



Methods for Assessing and Comparing Prescribing Quality

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Why Compare?

- “Since we do not possess an inherent ability to judge the value of something in isolation, we determine value by comparing and contrasting one thing to another.”
- Would you drive ten minutes out of your way to save €10 on a €25 blanket?
- Would you drive ten minutes out of your way to save €10 on a €125 jacket?

<http://www.uxmatters.com/mt/archives/2011/01/the-power-of-comparison-how-it-affects-decision-making.php>

Why Compare?

- €10 is €10.
- But the relative worth of €10 can influence our behavior.
- It's true in behavioral economics.
- It's true for healthcare associated infections.
- It's probably true for antibiotic use

Now Consider This

- Would you intervene aggressively on carbapenem use that's dropping by 5% per year?
- Would you intervene aggressively on carbapenem use that's dropping by 5% per year, but that was three times higher than in other hospitals like yours?
- “Knowing that our use is higher than others, rather than just thinking that it is, helps us when we talk to providers and has pushed us to do more.”

Measures of Antibiotic Use

- Raw measures of quantity
- Risk adjusted measures of quantity
- Proxy measures of quality
 - Appropriate cultures were sent before administration
- “Simple” measures of quality
 - Was the prescription guideline concordant?
- “Complex” measures of quality
 - Was the prescription correct based on relevant host factors?
 - Was the prescription changed properly (narrowed, stopped, etc)?

Additional Considerations

- Measures at a regional or national level are helpful, but not necessarily actionable.
 - And often quite delayed
- Actionable measures must be available in (near) real time AND must be granular- at the hospital, practice or provider level.



NATIONAL ACTION
PLAN FOR COMBATING
ANTIBIOTIC-RESISTANT
BACTERIA

MARCH 2015



- Goal 1: Slow the Emergence of Resistant Bacteria
- By 2020, significant outcomes of Goal 1 will include:
 - Reduction of inappropriate antibiotic use by 50% in outpatient settings and by 20% in inpatient settings.

Measuring Prescribing Quality in Outpatient Settings



Disease-specific antibiotic prescribing quality indicators report



Prevalence of Inappropriate Antibiotic Prescriptions Among US Ambulatory Care Visits, 2010-2011

Katherine E. Fleming-Delucchi, MD, MPH; Sarah M. Kelly, MD, PhD; David J. Shapiro, MD, MPH, MEd; David A. Clark, MD, PhD; Thomas M. Pilo, Jr, MD; Jonathan C. Frankston, MD, MPH; Jeffrey C. Gombash, MD, PhD; David T. Ryan, MD; Jeffrey R. Linder, MD, MPH; Ruth Cardarelli, MD; David S. Margolis, MD, PhD; Lawrence J. May, MD, MPH; Daniel Hanauer, MD; John W. Sherman, MD, PhD; Joseph A. Hawkins, MD, MPH; Scott A. Richards, MD; Rebecca M. Daniels, MD; Catherine E. Hoyle, MD; Paul C. Chang, MD; Thomas W. McManus, MD, PhD; Neil Kumar, MD, PhD; Robert C. Smith, MD, PhD; Scott

BACKGROUND: The National Action Plan for Combating Antibiotic-Resistant Bacteria set forth a goal of reducing inappropriate outpatient antibiotic use by 50% by 2020, but the extent of inappropriate outpatient antibiotic use is unknown.

OBJECTIVE: To estimate the rates of outpatient oral antibiotic prescribing by age and diagnosis, and the antibiotic portions of antibiotic use that may be inappropriate in adults and children by US counties.

DESIGN, SETTING, AND PARTICIPANTS: Using the 2010-2011 National Ambulatory Medical Care Surveys and Non-Facility Outpatient Ambulatory Medical Care Surveys, annual outpatient and ambulatory care visits, with 95% confidence intervals of ambulatory visits with oral antibiotic prescriptions by age, region, and diagnosis in the United States were extracted.

SETTING: Ambulatory care visits.

MEASUREMENTS AND MAIN RESULTS: Based on national guidelines and regional variation in prescribing, diagnosis-specific prevalence and rates of total and appropriate antibiotic prescriptions were determined. These rates were combined to calculate an estimate of the appropriate annual rate of antibiotic prescriptions per 1000 population.

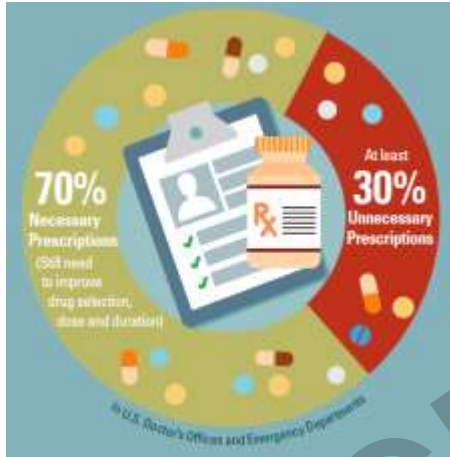
CONCLUSIONS: Of the 184132 sampled visits, 12.6% of visits (23163), 12.0% (2204) involved

- Submit your title
- Supplemental content at dx.doi.org/10.1001/jama.2012.2611
- View this article at jama.ama-assn.org

Measuring Prescribing Quality in Outpatient Settings

- Define syndromes/infections where there are best practice guidelines/recommendations for antibiotic use.
 - Experts establish consensus on how often therapy should differ from recommendations.
- Compare outpatient visits for those syndromes/infections with antibiotic prescriptions from those visits.
- Inappropriate use can be defined in multiple dimensions:
 - Was the decision to prescribe an antibiotic appropriate?
 - If so, was the recommended antibiotic prescribed?
 - Was the antibiotic prescribed for the recommended duration?

Outpatient Prescribing Quality in the United States



47 million unnecessary antibiotic prescriptions per year

“Prescribing of first-line antibiotics ranged from a low of 37% (95% CI, 32%-43%) for adult patients with sinusitis and pharyngitis to a high of 67% (95% CI, 63%-71%) for pediatric patients with otitis media. For all 3 conditions overall, use of first-line agents was 52% (95% CI, 49%-55%).”
JAMA Intern Med. 2016;176(12):1870-1872

For adults with sinusitis: “The median duration of therapy was 10.0 days (interquartile range, 7.0-10.0 days), and 69.6% (95% CI, 63.7%-75.4%) of therapies were prescribed for 10 days or longer.” JAMA Intern Med. Published online March 26, 2018

More Timely Measures of Prescribing Quality in Outpatient Settings

- HEDIS: Healthcare Effectiveness Data and Information Set
- Used by more than 90 percent of America's health plans to measure performance on important dimensions of care and service, including antibiotic use
- Data collected through surveys, medical charts and insurance claims.

Pediatric Measures:

- Appropriate Treatment for Children With Upper Respiratory Infection
- Appropriate Testing for Children with Pharyngitis

Adult Measure:

- Avoidance of Antibiotic Treatment in Adults with Acute Bronchitis

Health plan performance (%) on selected HEDIS measures, 2009-2012

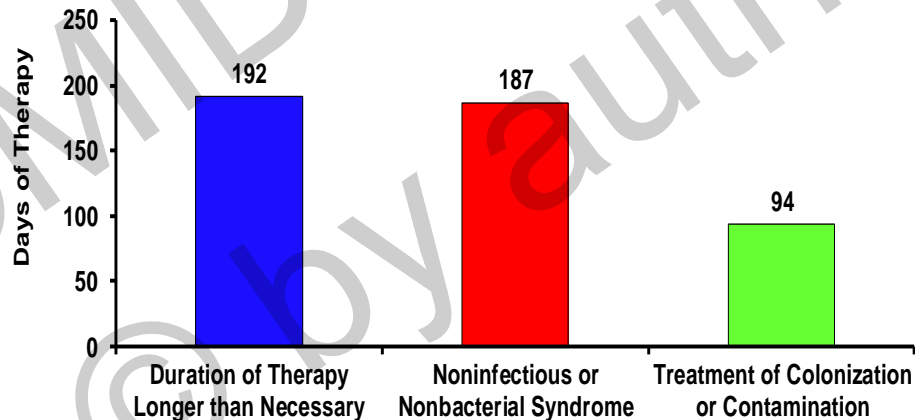
Year	Number of participating health plans	Mean %	Median %	Minimum %	Maximum%
Appropriate Testing for Children with Pharyngitis					
2009	371	75.7	77.2	37.8	95.2
2010	392	76.9	77.8	41.0	96.4
2011	347	78.0	78.7	39.1	96.1
2012	375	79.9	81.1	2.23	96.6
Appropriate Treatment for Children with Upper Respiratory Infection					
2009	372	84.0	85.3	47.0	99.1
2010	393	83.6	85.0	31.1	97.8
2011	350	85.0	86.2	44.5	98.5
2012	376	83.4	84.7	44.7	99.4
Avoidance of Antibiotic Treatment in Adults with Acute Bronchitis					
2009	375	25.4	23.5	9.9	90.5
2010	394	23.2	21.7	12.8	87.7
2011	349	22.1	20.7	8.5	75.0
2012	375	22.7	20.7	7.4	71.6

Peer Comparison to Top Performers

- **“You are a Top Performer:**
You are in the top 10% of clinicians. You wrote 0 prescriptions out of 21 acute respiratory infection cases that did not warrant antibiotics.”
- **“You are not a Top Performer:**
Your inappropriate antibiotic prescribing rate is 15%. Top performers' rate is 0%. You wrote 3 prescriptions out of 20 acute respiratory infection cases that did not warrant antibiotics.”
- Mean antibiotic prescribing for antibiotic-inappropriate diagnoses decreased from 19.9% to 3.7% (-16.3%)
 - Statistically significant versus controls

What About Measuring Prescribing Quality in Hospitals?

- Simply looking at discharge diagnoses does not usually help assess if antibiotic use was appropriate.
 - Which antibiotics are for which diagnoses?
- Most inappropriate use in hospitals occurs in patients who are either misdiagnosed with an infection or who have an infection, but are treated incorrectly.



Hecker MT et al. *Arch Intern Med.* 2003;163:972-978

Measuring Prescribing Quality in Hospitals

- When this has been done, it has involved detailed chart reviews.
 - Expert clinicians- often infectious disease, often a panel
 - Non-clinician applying an algorithm
- Both are (very) labor intensive.
- The former has the advantage of being able to assess use in all cases, the latter has the advantage of being more standardized and reproducible.
- In the US, we are taking the latter approach to attempt a national assessment of appropriate use.

United States Point Prevalence Survey of Hospital Prescribing Quality

- In 2015, CDC conducted a point prevalence survey of healthcare associated infections and antibiotic use in about 180 hospitals in 10 states.
 - Follow up from a 2011 survey, similar methods to EU surveys
- The 2015 survey also abstracted data to look at quality prescribing for:
 - Vancomycin
 - Quinolones
 - Urinary tract infections
 - Community acquired pneumonia
- Algorithms will be used to assess prescribing quality.

Pilot-Vancomycin Prescribing Quality in 36 Hospitals

Patients treated with intravenous vancomycin	185	—
No diagnostic culture obtained around antibiotic initiation, although standard practice with most infections	17	(9.2)
Diagnostic culture showed no Gram-positive bacterial growth, but patient still treated for long duration (>3 days) (excludes presumed SSTI, which often can be culture negative)	40	(21.6)
Diagnostic culture grew only oxacillin-susceptible <i>Staphylococcus aureus</i> , but patient still treated for long duration (>3 days) (likely missed opportunity to switch antibiotic based on culture result)	9	(4.9)
No. of patients with potential for improvement in prescribing	66	(35.7)

The Challenge With Current Assessments of Appropriate Antibiotic Use

- Retrospective chart reviews provide a useful snapshot of prescribing for some key agents and indications.
- They help inform broad stewardship efforts- what education and resources would be most useful.
- They are not directly actionable by providers and stewardship programs.
- We need to be able to answer the question:
- “How well did this provider (or hospital) do with prescribing last month?”

Advancing Assessments of Appropriate Use in Hospitals

- Exploring ways to use electronic health information to assess appropriate antibiotic use.
- Outpatient/community measures are already extracted electronically in many instances.
 - How can we make that data available in real time?
- Some hospital assessments of prescribing quality also seem amenable to electronic surveillance.
 - Vancomycin use
 - Unnecessary duplicate antibiotic therapy
 - Bug-drug mismatch

In the Interim. . .

- In hospitals, CDC is using real time electronic reporting of risk-adjusted antibiotic use as a proxy measure of prescribing quality.
- Based on the premise that high rates of risk adjusted prescribing don't always reflect poor use- but often do!
- The goal is to help stewardship programs find high priority hospital locations and agents where there are likely to be opportunities for improvement.

National Healthcare Safety Network (NHSN) Antibiotic Use (AU) Option

- Captures electronic data on antibiotics administered, along with admission/discharge/transfer data.
- Calculates rates of administration for use:
 - By facilities to monitor interventions on single units or facility wide
 - To collect aggregate information on antibiotic use at a regional and national level
 - To create antibiotic use benchmarks
- As of April 1, 2018, 776 hospitals have reported into the system.

Standardized Antibiotic Administration Ratio (SAAR)

- SAAR expresses observed antibiotic use compared to predicted use.
 - Predicted use is calculated with risk adjusted models
 - Risk adjustment can only be done on facility characteristics (e.g. number of ICU beds, teaching status, bed size)
 - NHSN does not capture patient level data
- SAAR of 1.0= observed use is the same as predicted.
- CDC worked with many partners to develop the SAAR measure to try and make it most useful for stewardship.
 - Endorsed by The National Quality Forum in 2016 for performance improvement.

Standardized Antibiotic Administration Ratio (SAAR) Categories

- Broad spectrum agents predominantly used for hospital-onset/multi-drug resistant bacteria.
- Broad spectrum agents predominantly used for community-acquired infection.
- Anti-MRSA agents.
- Agents predominantly used for surgical site infection prophylaxis.
- All antibacterial agents.
- SAAR categories are calculated separately for different patient care locations
 - ICU and Ward
 - Pediatrics and Adult

Key Questions About the SAAR

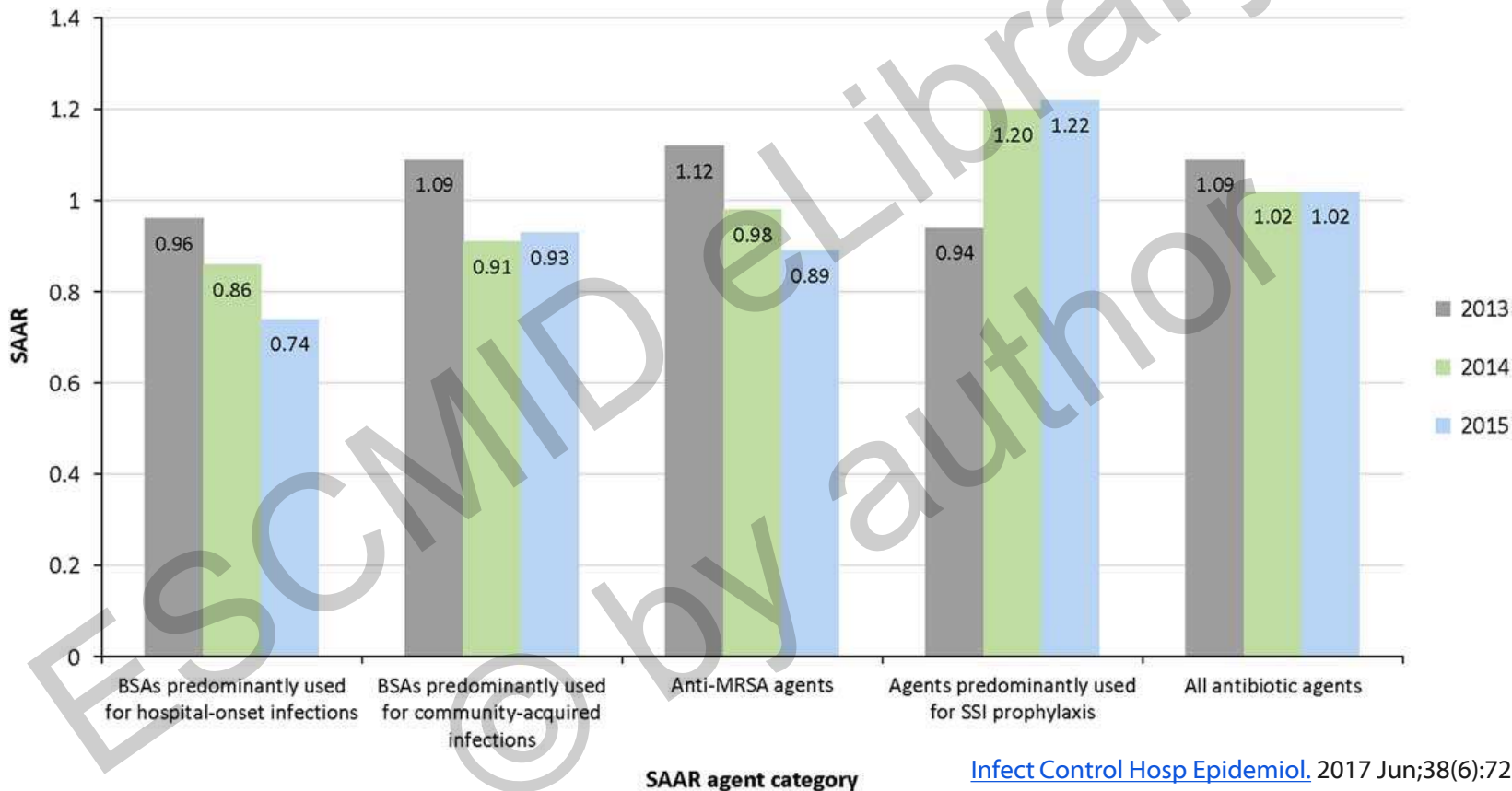
- Does the SAAR help point to locations and/or agents where there are meaningful opportunities to improve antibiotic use?
- Will the SAAR values change if antibiotic use is improved?
- How would additional data for risk-adjustment impact the SAAR?

Using NHSN AU Data to Focus Stewardship Efforts



Courtesy of Eddie Stenehjem

SAAR Values Before And After A Stewardship Intervention



Comparing Facility Level and Patient Level Risk Adjustment

- CDC collaborated with a health system that had access to SAAR values and could risk adjust their use data based on extensive patient level data.
- They compared the facility level adjusted SAAR to patient level risk adjusted observed to predicted ratios.
 - Agreement defined as both above or below 1.0
- They agreed:
 - 86% of the time for all antibiotics
 - 72% for agents predominantly used for community-acquired infection.
 - 86% for hospital-onset/multi-drug resistant bacteria agents
 - 92% for surgical site infection prophylaxis agents
- There were differences in magnitude in some instances.

Next Steps for the SAAR Measure

- More work on exploring and refining risk adjustment.
 - Repeating analyses of facility vs. patient level risk adjustment with another health system.
 - Exploring other facility level characteristics that might improve risk adjustment.
- More work on assessing application of the SAAR for stewardship.
 - CDC funding a prospective project where a group of 11 hospitals is using the Antibiotic Use option to monitor the impact of expanded stewardship efforts.

Conclusions

- For stewardship efforts to succeed in the long term, we will need good measures of prescribing quality.
- We also need to think more about how we can better use measures of quantity as proxy measures for quality.
- But it's not just having the measures and reporting on them- we need to think about how to motivate action on them.
- Comparison might be a way to do that.
- That will bring other challenges, especially risk adjustment.
- We are making progress, but there is much more to do.