Antimicrobial Stewardship - Creating a Dashboard

Work in Progress

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Disclaimer

The views expressed in this presentation reflect those of the author, and not necessarily those of KP.

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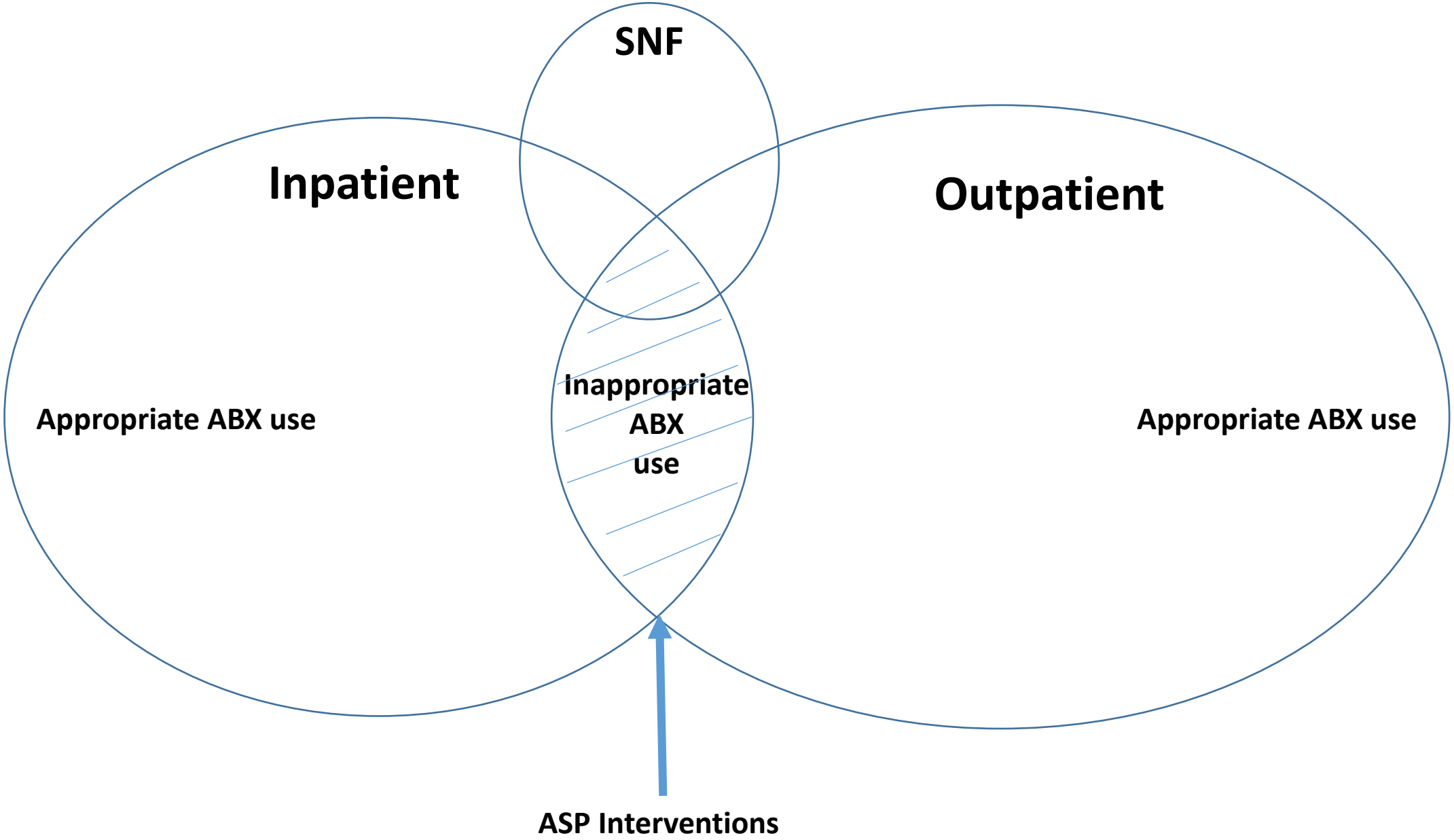
Some General Thoughts

- Antimicrobials are an important medication class
  - Used appropriately, antimicrobials have huge benefits and improved clinical outcome
- The Problem:
  - Emergence of multidrug resistant organisms (MDRO) (and C. difficile)
- Judicious use of antimicrobial use is paramount to limit the pressure on organisms to develop antimicrobial resistance

→ **Minimize unnecessary use of antimicrobials**


SNF
Inpatient
Outpatient
Appropriate ABX use
Inappropriate ABX use
Appropriate ABX use
ASP Interventions

What to We Need on a Dashboard

Data to be able to

- Estimate portion of unnecessary antibiotic usage (AU)
- Identify area of opportunity to minimize unnecessary AU
- Monitor improvement over time
- Monitor outcomes

Components of a Antimicrobial Use Dashboard

Antimicrobial Use – Hospital Setting

- Monitor overall and broad spectrum abx use
- Establish benchmark
- Measure abx use against benchmark

AU – Outpatient Setting

- Monitor overall use
- Monitor use for specific diagnoses (URI, sinusitis, otitis,..)
- Monitor use of specific abx (FQ)
- Peer comparison
- Target feedback to high prescriber

Unnecessary antibiotic use

AU – SNF

Antimicrobial Stewardship Interventions

- Allows to analyze individual interventions and potential impact on AU and on MDRO/? CDI

Rate of MDRO's

- Influences benchmark / need to use advanced ABX

↕

- Outcome of antimicrobial stewardship efforts

Components of a Antimicrobial Use Dashboard

Antimicrobial Use – Hospital Setting

- **Monitor overall and broad spectrum abx use**
- **Establish benchmark (bedsize,%ICU, case mix,..)**
- **Measure abx use against benchmark**

Hospital ABX Use – Challenges

- **Realistic measurement of antimicrobial use**
  - Combinations of abx versus single broad spectrum abx
  - Therapy changes – double count of abx on day of change?

- **Identification of inappropriate ABX use**
  "Bird's eye view":
  - Sophisticated inpatient benchmark (define expected / appropriate AU):
    - CDC/NHSN: ICU beds / total beds
    - Addition of DRG / Clinical Markers / ….
    - Integrate changes in resistance pattern in the community – necessity to use advanced antimicrobials

  "On ground view"
  - Case review – ASP interventions

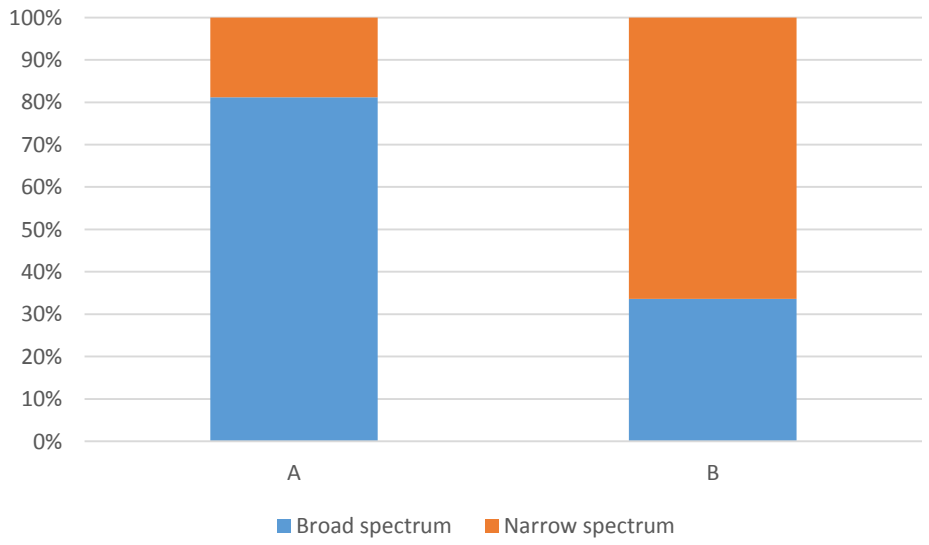
CDC / NHSN AUR module – AU Metric

- AU module ABX usage metrics:
  - Primary: specific antimicrobial days per 1000 days present
  - Secondary: specific antimicrobial days per 1000 admissions

AU metrics: Broad Spectrum versus Combination Regimens

Example

	Patient A **Ertapenem**	**Patient B** **Ceftriaxone / ampicillin / metronidazole**
Day 1	Ertapenem days = 1 **Total abx days = 1**	Ceftriaxone days =1 Ampicillin days = 1 Metronidazole days = 1 **Total abx days =3**



Number of patients: A > B

Possible additional metric:

# of patient on systemic abx / inpatient census

AU metrics: Therapy Changes – “skewed” counting

Example

	Day 1	Day 2	Day 3
Meropenem	Given 3x/day	Given 1 time	
Ceftriaxone	none	1 time	1 time
Drug-specific Antimicrobial Days (total) per CDC AUR module	Meropenem days =1 Ceftriaxone days = 0	Meropenem days = 1 Ceftriaxone days =1	Meropenem days = 0 Ceftriaxone days = 1

Hospital ABX Use – Biggest Challenge

Identification of inappropriate ABX use

"Bird's eye view":

- Sophisticated inpatient benchmark (define expected / appropriate AU):
  - CDC/NHSN: ICU beds / total beds
  - Addition of DRG / Clinical Markers / MDRO rate / ….
  - Integrate changes in resistance pattern in the community – necessity to use advanced antimicrobials

"On ground view"

- Case review - ASP interventions:
  - Identifies individual patient receiving unnecessary abx therapy
  - Tracking of ASP interventions / trends over time

The bird’s eye view: Facility level

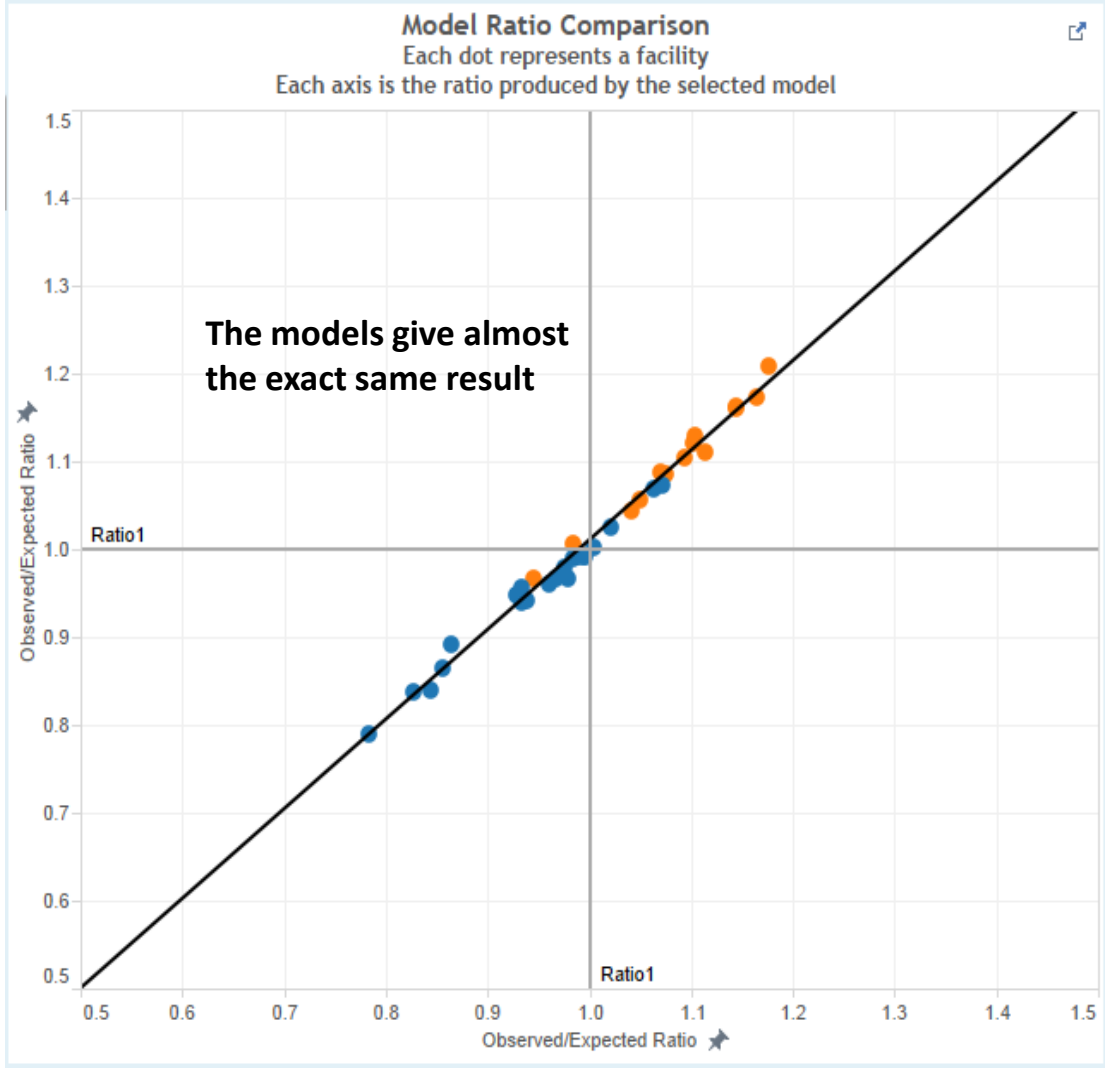
- CDC/NHSN AU module adjusters:
  - Hospital bed size
  - Percentage ICU
- Large scale approach with easily available data points

Risk-Adjusting Antimicrobial Use to improve benchmark: Potential explanatory variables

Facility level	Encounter level	
	Encounter	***Clinical/Prior utilization***
+ **Percent ICU** + **Hospital bed size** (CDC/NHSN AU Module Adjusters) + Case Mix Index + DRGs (top 10 infection DRGs) + Number of admissions per month + Percent overall capacity + Percent ICU capacity + Percent Medicare patients + Percent surgical + Percent transplant patients (history of transplant)	+ Patient demographics + Infection present on admission + ICU encounter + Risk score (e.g., DxCG, Charlson, HCC)	+ Comorbid burden and conditions + Prior clinic, ED, and inpatient encounters + Presenting lab values (e.g., WBC, other laboratory markers of infection) + Vital signs + Clinical risk scores (e.g., APACHE, SOFA) + Fluid I/O

Using DRG codes and post d/c ID dx provides good risk adjustment using the LEAST amount of data (work in progress; example)

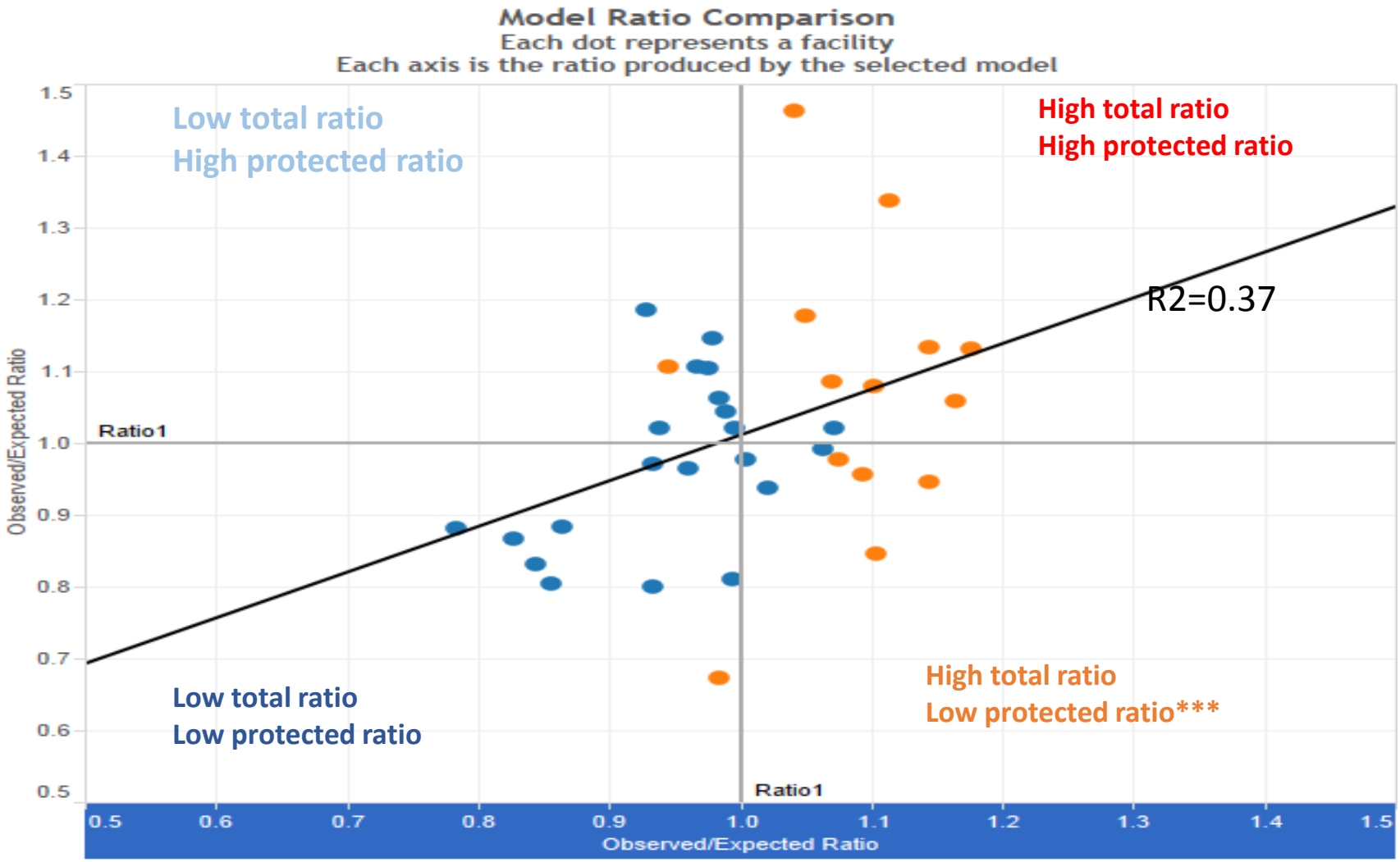
Y axis –O/E ratio using DRG and infection Dx **plus WBC, Cr, outpatient abx, Charlson comorbidity, etc**.



X axis – O/E ratio using DRG and infection Dx

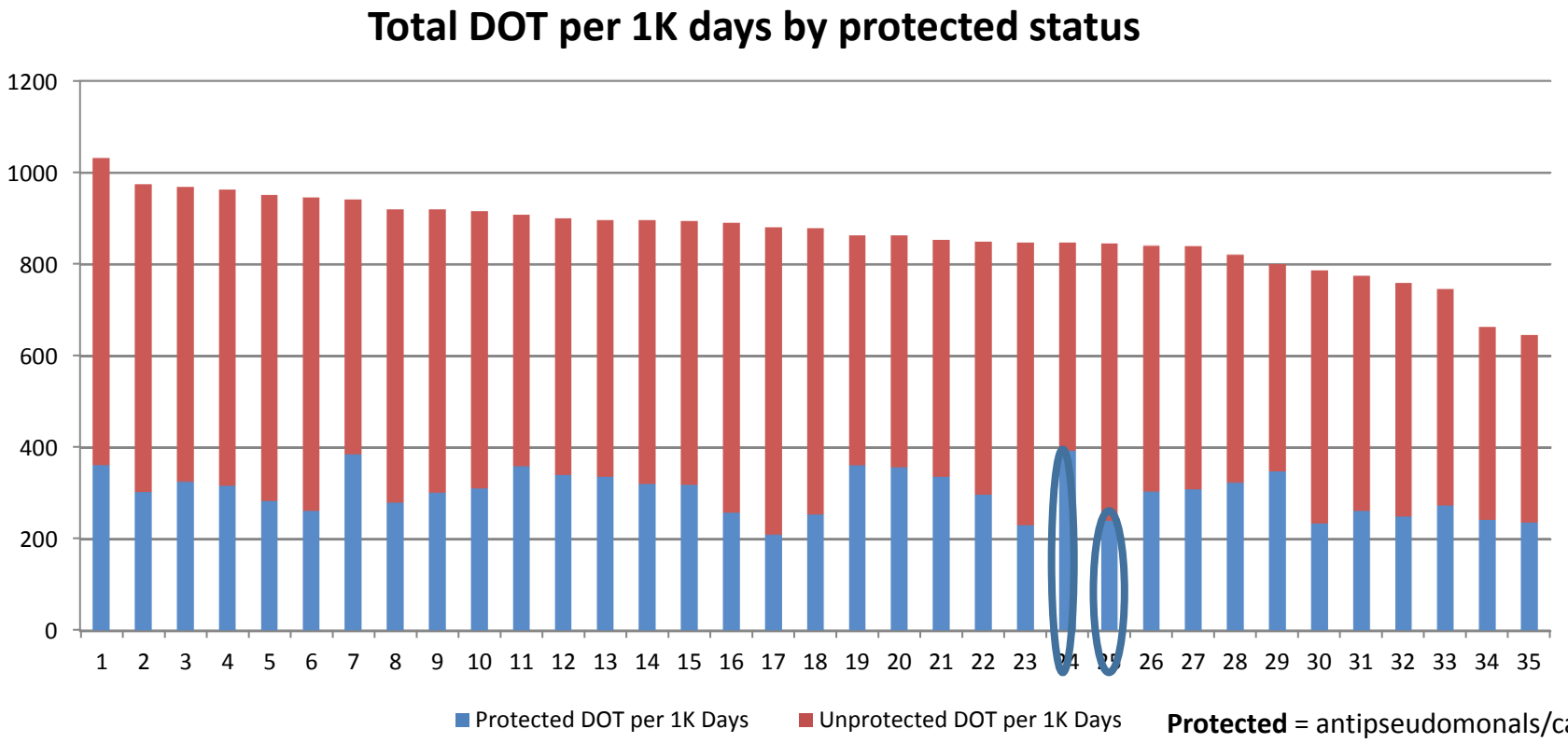
Example of a Benchmark (preliminary)

Y axis- ratio using
DRG and ID dx
*__Protected__ DOT ratio
*ALL inpatients



X axis – ratio using DRG and infection Dx
*total DOT ratio
*ALL inpatients

Potential Impact of Community Rate of MDRO on "Protected Abx"



Protected = antipseudomonals/carbapenems/anti-MRSA

Higher usage of "protected" ABX:

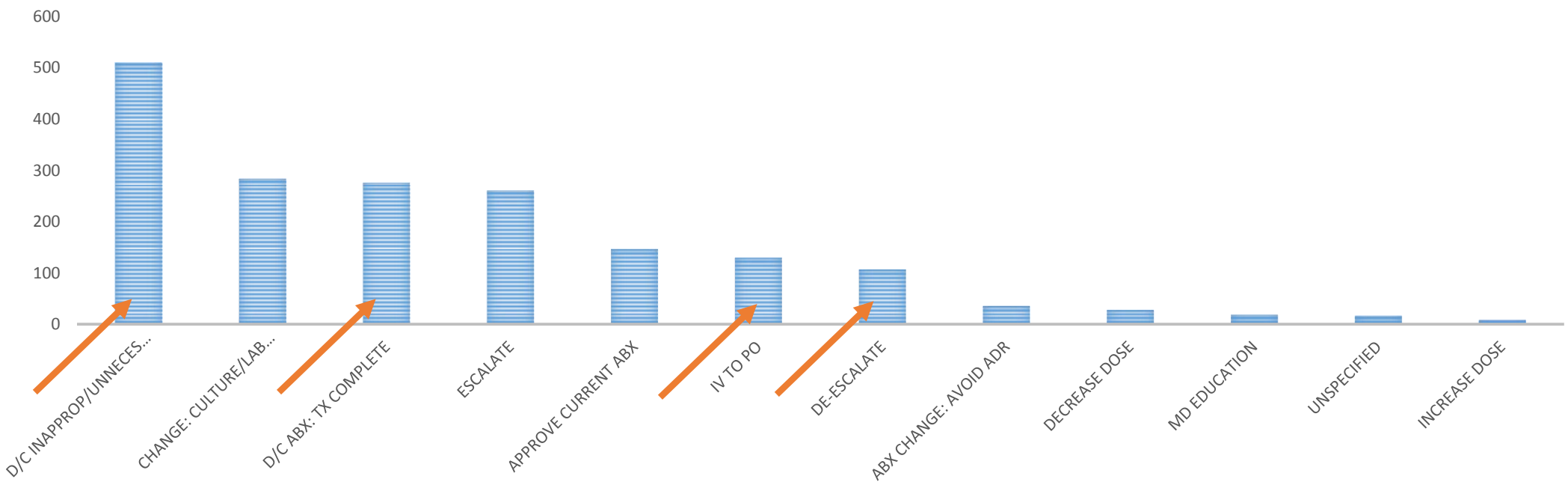
- inappropriate use (not necessary)

OR

- appropriate due to higher rate of MDRO in specific hospital / community

The “on ground view”

- Case review – no feasible
- ASP interventions (example):
  - Individual case review – identifies unnecessary abx use and intervenes
  - Need to further standardize data to include in a benchmark



Components of a Antimicrobial Use Dashboard

AU – Outpatient Setting

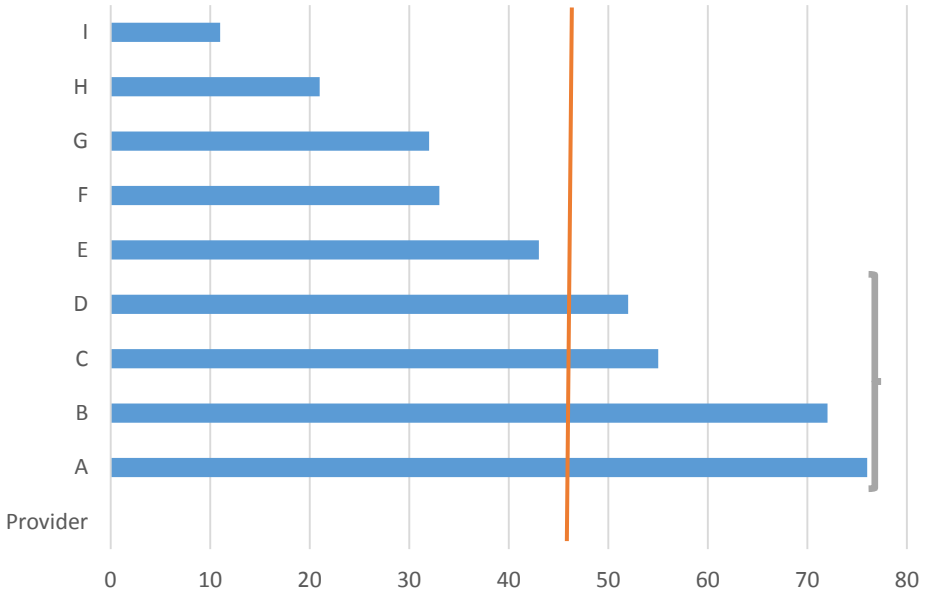
- **Monitor overall use**
- **Monitor use for specific diagnoses (URI, sinusitis, otitis,..)**
- **Monitor use of specific abx (FQ)**
- **Peer comparison**
- **Target feedback to high prescriber**

Outpatient ABX Usage – Some Thoughts

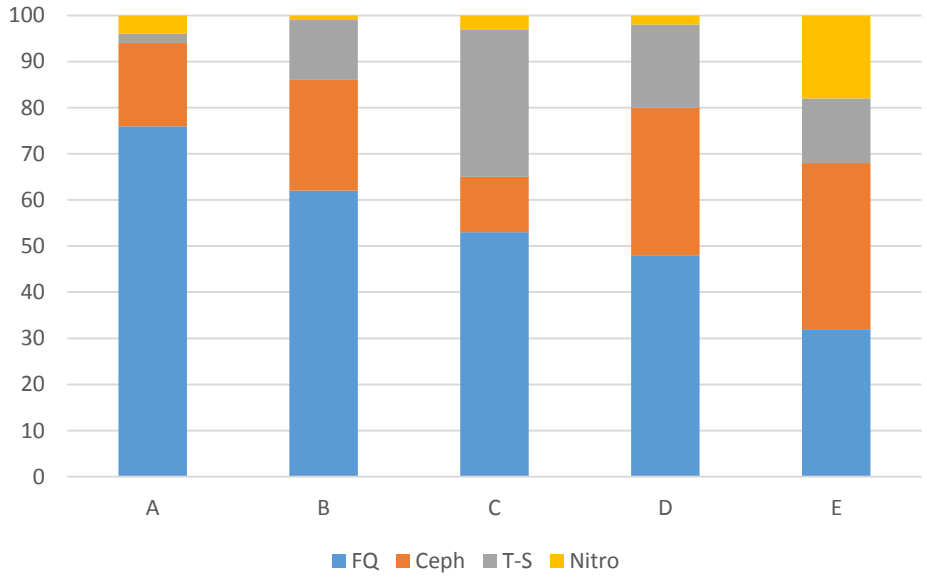
1. Standardize recommended abx treatment regimens
2. Measure AU (medical office building / MC area):
    1. Overall abx prescription / encounters
    2. ABX prescription for dx with no abx recommendation
    3. Specific ABX for dx with abx recommendations
    4. Peer comparison
3. Feedback and educational opportunities

Outpatient ABX Usage

Example: ABX prescription per encounter for likely viral dx (i.e. bronchitis, sinusitis,..)



Example: ABX prescription per encounter with bacterial infections (i.e. UTI,...)



Thank you!!!

Questions / Comments / Thoughts