjustment over the risk-stratified pooled mean rates
  - National pooled mean rates and DURs will not be produced annually
  - Hospitals can continue to obtain their own location stratified rates and DURs
How have SIRs changed?

- SIRs available for more HAIs and settings than previously
- Improved risk adjustment over previous models and methods
- More current baseline year = more current definitions + more timely national HAI incidence
- Change varies depending on HAI, setting, and your hospital’s experience
- 2015 baselined SIRs should be measured independent from the previous SIRs
What has remained the same?

- SIR is only calculated when the predicted # of infections is greater than or equal to 1
- SIR remains a valuable, risk-adjusted, scalable measure
- Same types of statistics provided in SIR reports as was provided previously
- Progress can be measured from the baseline time period

\[
SIR = \frac{\# \text{ observed HAIs}}{\# \text{ predicted HAIs}}
\]
Old Baseline = Old Rules!

- Original baselines are referred to as “Baseline Set 1”
  - Output options in NHSN will be moved to a “Baseline Set 1” folder
  - All Baseline Set 1 SIRs will be calculated *through* 2016 data
  - All analysis datasets used to calculate the baseline set 1 SIRs will be renamed and prefaced with “bs1_”

- All Baseline Set 1 reports will use old rules
  - Example: MBIs are included in BS1 output
  - Example: PATOS = Y SSIs are included in BS1 output
NHSN v8.6: Postponed Rebaseline Reports

- Due to the extensive nature of implementing the new baseline, some reports had to be postponed for a couple of months.
  - The following appear on the list of Reports, but are not yet available and will not produce any results at this time:
    - Bar Chart - All MBI CLABSI Events
    - Pie Chart - All MBI CLABSI Events
    - Run Chart - MBI-CLABSI Data (ICU/Other)
    - Run Chart - MBI-CLABSI (SCA/ONC)
    - Rate Table - MBI-CLABSI Data (NICU)
    - Run Chart - MBI-CLABSI Data (NICU)
    - TAP Report - IRF CDI LabID Data
    - TAP Report - LTAC FACWIDEIN CDI LabID data
NHSN v8.6: Postponed Rebaseline Reports

- Due to the extensive nature of implementing the new baseline, some reports had to be postponed for a couple of months.
  - The following will be added in the **Summer, 2017**:
    - Device-associated Standardized Utilization Ratios (SURs), all device types and settings
    - Mucosal Barrier Injury (MBI) SIRs

- Posted in December, 2016 – updated in January 2017
- Describes the SIR and related statistical measures
  - Model types
  - P-values
  - 95% Confidence Intervals
  - Example interpretations

- Includes a detailed Supplement (beginning on page 15)
  - Model details for each HAI
  - Organized by HAI, then setting (e.g., ACHs, IRFs, etc.)
  - Does not include details on the “All SSI” or “Complex A/R SSI” Models
- Methods and complete results will be published this year
More to Come this Week...

- Learn how to use, modify and interpret various reports in NHSN
- Learn more about the risk adjustment methods and models for different HAI s
- Learn about special inclusions/exclusions in the SIRs