Antimicrobial Stewardship News

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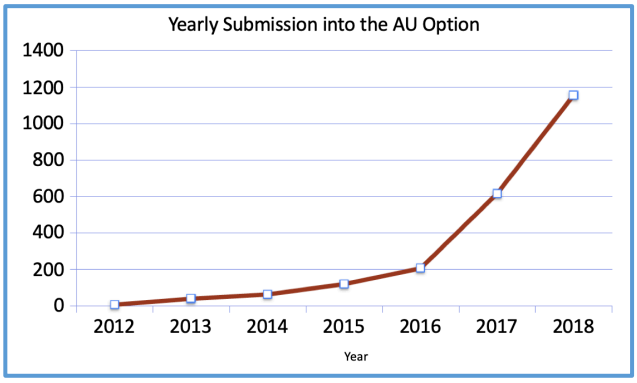
Updates to the NHSN AU Option: New Standardized Antimicrobial Administration Ratio (SAAR)

Introduction

The National Healthcare Safety Network's (NHSN) Antimicrobial Use (AU) Option is a secure, internet-based surveillance system used to collect AU data and provide a national benchmark for comparison.[1] The AU Option provides participating hospitals with a standardized metric to compare local AU to a national benchmark, the standardized antimicrobial administration ratio (SAAR). The original SAAR predictive model was developed in 2014 when the number of hospitals reporting AU data to the NHSN was relatively small. Over the last several years, the number of hospitals reporting AU data to the NHSN has increased substantially (Figure 1); therefore, the SAAR predictive model was recently updated using data from a larger and more diverse group of hospitals in order to produce more meaningful and accurate values.

This newsletter reviews the changes between the 2014 and 2017 SAAR predictive models and describes the impact of these changes at DASON hospitals.

Figure 1. Number of Facilities Reporting AU Data to the NHSN AU Option by Year



What is a "SAAR"?

The SAAR is a metric that compares observed antimicrobial days of therapy (DOT) to predicted DOT for specified groups of antimicrobials being used in specified patient care locations. The purpose of the SAAR is to summarize AU data and allow for inter-hospital comparison including some limited risk-adjustment for facility-level factors. The intended use of the SAAR is to allow stewardship champions to quickly identify targets (e.g., hospital units or antimicrobial categories) for further investigation.

$$\text{SAAR} = \frac{\text{Observed Antimicrobial Use}}{\text{Predicted Antimicrobial Use}}$$

The SAAR is a ratio, and values are always greater than zero. Below, we highlight how to appropriately interpret a SAAR result:

- If SAAR <1.0, then AU is lower than the predicted rate
- If SAAR >1.0, then AU is higher than the predicted rate
- If SAAR = 1.0, then AU is equivalent to the predicted rate

How has the "SAAR" changed?

The original SAAR model was developed in 2014 using data from 77 acute care hospitals including 350 adult and 33 pediatric locations. Nineteen (25%) of those hospitals were community hospitals from a single health system in the Midwest, and another 50% were Veteran's Affairs hospitals. Our December 2016 DASON Newsletter describes how this comparator group used in the original predictive model differs from DASON hospitals and highlights limitations of SAAR reporting.

In the 2017 update, several changes were made to the predictive model. Table 1 highlights key changes in the 2017 update.

Table 1. Key Updates to 2017 SAAR Predictive Models

New patient care locations added: • adult general hematology-oncology wards • adult step-down units
New risk adjustment variables assessed: • percentage of ICU beds / total beds • average length of stay
Larger sample size of data analyzed in the model: • adults: 449 hospitals and 2,156 patient locations • pediatrics: 109 hospitals and 170 patient locations
Changes to the SAAR antimicrobial categories

Several notable changes were made to the SAAR antimicrobial categories that warrant further discussion. First, new antimicrobial categories were added that may provide further insight on local AU:

1. Narrow-spectrum beta-lactam agents
2. Antibacterial agents posing the highest risk for CDI (*Clostridioides difficile* infection)
3. Antifungal agents predominantly used for invasive candidiasis
4. Azithromycin (pediatrics only)

For the complete summary of the changes made to the SAAR antimicrobial categories, please visit the CDC's website.

Second, agents used to treat infections caused by multidrug-resistant organisms (MDROs) (e.g., colistin, polymyxin B, tigecycline, ceftazidime/avibactam, and ceftolozane/tazobactam) were removed from the hospital-onset agent group due to the fact that a SAAR for this group would be of little value since use was very low and there was little variations among hospitals. Note, these agents are still included in the DASON Antimicrobial Stewardship Assessment Portal (ASAP) under the clinical cluster "MDR Gram-negative".

Third, a new category, "antibacterial agents posing the highest risk for CDI", was created with the intent to provide a meaningful comparison with local CDI rates and collaboration with infection prevention colleagues. We encourage DASON hospitals to use these data in collaboration with local infection preventionists to inform *Clostridium difficile* infection initiatives.

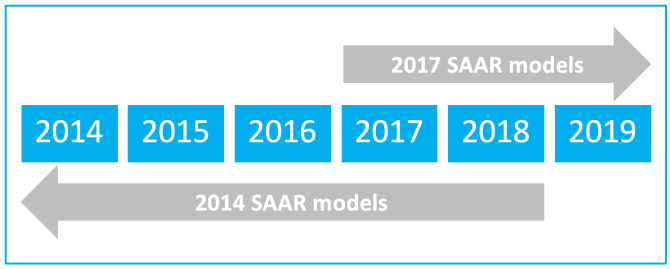
Lastly, new risk adjustment variables, including the percentage of ICU beds to total beds and the average hospital length of stay, were included in the new SAAR predicative model. Tables 2 and 3 highlight the new risk adjustment variables included in the new SAAR predictive model by SAAR antimicrobial category.

How will these changes affect my hospital?

First, it is important to recognize that local SAAR values will likely change with the new prediction model. The new model was developed from a larger and more recent data set, and new patient locations and risk adjustment variables were added.

Second, direct comparisons of old and new baseline SAAR values should be interpreted with caution. For example, a 2014 SAAR value should not be directly compared with a 2017 SAAR value without providing additional context of the changes in methodology. Figure 2 outlines which SAAR values can be calculated and output from the NHSN based on the reporting year.

Figure 2. Available SAAR Models by Reporting Year



Third, new SAARs will be available for hospitals reporting AU for adult step-down or adult hematology/oncology units. If your hospital currently has units in either of these categories, you will now be able to generate SAARs for these units individually. Table 4 highlights patient care locations with individual SAARs.

Table 4. Patient Care Locations with 2017 SAARs

Adult	Pediatric
Medical Ward	Medical Ward
Surgical Ward	Surgical Ward
Medical/Surgical Ward	Medical/Surgical Ward
Medical ICU	Medical ICU
Surgical ICU	Surgical ICU
Medical/Surgical ICU	Medical/Surgical ICU
Step-down	
Hematology/Oncology	

Fourth, adult and pediatric patient populations were modeled separately in the 2017 update. Due to the fact that AU differs substantially between adult and pediatric patient populations, the new model will likely produce SAAR values that are more meaningful for pediatric units.

Take Home Points:

- The SAAR is a metric comparing observed antimicrobial DOT to predicted DOT for specified groups of antimicrobials being used in specified patient care locations.
- The original (2014) SAAR prediction model used AU data from 77 hospitals, many of which were not comparable to DASON community hospitals.
- The new (2017) SAAR prediction model uses AU data from a larger and more robust dataset and includes more patient locations, new antimicrobial categories, and new risk adjustment variables to provide a more meaningful national benchmark.

DASON 2018 Benchmark Reports:

DASON will soon be distributing annual antimicrobial use benchmark reports to sites. We want to make you all aware of two major methodological changes made to the benchmark reports for calendar year 2018. First, we changed the denominator (patient days) source from metrics calculated locally by infection prevention (IP) to an electronic bedflow source. All timeline trends have been calculated with the new denominator information. While the actual AU point estimates may look different from prior DASON benchmark reports, all time-trend comparisons are being made on data from the same source for the 2018 reports. Second, we eliminated units housing mothers and babies from the DASON benchmark to allow for better between-facility comparisons. This change will likely result in higher facility-wide AU rates than previously reported at sites with large mother/baby populations and provide hospitals without large mother/baby units with more meaningful facility-wide AU comparisons.

References:

1. Center for Disease Control and Prevention Antimicrobial Use and Resistance (AUR) Module. January 2019. Available at: https://www.cdc.gov/nhsn/pdfs/pscmanual/11pscaurcurrent.pdf.

Table 2. Risk Adjustments for 2017 Adult SAAR Model

Factor	BSHO	BSCA	GramPos	NSBL	Fungal	CDI	All
Location type	✓	✓	✓	✓	✓	✓	✓
Facility type	✓	✓	✓		✓	✓	✓
Medical school affiliation	✓					✓	
Total number of hospital beds		✓	✓	✓	✓	✓	
Total number of hospital ICU beds	✓				✓	✓	
Percentage of hospitals that are ICU beds		✓		✓			
Average hospital length of stay	✓	✓	✓	✓	✓	✓	✓

Table 3. Risk Adjustments for 2017 Pediatric SAAR Model

Factor	BSHO	BSCA	GramPos	NSBL	Azithro	Fungal	CDI	All
Location type		✓	✓		✓	✓	✓	
Facility type		✓					✓	
Medical school affiliation	✓			✓				
Total number of hospital beds		✓		✓	✓		✓	✓
Total number of hospital ICU beds								
Percentage of hospitals that are ICU beds	✓					✓		✓
Average hospital length of stay							✓	✓

BSHO, broad-spectrum antibacterial agents predominantly used for hospital-onset infections
BSCA, broad-spectrum antibacterial agents predominantly used for community-acquired infections
GramPos, antibacterial agents predominantly used for resistant Gram-positive infections (e.g., MRSA)
NSBL, narrow-spectrum beta-lactam agents
CDI, antibacterial agents posing highest risk for Clostridium difficile infection (CDI)
Fungal, antifungal agents predominantly used for invasive candidiasis
Azithro, azithromycin