

---

# Contextualizing National Guidelines for Local Practice

**Kelly Flett MD, MMSc**

Novant Health Ambulatory Antimicrobial  
Stewardship Program

---

I have no significant financial relationships with ineligible companies to disclose.

# Objectives

**Describe how data can inform the local application of national guidelines**

**Describe ways in which data can be used to improve antibiotic use**

# National Guidelines in Ambulatory Antimicrobial Stewardship



Use national guidelines to inform improvement efforts



Customize national guidelines based on local susceptibility data



Disseminate national guidelines through prescriber resources

# Ambulatory Antimicrobial Stewardship at Novant Health

## 2014 Team Created

Physician

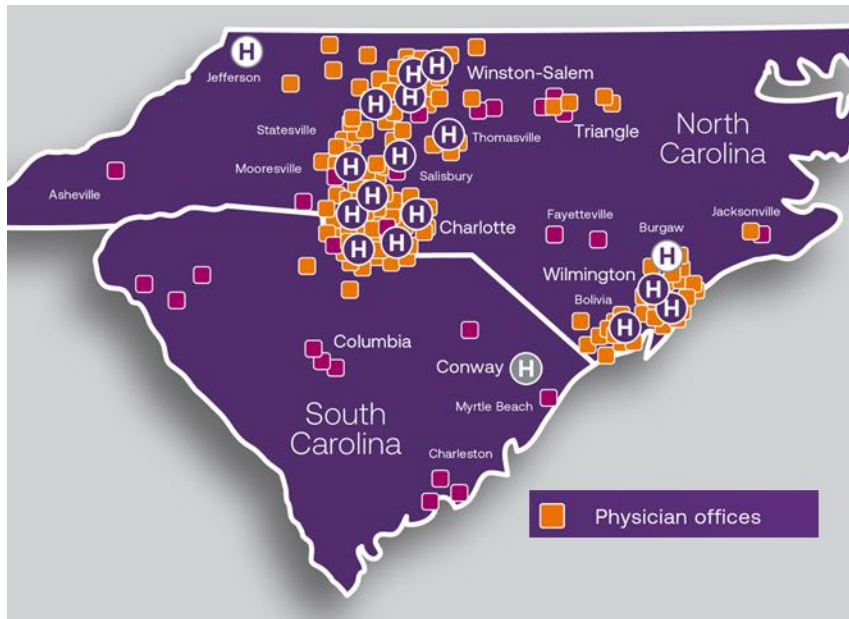
Primary Care Physician

Quality/Safety

Representative

Pharmacist

“started doing some work”



Measure created for pediatric AOM, Sinusitis, and URI (2015)

Added adult measures for Group A strep and bronchitis for adult patients in Family Medicine and Internal Medicine (2016)

Added measures for Urgent/Express Care and Emergency Department (2018)

Consolidated measures for consistency in adult and pediatrics and introduced provider-specific feedback (2022)

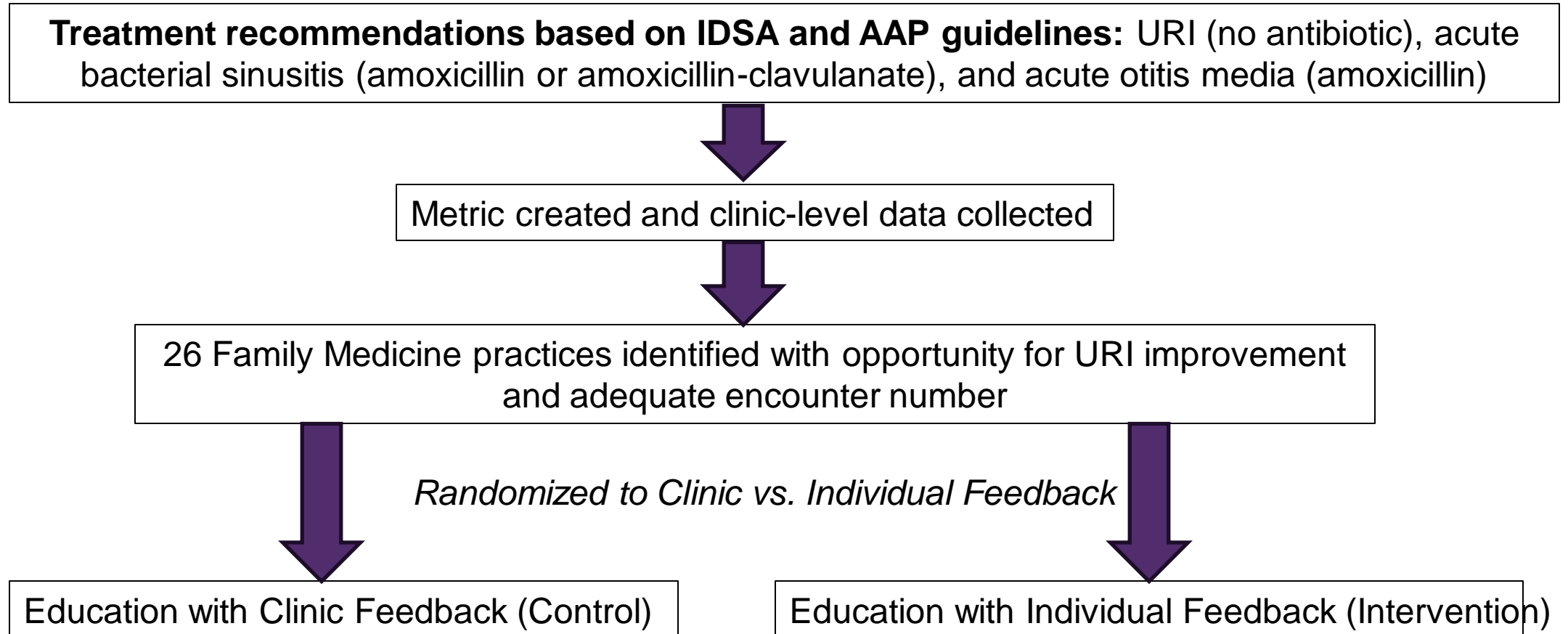
# Focus on acute respiratory tract infection (ARTI) based on national data

Table 2. Sampled Visits With Antibiotics Prescribed and Mean Annual Rate per 1000 Population of Ambulatory Care Visits With Antibiotics Prescribed by Age Group and Diagnosis From the US NAMCS/NHAMCS, 2010-2011

Diagnosis <sup>a</sup>	Age Group, y							
	0-19		20-64		≥65		All Ages	
	Unweighted No. of Sampled Visits With Antibiotics Prescribed	Weighted Mean Annual Rate of Visits With Antibiotics Prescribed, % (95% CI) <sup>b,c</sup>	Unweighted No. of Sampled Visits With Antibiotics Prescribed	Weighted Mean Annual Rate of Visits With Antibiotics Prescribed, % (95% CI) <sup>b,c</sup>	Unweighted No. of Sampled Visits With Antibiotics Prescribed	Weighted Mean Annual Rate of Visits With Antibiotics Prescribed, % (95% CI) <sup>b,c</sup>	Unweighted No. Sampled Visits With Antibiotics Prescribed	Weighted Mean Annual Rate of Visits With Antibiotics Prescribed, % (95% CI) <sup>b,c</sup>
Sinusitis	457	65 (51-79)	1055	55 (45-64)	151	44 (32-57)	1663	56 (48-64)
Suppurative otitis media	1660	154 (131-177)	305	9 (7-11)	23	<sup>d</sup>	1988	47 (41-54)
Pharyngitis	1001	91 (76-105)	785	29 (23-35)	39	<sup>d</sup>	1825	43 (38-49)
Skin, cutaneous, and mucosal infections	570	39 (32-46)	1493	39 (33-44)	230	38 (29-47)	2293	39 (34-43)

National data shows prescribing for acute respiratory tract infections accounts for a large amount of antibiotic prescribing

# Improving Guideline-based Prescribing for Pediatric ARTI



# Pediatric ARTI: Clinic vs. Individual Feedback

## Intervention Period

All clinics:

- 1-hr education session, a tip sheet, and an after-visit summary to give to parents
- Monthly performance data emailed to the lead clinician and clinic administrator

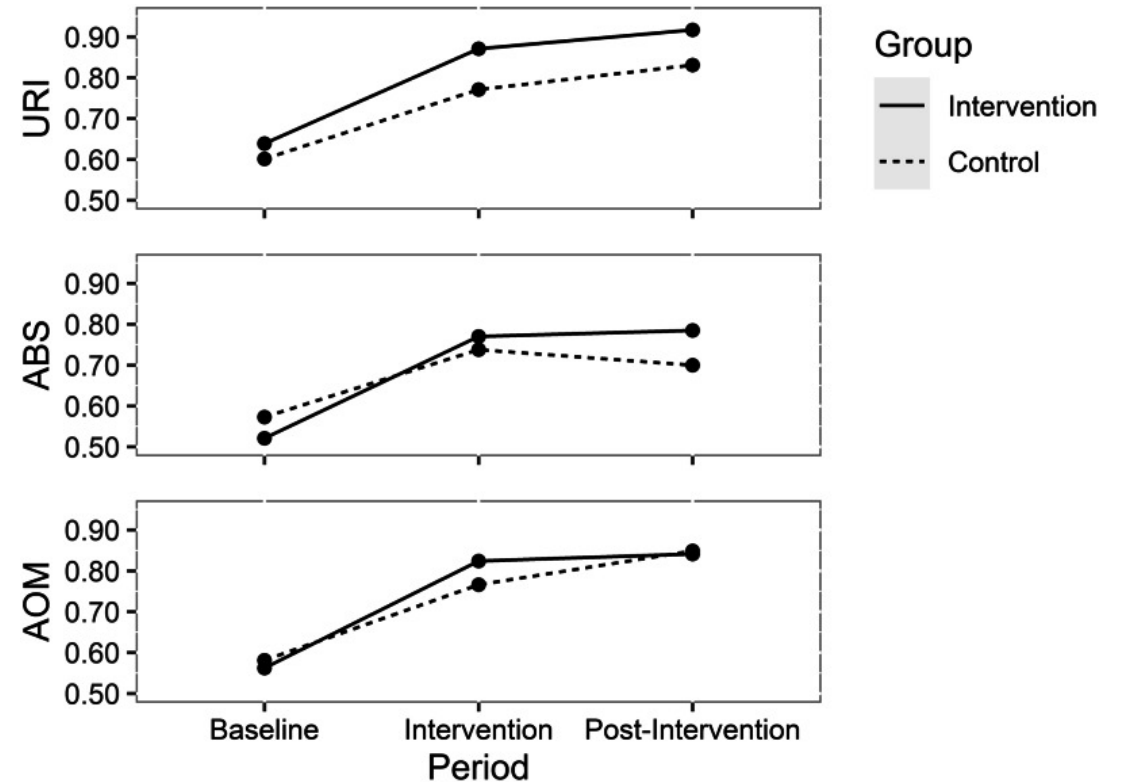
Control clinics also received provider-level data for their clinic

## Post-intervention Period

All clinics received only clinic-level data

**All clinics had sustained improvements**

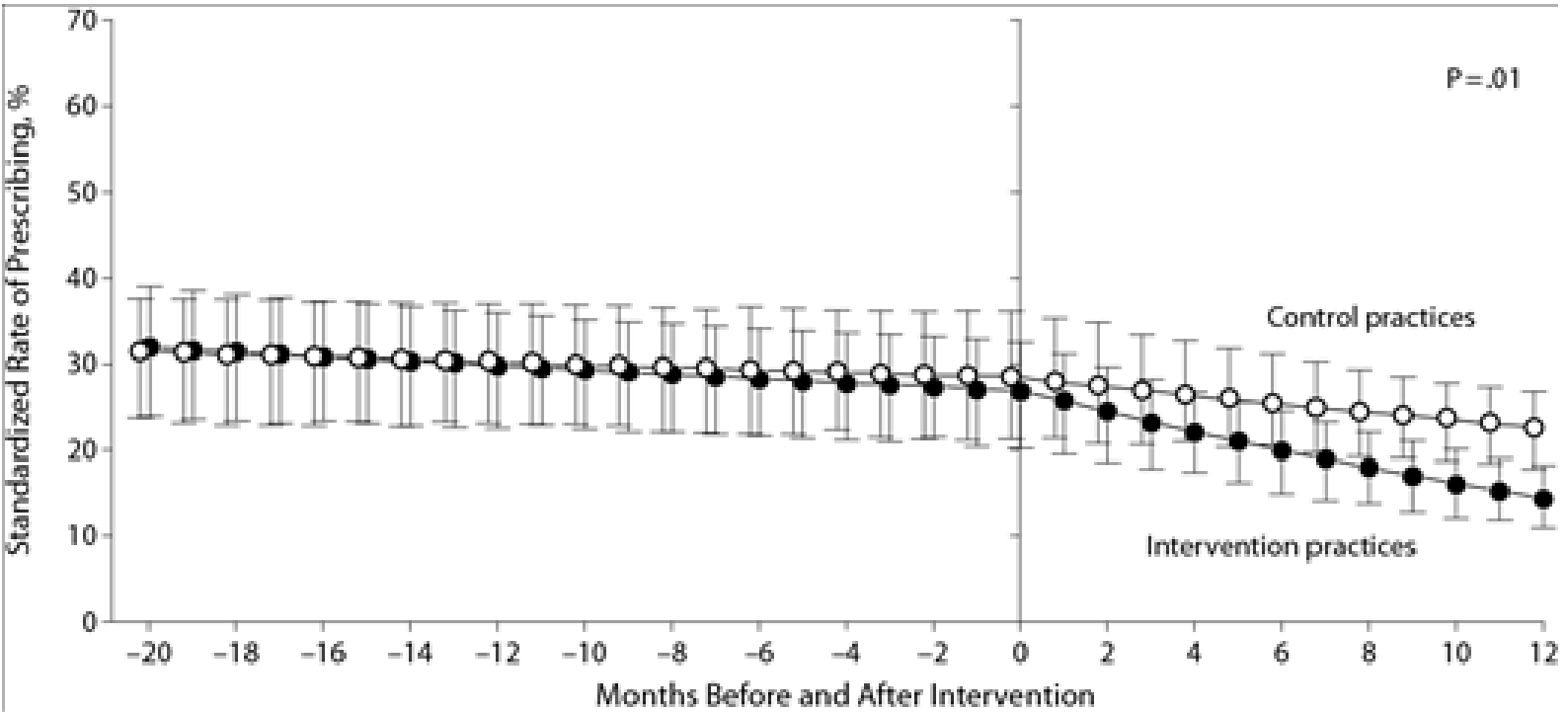
**Intervention clinics had significantly greater improvement than control clinics.**





# Additional Literature Supports Feedback on Prescribing

## Effect of an Outpatient Antimicrobial Stewardship Intervention on Broad-Spectrum Antibiotic Prescribing by Primary Care

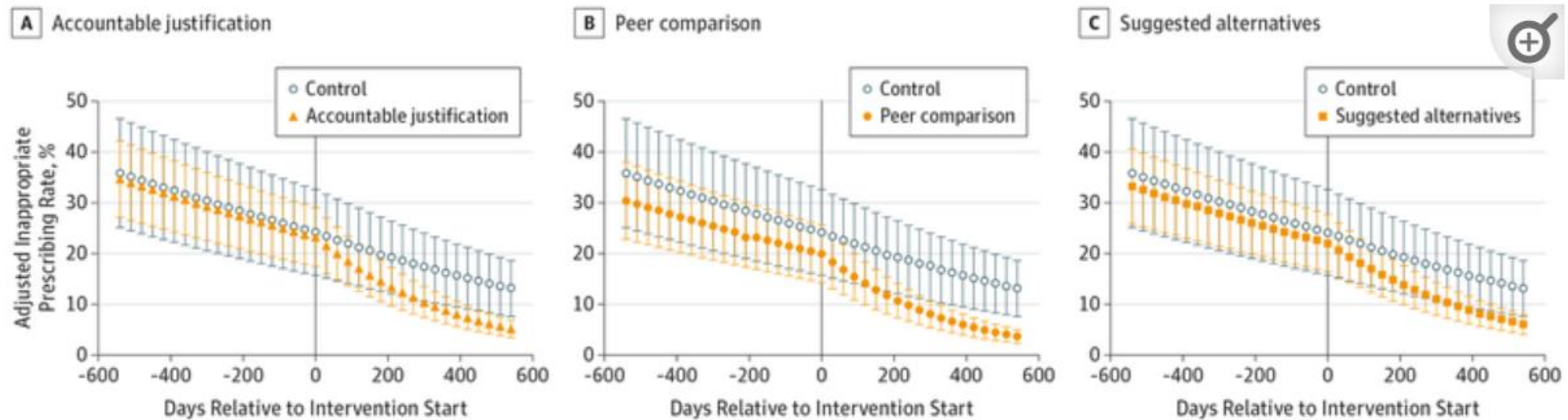


- Intervention:**
- 1hr clinician education session
  - Personalized quarterly audit and feedback with prescribing rates for the individual, practice, and network for viral infections, sinusitis, group A streptococcal pharyngitis, and pneumonia
  - All practices aware of participation in a study during which prescribing patterns would be tracked.

Figure 2. Standardized Rates of Broad-Spectrum Antibiotic Prescribing at Acute Care Office Visits Over Time

# Is Feedback the only option to improve appropriate antibiotic prescribing?

- *Suggested alternatives* presented electronic order sets suggesting nonantibiotic treatments;
- *Accountable justification* prompted clinicians to enter free-text justifications for prescribing antibiotics into patients' electronic health records;
- *Peer comparison* sent emails to clinicians that compared their antibiotic prescribing rates with those of “top performers” (those with the lowest inappropriate prescribing rates).



Adjusted Rates of Antibiotic Prescribing at Primary Care Office Visits for Antibiotic-Inappropriate Acute Respiratory Tract Infections Over Time

# Building on pediatric ARTI: Adults with acute uncomplicated bronchitis

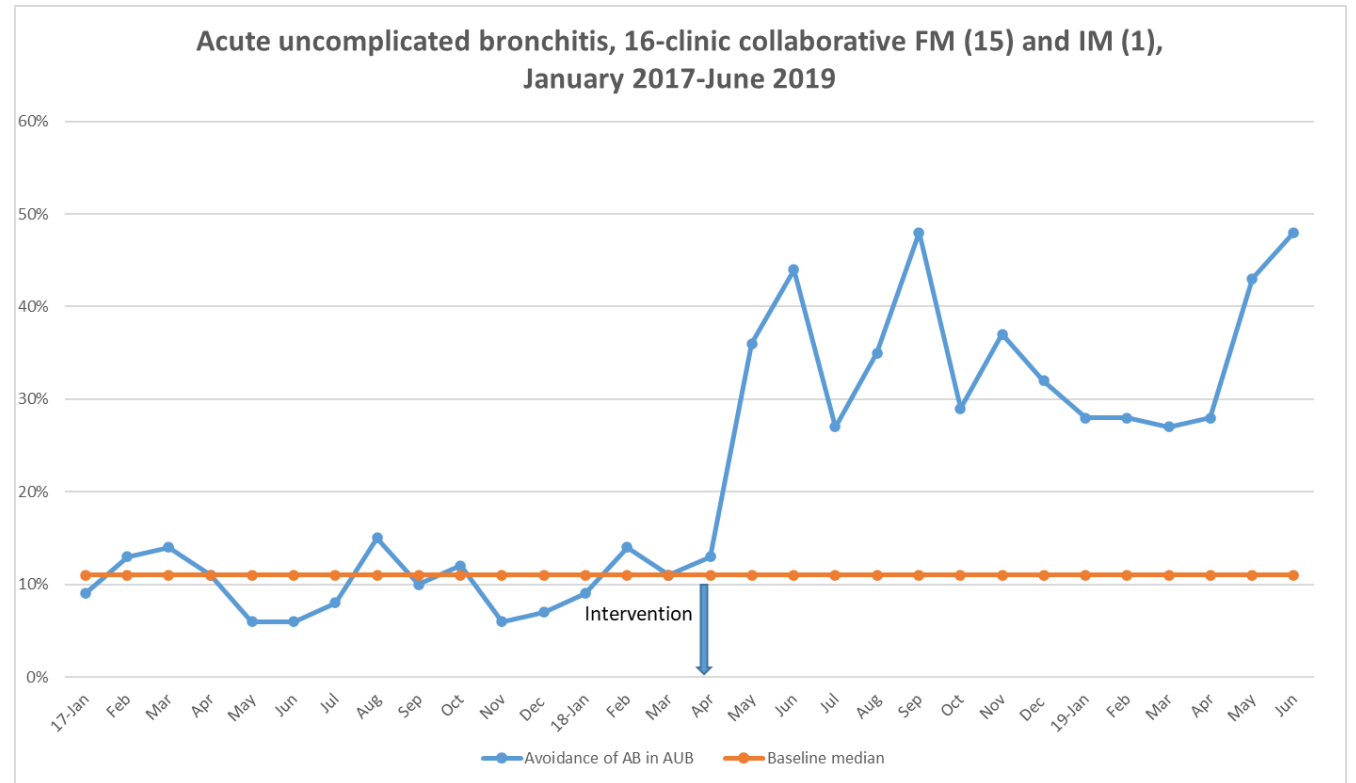
## Why Bronchitis?

- Avoidance of antibiotics for adults with bronchitis is a **HEDIS measure**
- National data shows opportunity for improvement

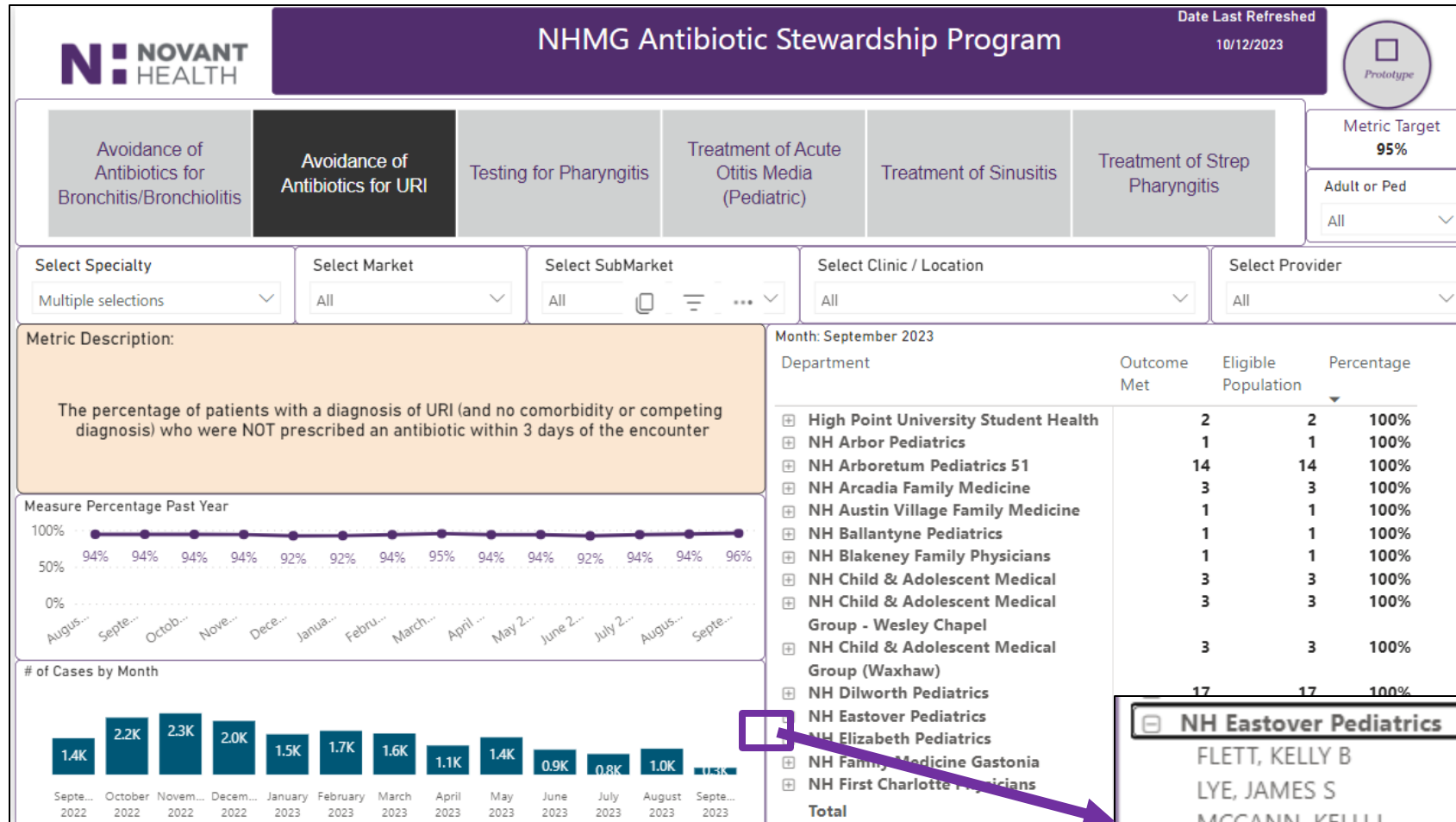
**Guideline created** for acute uncomplicated bronchitis

## Intervention:

- All clinics received monthly clinic-level feedback and guideline review.
- 16-clinic collaborative received in-person education and monthly individual-level data



# Expanding access to individual-level data with dashboard



Prior PDF format of prescribing reports converted to dashboard to allow all clinics to access provider-level data

Sent monthly by email to clinic administrators and lead clinicians

Some measures are also integrated into Epic dashboard

Department	Outcome Met	Eligible Population	Percentage
<b>NH Eastover Pediatrics</b>	<b>20</b>	<b>20</b>	<b>100%</b>
FLETT, KELLY B	2	2	100%
LYE, JAMES S	5	5	100%
MCCANN, KELLI L	4	4	100%
RANKIN, MATTHEW H	4	4	100%
WALBY, LAURA M	2	2	100%
ZEITOUNI, ALYSSA C	3	3	100%

# Tracking monthly performance and education opportunities



## NHMG Antibiotic Stewardship Program

Date Last Refreshed

10/26/2023



Avoidance of Antibiotics for Bronchitis/Bronchiolitis	Testing for Pharyngitis	Treatment of Sinusitis
<b>Avoidance of Antibiotics for URI</b>	Treatment of Acute Otitis Media (Pediatric)	Treatment of Strep Pharyngitis

Timeperiod: 1/1/2022 - 10/1/2023

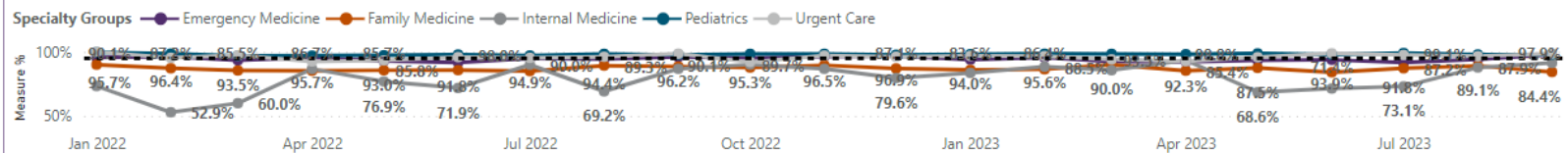
Adult or Ped: All

Metric Target: 95%

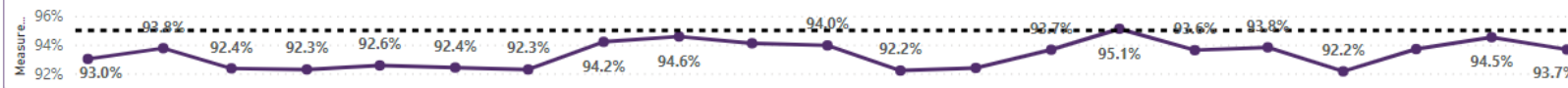
### Current Performance

Date	5/1/2023			6/1/2023			7/1/2023			8/1/2023			9/1/2023			Total		
	NHMG Specialty Group	Eligible	Percentage	Met	Eligible	Percentage	Met	Eligible	Percentage	Met	Eligible	Percentage	Met	Eligible	Percentage	Met	Eligible	Percentage
⊕ NHMG Specialties	1	1408	93.8%	869	943	92.2%	729	778	93.7%	932	986	94.5%	1494	1595	93.7%	23650	25312	93.4%
⊕ Other Specialties	5	642	94.2%	447	467	95.7%	425	450	94.4%	452	475	95.2%	773	788	98.1%	11864	12475	95.1%

### Trended Performance by Specialties



### Trended Performance NHMG



- ASP Monthly Summary Page
- Longterm Trending
- Antibiotic Appropriateness
- Azithromycin Indications
- Acute Otitis Media

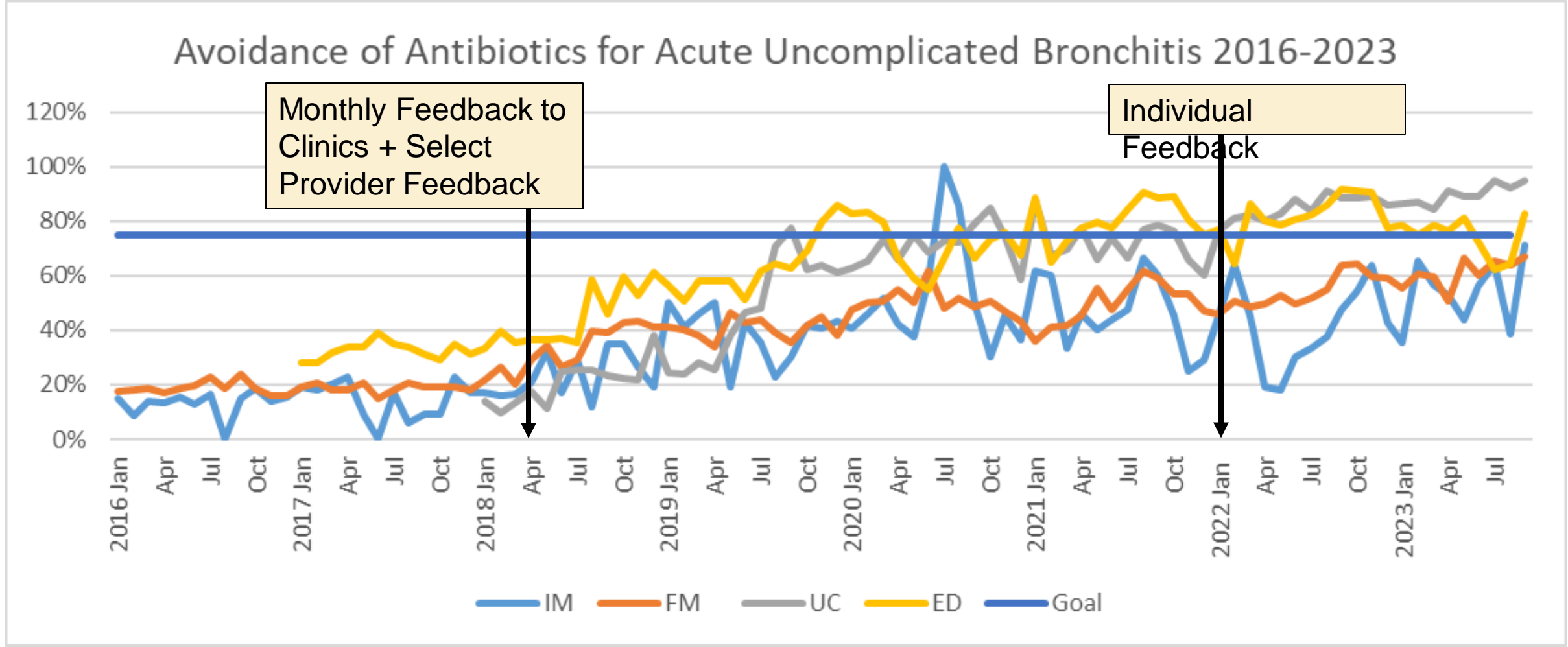
Dashboard for 6 primary measures reviewed monthly

Opportunities for continued improvement are discussed

Cases that do not meet a metric can be reviewed easily

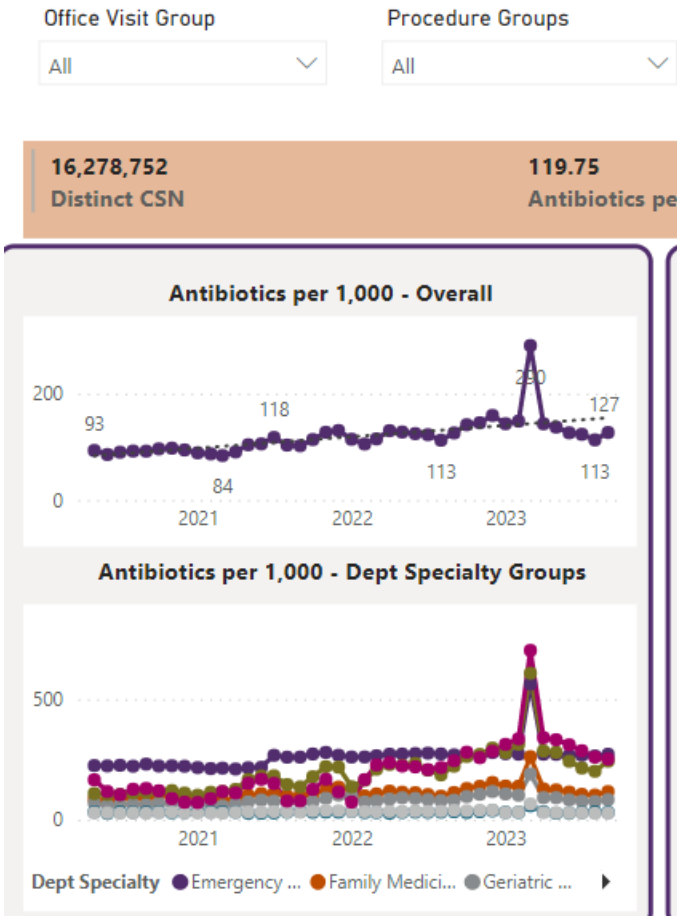
Relevant education is incorporated into the email that is sent with provider data

# Impact of clinic and provider feedback



Small cohorts of low-performing clinics given more personalized feedback in 2020, 2022, and 2023 (IM)

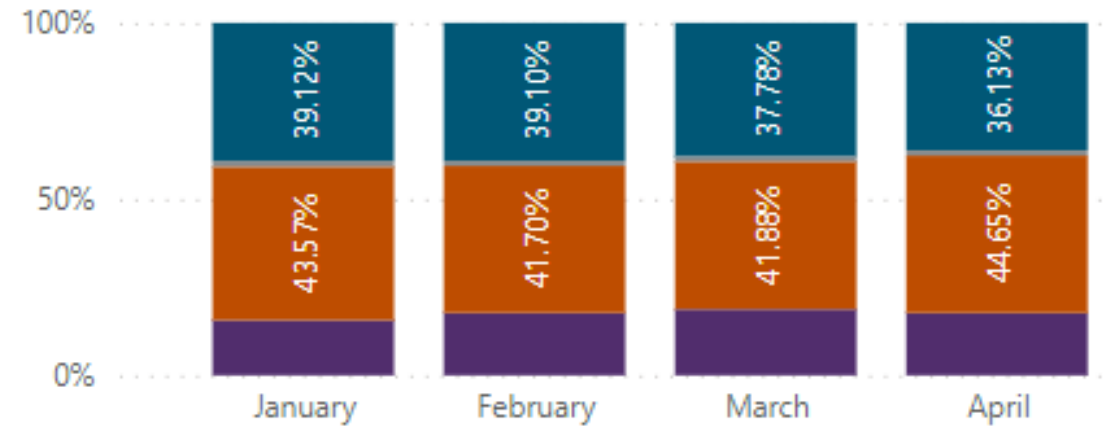
# Additional data opportunities for provider feedback



Antibiotic Prescribing Rate

Percent of Appointments by Antibiotic Appropriateness Category

CATEGORY ● Always ● Never ● Not mapped ● Sometimes



Broad measure of appropriate antibiotic use

# Disseminating the data: Provider preferences

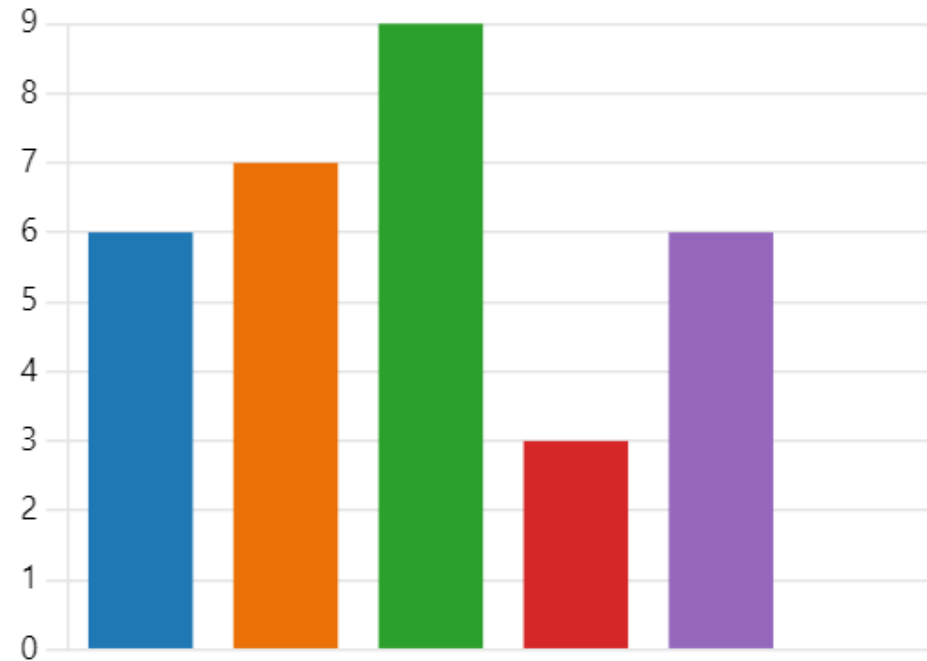
24 Internal Medicine providers surveyed after ASP education sessions

92% found it helpful to view data from other clinics, specialties, and providers

3. How would you prefer to receive data on your own antimicrobial prescribing? (Select all that apply)

[More Details](#)

- Email forwarded from Clinic Ad... 6
- Email directly to you with link to... 7
- Email directly to you with your d... 9
- Printed reports 3
- EPIC dashboard 6
- Other 0





# Applying guidelines to focused QI projects:

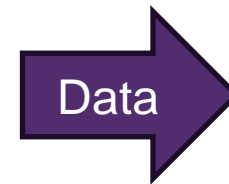
## Shortening Treatment Duration for Acute Otitis Media (AOM)

AAP Guideline for the Diagnosis and Management of AOM recommends 10 days of antibiotics for

- Children < 2 years of age
- Perforation/otorrhea
- Severe disease
- History of recurrent AOM or antibiotics within the past 30 days

**For all other children, 7 days should be prescribed if 2-5 years of age and 5-7 days if  $\geq 6$  years of age**

Clinician experience that most treatment durations in pediatrics were for 10 days



Amoxicillin prescriptions 2019 – 2021 for children 2+ years old	
5/7/10 day prescription duration	Number (%) of prescriptions
10	19,335 (91%)
7	1,680 (8%)
5	146 (1%)

Preliminary Data showed only 9% of prescriptions were for 5-7 days

# Chart Review to Obtain Data for Goal

August AOM cases that met our metric from all ages were randomized for reviewed

Reviewed charts until identified 20 charts with age  $\geq 2y$  and adequate documentation

- 17/20 (85%) in children  $\geq 2y$  with adequate documentation were appropriate for shorter duration
- In total 17/42 (40%) were appropriate to have shorter duration

Kept metric simple; set goal of 30% of prescriptions for AOM for 5 or 7 days

# Metric Creation and Balancing Measures

Created new metric for prescription duration for AOM

- Built on current AOM metric (age < 12 years, exclusion criteria)
- Included amoxicillin only
- Created new metric for duration from the EMR – **potential use for future projects**
- Created balancing measure

Intervention performed with 3 PDSA cycles Data reviewed by the Ambulatory ASP team and shown at occasional provider meetings but direct provider feedback on prescribing was not a key component



# Intervention to Improve Treatment Duration for AOM

Education to pediatric providers on AAP guidelines and creating preferred orders

“Nudge” with sticky note:

- Delivered by mail and then by hand to 45 pediatric clinics
- Required phone follow-up to assure all clinics had received them

Feedback provided on balancing measures



Master the Short Game for AOM.

If your patient has mild to moderate AOM:

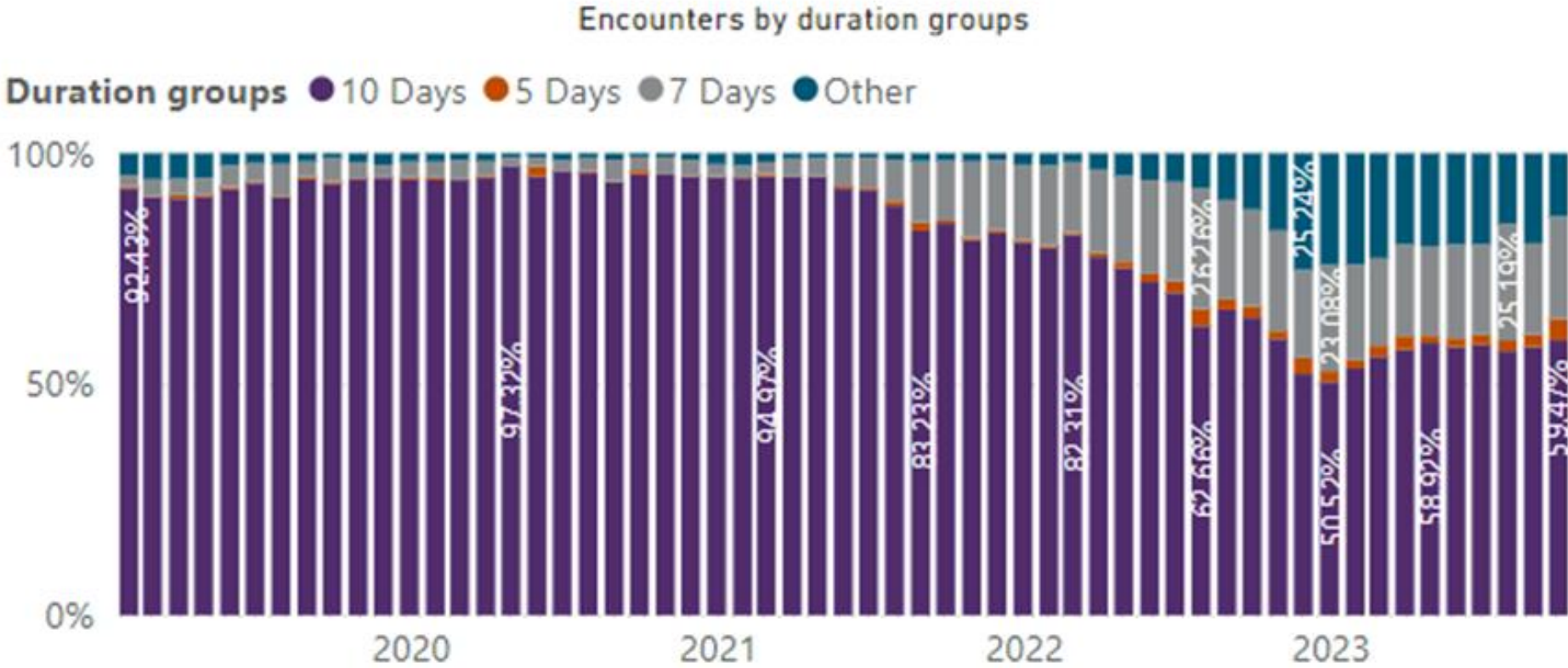
- Mild otalgia < 48 hours
- Fever < 39°C (102.2°F)
- No recent AOM in past 30 days
- No perforation

Antibiotic duration:

- Ages 2-5 years: 7 days
- Age 6+ years: 5-7 days

8/21 • NH-864314

# Dashboard Monitoring of AOM Treatment Duration

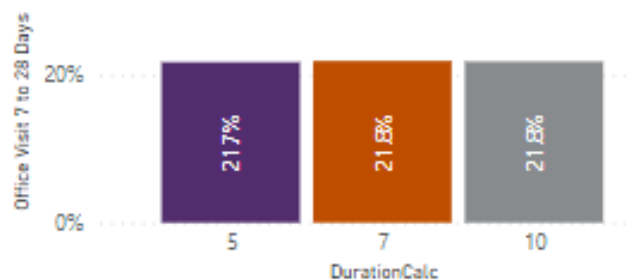


Dashboard view of primary measure showing antibiotic duration for all patients with AOM that were 10, 7, or 5 days

# Balancing Measure: Impact of shorter duration on subsequent clinic visits and antibiotics 7-28 days after initial encounter

Office Visit 7 to 28 Days and RecCount by DurationCalc and DurationCalc

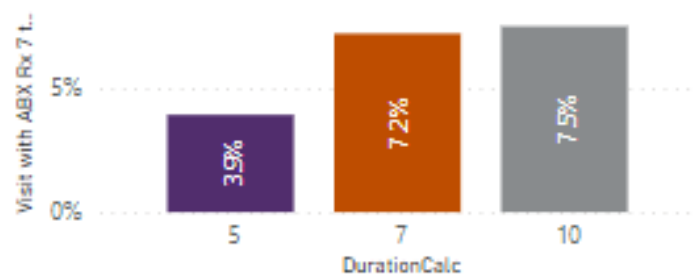
DurationCalc ● 5 ● 7 ● 10



Similar proportion of subsequent (sick) visits

Visit with ABX Rx 7 to 28 Days and RecCount by DurationCalc and DurationCalc

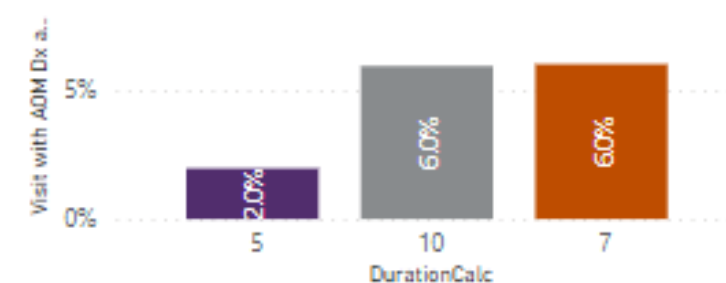
DurationCalc ● 5 ● 7 ● 10



No increase in antibiotic prescription

Visit with AOM Dx and ABX Rx 7 to 28 Days and RecCount by DurationCalc and DurationCalc

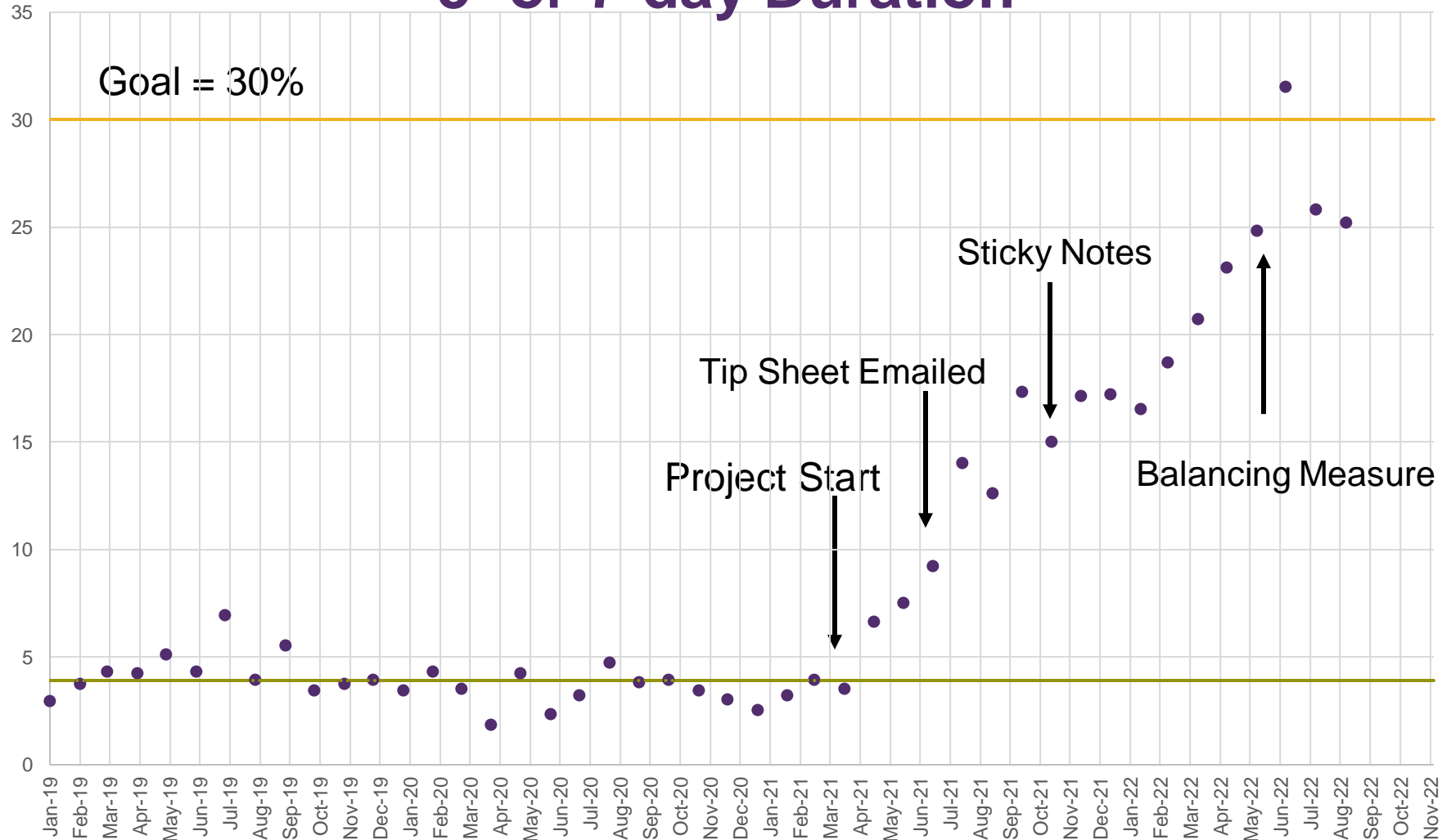
DurationCalc ● 5 ● 10 ● 7



No increase in visit with AOM Dx and antibiotic prescription

**Conclusion:** Providers should feel comfortable that they are not causing harm by prescribing shorter durations to appropriate patients

# % of Amoxicillin Prescriptions for AOM with 5- or 7-day Duration



# Data sources and strategies beyond feedback: Decreasing inappropriate azithromycin use

Azithromycin is prescribed inappropriately more often than other antibiotics<sup>1,2</sup>

Internal inpatient antibiograms show *S. pneumoniae* 48-56% sensitive to azithromycin

## EMR-based interventions

- 1) Indication required for oral azithromycin prescriptions
- 2) Best Practice Alert for those patients with free text indication and no allergies

Metric created to evaluate for improvement in azithromycin prescribing and capture typical indications to provide education

<sup>1</sup>White AT. Am J Infect Control 2019 Aug;47(8):858-863

<sup>2</sup>Shively NR. Antimicrob Agents Chemother. 2018 Aug;62(8):e00337-18.



# Azithromycin Indications

azithromycin 500 mg tablet ✓ Accept ✗ Cancel

! Indications:

Acute Bacterial Sinusitis  Non-tuberculosis mycobacteria  
 Acute Otitis Media  Pertussis  
 Bacterial Exacerbation of COPD  Sexually transmitted infection  
 Community Acquired Pneumonia  Streptococcal Pharyngitis  
 Infectious/Travelers Diarrhea

Indications (Free Text):

Product: **AZITHROMYCIN 500 MG PO TABS**

Sig Method: **Specify Dose, Route, Frequency** Use Free Text Taper/Ramp Combination Dosage

Dose:  mg **500 mg** 1,000 mg 2,000 mg

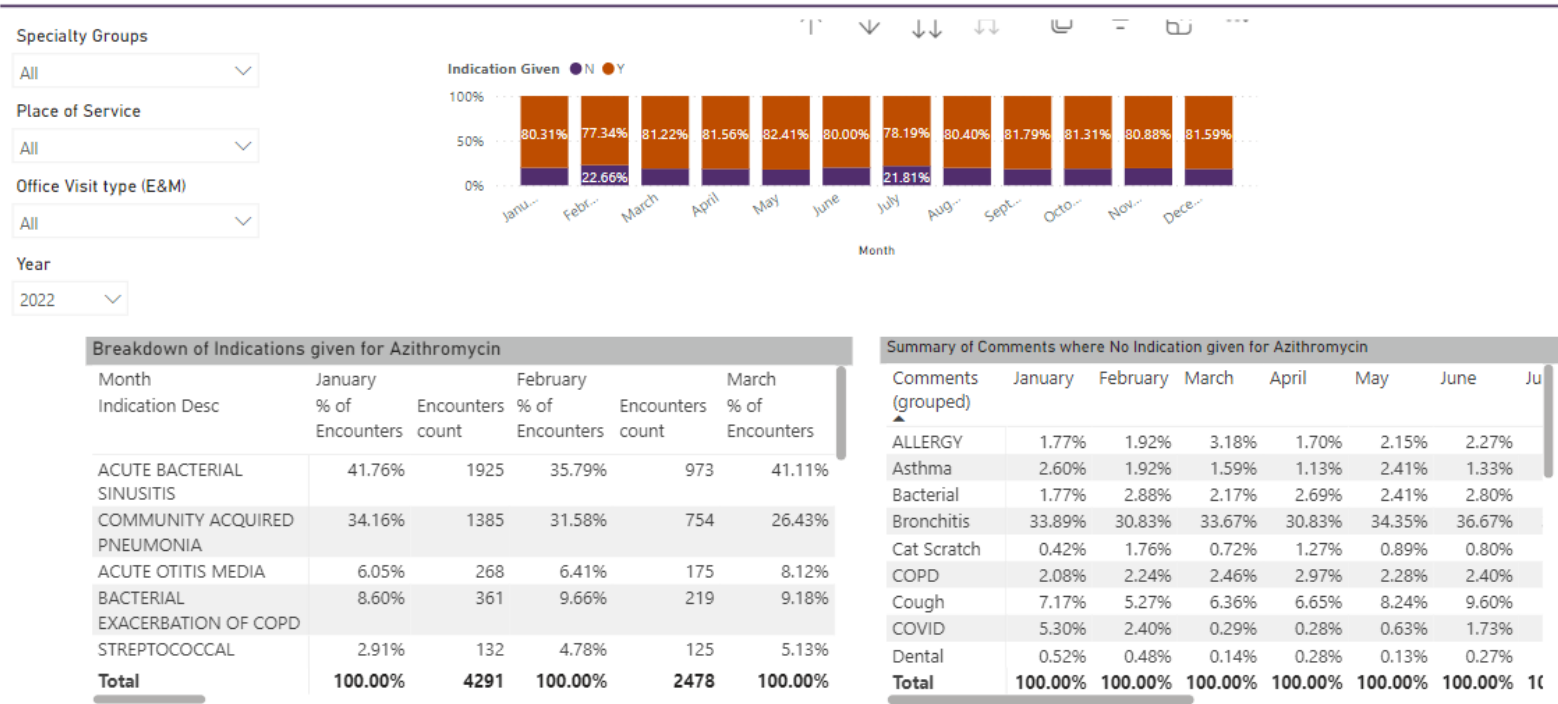
Prescribed Dose: 500 mg  
Prescribed Amount: 1 tablet

# ASP Dashboard for Monitoring Azithromycin Indications

- Initial data showed 30% of azithromycin prescriptions had free text entered indication (now ~20%)
- 40% of prescriptions with free-text indication were for respiratory conditions that do not need antibiotics such as URI, bronchitis, and cough.



Breakdown of Medical Conditions with Azithromycin - YTD



# Best Practice Alert (BPA) created based on indication data

## New BPA for Azithromycin without Indication

- BPA fires when free-text indication is used and no penicillin or cephalosporin
- Provider message prior to start of the BPA included data on azithromycin indications and education on *S. pneumoniae* sensitivity

BestPractice Advisory - Test, Baby J

Quality / Compensation / Regulatory (NHMG) (1)

**Antibiotic Stewardship:** Azithromycin ordered without indication selected and patient does not have a documented allergy to PCN or Cephalosporin.

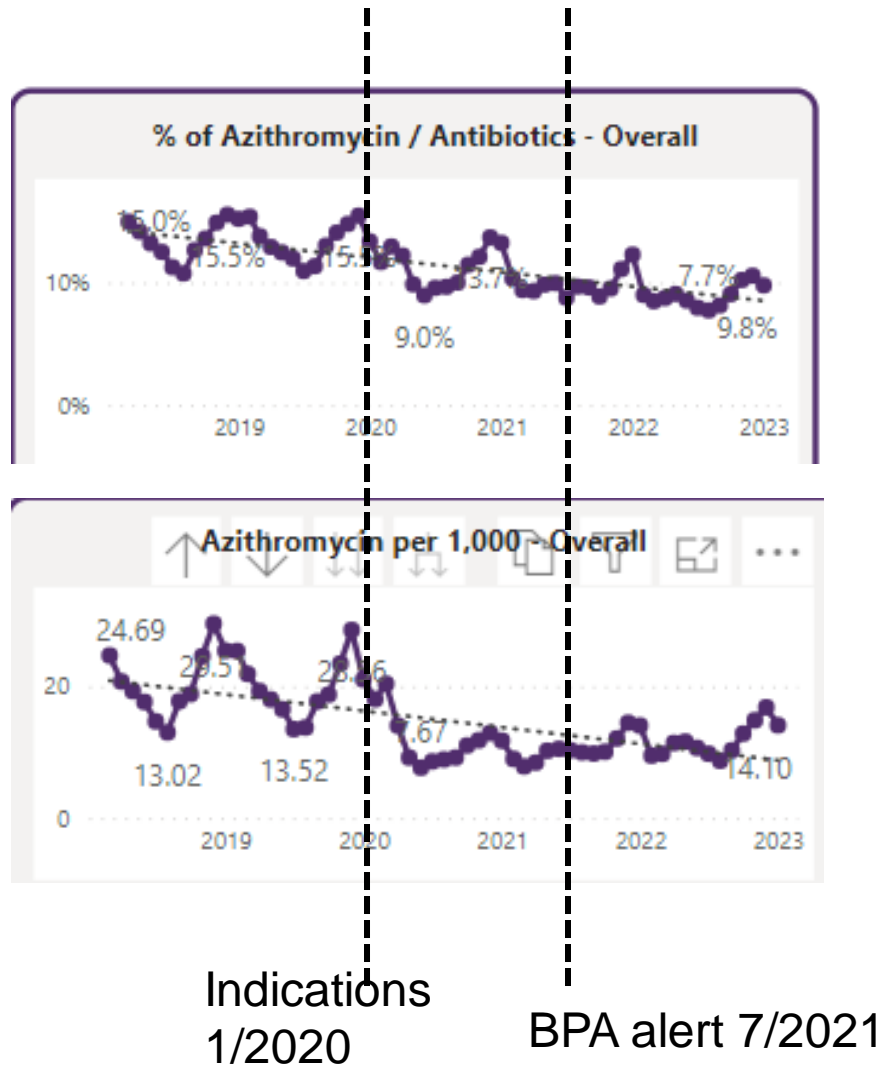
- Azithromycin provides poor coverage for *S. pneumoniae*. Consider a beta-lactam antibiotic for common respiratory infections.
- Antibiotics are not recommended for URI or acute uncomplicated bronchitis.
- Azithromycin does NOT improve COVID-19 outcomes.

Remove the following orders?

azithromycin ( ) 500 mg tablet  
Take one tablet (500 mg dose) by mouth daily for 3 days. Take for moderate/severe or bloody diarrhea while traveling Normal, Disp-3 tablet, R-0 Indications: none

[Care Pathways](#)

# Impact of EMR Changes on Azithromycin Prescriptions



- Trends obscured by COVID during 2020
- Likely impact on introduction of indications
- Unclear if BPA had as much impact as initial indications and role of underlying temporal trends
- BPA removal requested in 3/2023 and transitioned to information box

# Transition from BPA to Information Box

azithromycin | 500 mg tablet ✓ Accept ✗ Cancel

Reference 1. Micromedex

Links:

Order Inst: Azithromycin provides poor coverage for *S. pneumoniae*. Consider a beta-lactam antibiotic for common respiratory infections. Antibiotics are not recommended for URI or acute uncomplicated bronchitis. Azithromycin does NOT improve COVID-19 outcomes.

Indications:

- Acute Bacterial Sinusitis
- Acute Otitis Media
- Bacterial Exacerbation of COPD
- Community Acquired Pneumonia
- Infectious/Travelers Diarrhea
- Non-tuberculosis mycobacteria
- Pertussis
- Sexually transmitted infection
- Streptococcal Pharyngitis

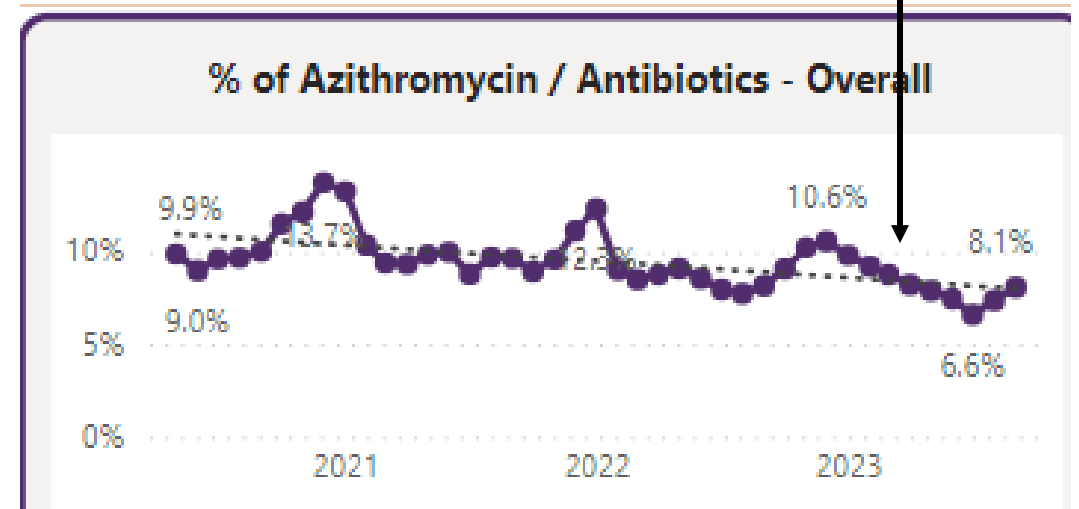
Indications (Free Text):

Product: **AZITHROMYCIN 500 MG PO TABS**

Sig Method:

Dose:  mg

BPA Removed



# Additional literature describes Clinical Decision Support (CDS) on azithromycin prescribing in primary care

All outpatient orders for azithromycin defaulted to CDS panel that had information on appropriate prescribing and dosing / duration set for common indications

Alternative Selection

**Alternative Required**

You selected:  
**azithromycin** 250 mg tablet: Take 2 tablets on day 1; Take 1 tablet on days 2-5. Disp-6 tablet, R-0, Normal

**Details**

- asthma and COPD exacerbations DO NOT require antibiotics
- do not use azithromycin for SSTIs, UTIs, sinusitis
- caution with use for patients with concurrent QTc prolonging medications

**References**

- URI Diagnostic Criteria
- FDA Warning on FQs - mental health and hypoglycemia
- FDA Warning on FQs - risk > benefit related to indications
- Community-acquired Pneumonia (CAP) Guidelines
- FDA Warning on FQs - aortic dissection/aneurysm

**Alternatives**

Alternative	Details
<input type="radio"/> Bronchitis Treatment	albuterol HFA (VENTOLIN) 108 (90 Base) MCG/ACT inhaler, guaifenes...
<input type="radio"/> Sinusitis Treatment	This suggestion contains a panel. Review the orders before signing.
<input type="radio"/> Pneumonia 1st line - azithromycin 500 mg x 1, then 250 mg daily x 4 days	Disp-6 tablet, R-0, Normal
<input type="radio"/> Pneumonia 2nd line - doxycycline 100 mg PO BID x 5 days	Disp-10 capsule, R-0, Normal
<input type="radio"/> Azithromycin (Z-pak) 500 mg x 1 then 250 mg daily x 4 days	Disp-6 tablet, R-0, Normal
<input type="radio"/> GC/Chlamydia azithromycin 1 g PO x 1 dose	Disp-2 tablet, R-0, Normal
<input type="radio"/> MAC prophylaxis 1200 mg PO once a week	Normal
<input type="radio"/> azithromycin (ZITHROMAX) 250 mg tablet	Normal
<input type="radio"/> azithromycin (ZITHROMAX) 600 mg tablet	Normal

**Bronchitis Treatment** ✓ Accept

- Please educate/counsel patient on the following:
  - Bronchitis is a self-limiting disease – may take up to 6 weeks for complete resolution
  - Commonly due to viruses
  - Antibiotics DO NOT have benefit in treating viruses
  - Giving antibiotics may cause harm including: diarrhea, rashes, severe diarrhea (C. difficile infection), anaphylaxis and future antibiotic resistance (future infection has resistance to antibiotics)

**URI Diagnostic Criteria**

albuterol HFA (VENTOLIN) 108 (90 Base) MCG/ACT inhaler  
Disp-1 inhaler, R-0, Normal

guaifenesin-dextromethorphan (ROBITUSSIN DM) 100-10 MG/5ML syrup - Do NOT exceed 7 days of use  
Normal

benzonatate (TESSALON) 100 mg capsule, Do not exceed 7 days of use  
Normal

cetirizine (ZYRTEC) 10 mg tablet  
Normal

loratadine (CLARITIN) 10 mg tablet  
Normal

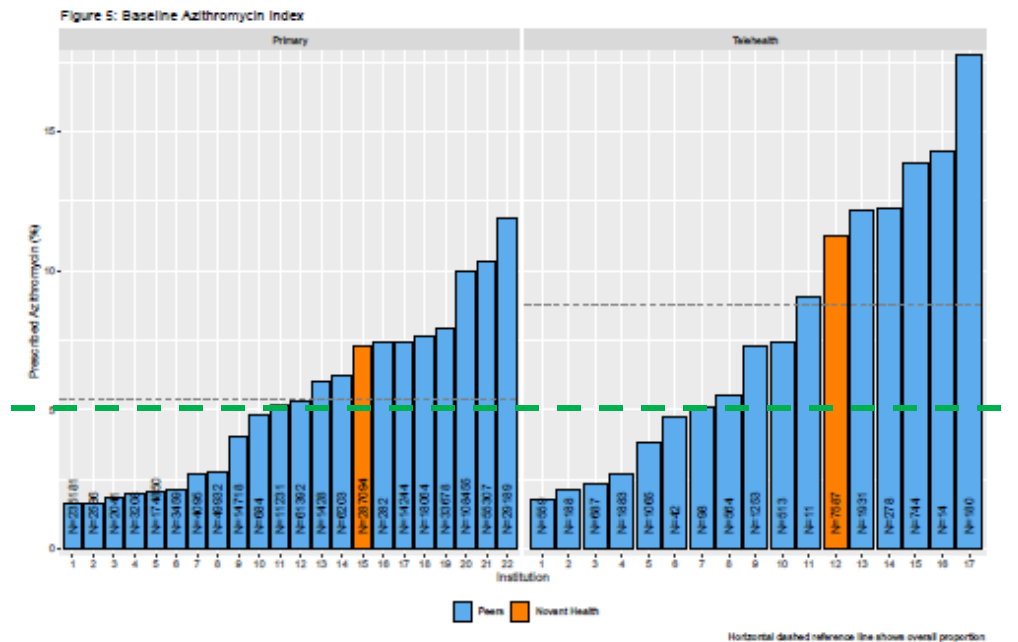
**Next Required** ✓ Accept

**Inappropriate azithromycin prescriptions decreased from 81.4% to 68.8% post-intervention ( $P < 0.001$ ).**

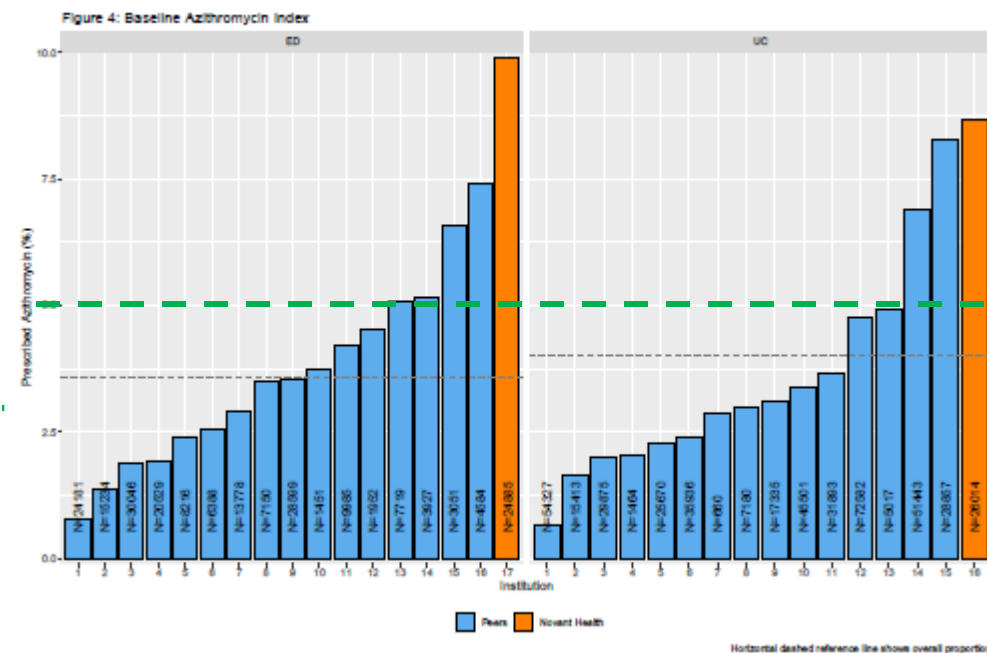
# Azithromycin Prescribing in Pediatrics: Using data from a national collaborative

- SHARPS-OP is a pediatric antimicrobial stewardship collaborative
- Participating healthcare systems, primary care clinics, and ASPs were invited to join a research study in 2022 which would provide benchmarked data on prescribing rates, including azithromycin use.
- Data showed relatively high use of azithromycin and provided data to establish goal

Primary/Telehealth Baseline Azithromycin Index

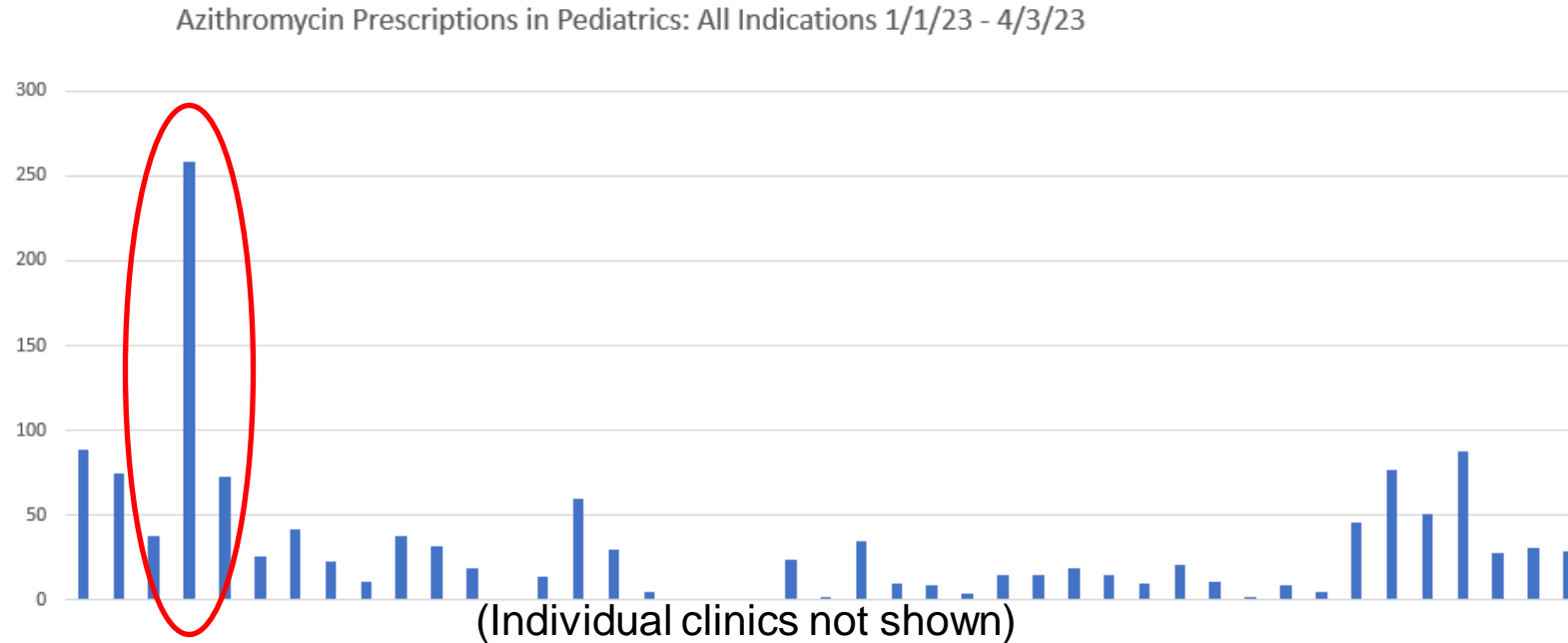


ED/UC Baseline Azithromycin Index



Goal for  
<5%

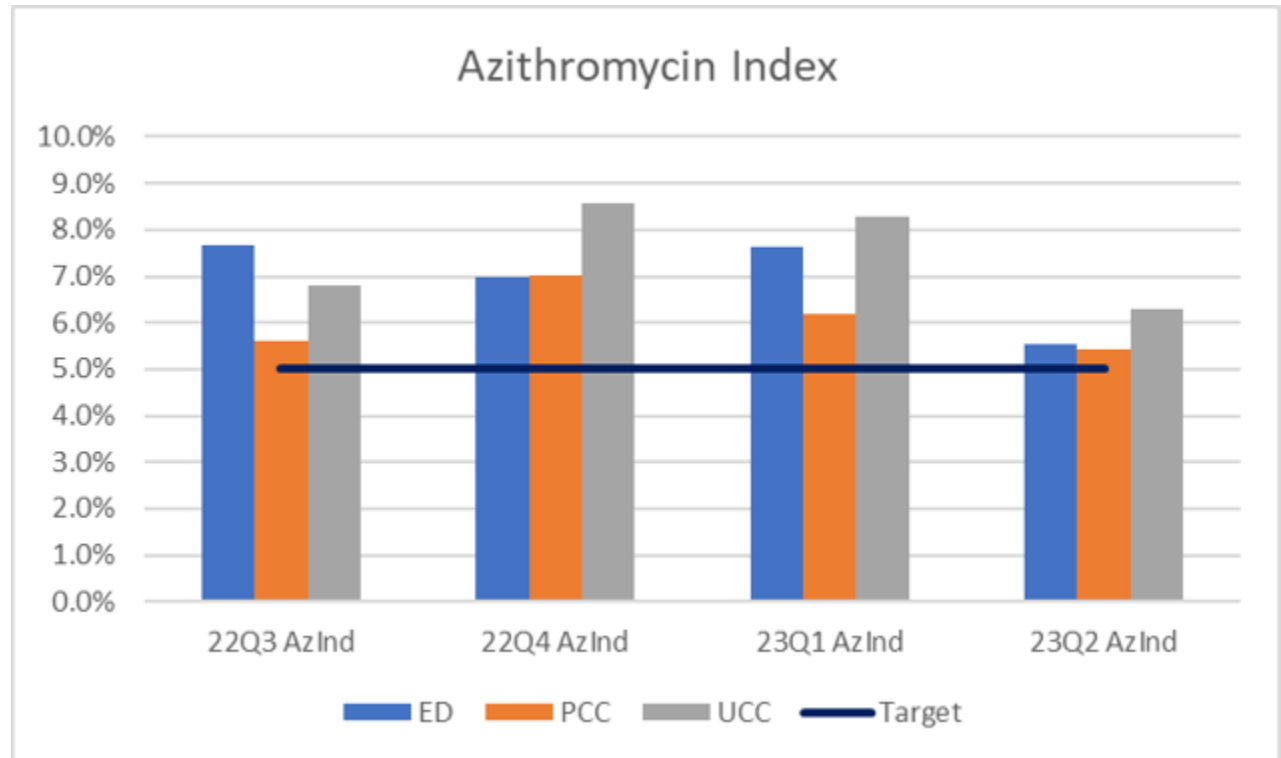
# Azithromycin Prescribing in Pediatrics: Evaluating Use across Pediatric Clinics





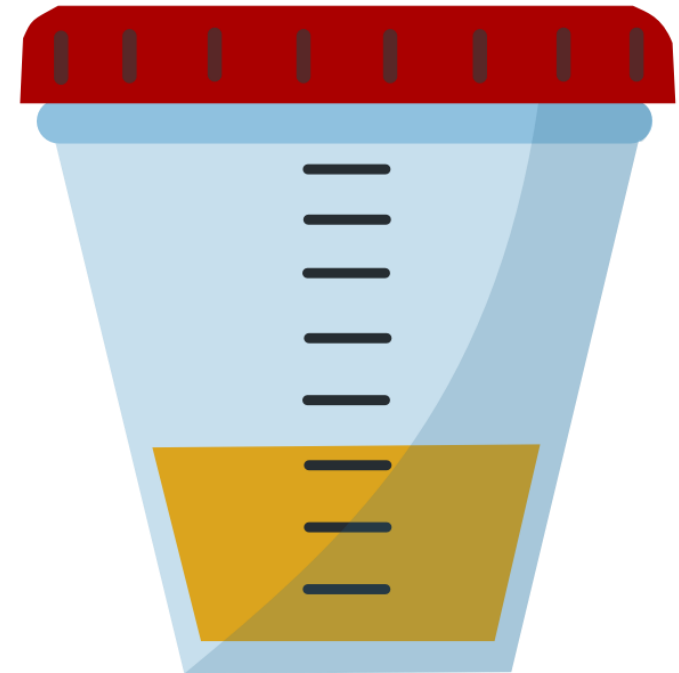
# Azithromycin Prescribing in Pediatrics: Interventions and Data

- Feedback and education (including individual-level data) to lead clinician of high prescribing clinic (May 2023)
- Feedback and educational slides provided to Urgent care and Emergency Department leaders (Summer 2023)
- Review of provider-specific data also showed that admitted patients with appropriate use being included in the ED data



# Customizing national guidelines to local susceptibility rates: Treatment of Urinary Tract Infection (UTI)

- Pediatric and adult guidelines give multiple options for treatment of uncomplicated urinary tract infection (cystitis)
- Cefazolin testing predicts sensitivity for cephalexin in addition to later generation cephalosporins.
- Cephalexin has good urinary excretion but anecdotally was not used frequently
- Ambulatory urinary antibiogram could be helpful in determining the appropriate empiric antibiotic for UTI



# Creation of urinary antibiogram with Labcorp

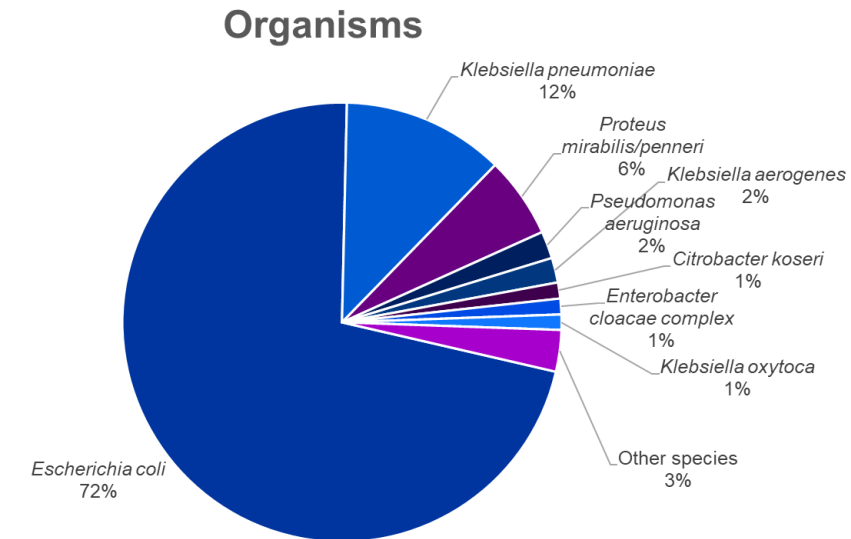
Most urine cultures from Novant clinics are processed by Labcorp

Urinary antibiogram created using M100 based on cultures sent from Labcorp ambulatory clinics

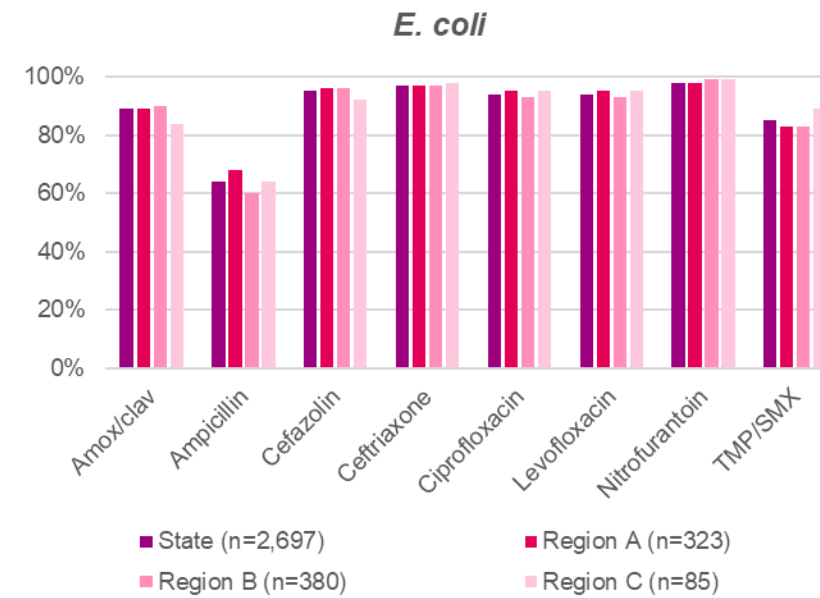
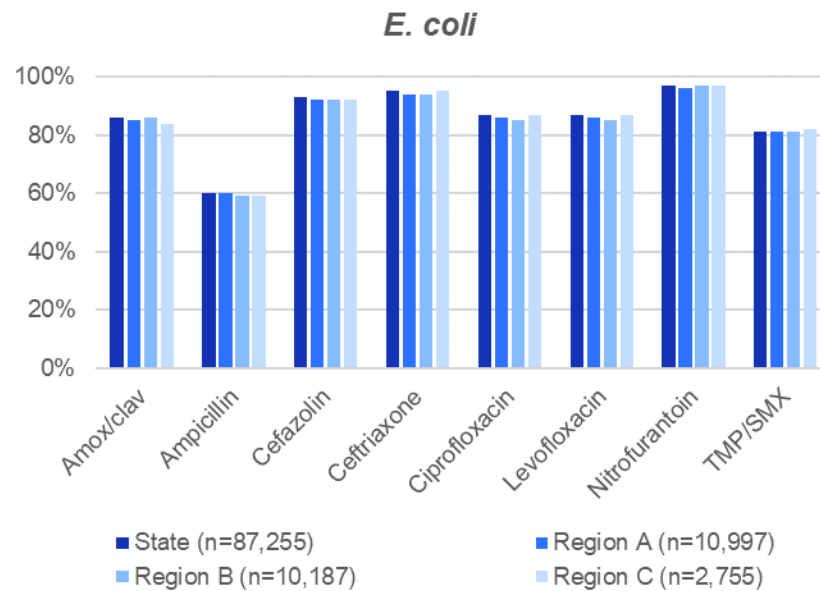
Susceptibility data examined for most common organisms by region to determine need to report data regionally

Adult and pediatric data analyzed and reported separately

State-level data (data from all Labcorp urine cultures) also analyzed to determine any institution specific patterns



# Regional Data (shown for *E. coli* state-wide **Adult** / **Pediatric**)



- *E. coli*, *K. pneumoniae*, and *P. mirabilis* were  $\geq 80\%$  susceptible all antibiotics except ampicillin for *E. coli* and nitrofurantoin for *P. mirabilis*
- Susceptibility was similar between NH and state-wide data except for ceftriaxone (94% vs. 95%;  $p < .001$ ) in *E. coli*
- Susceptibility rates by region were similar in NH and state-wide data for *E. coli*, *K. pneumoniae*, and *P. mirabilis*

## Ambulatory Urinary Antibiogram - Adult

Data from ambulatory sites, January - December 2022

Gram-negative	Total Isolates							
		Amoxicillin	Amox/clav	Cephalexin*	Ceftriaxone^	Nitrofurantoin	TMP/SMX	Ciprofloxacin*
<i>Citrobacter koseri</i>	1,481	NS	98%	NS	98%	91%	99%	100%
<i>Enterobacter cloacae</i> complex	1,532	NS	NS	NS	NS	70%	92%	97%
<i>Escherichia coli</i>	88,223	60%	87%	93%	95%	98%	82%	87%
<i>Klebsiella aerogenes</i>	5,199	NS	NS	NS	89%	22%	98%	99%
<i>Klebsiella oxytoca</i>	1,474	NS	93%	--	94%	88%	95%	99%
<i>Klebsiella pneumoniae</i>	15,772	NS	96%	96%	96%	36%	93%	98%
<i>Morganella morganii</i>	771	NS	NS	NS	NS	NS	86%	91%
<i>Proteus mirabilis/penneri</i>	7,467	85%	100%	96%	97%	NS	92%	94%
<i>Pseudomonas aeruginosa</i>	2,716	NS	NS	NS	NS	NS	NS	92%
<i>Serratia marcescens</i>	663	NS	NS	NS	93%	NS	100%	98%

Gram-positive	Total Isolates						
		Amoxicillin	Oxacillin	Nitrofurantoin	TMP/SMX	Ciprofloxacin*	Levofloxacin*
Coag-neg <i>Staphylococcus</i> spp.	6,315	NS	56%	99%	81%	77%	78%
<i>Enterococcus faecalis</i>	13,529	99%	NS	99%	NS	93%	94%
<i>Enterococcus faecium</i>	344	42%	NS	37%	NS	41%	42%

### Textured shading denotes preferred agent for uncomplicated cystitis

The first-line recommendations for adults with uncomplicated UTI (e.g. cystitis in women) are trimethoprim-sulfamethoxazole or nitrofurantoin.

If a cephalosporin is needed, cephalexin is an appropriate choice based on susceptibility and pharmacokinetic data and should be given for 5-7 days.

\*Cefazolin susceptibility may be used as surrogate for cefaclor, cefdinir, cefpodoxime, cefprozil, cefuroxime, cephalexin, and loracarbef for uncomplicated UTIs

^Ceftriaxone susceptibility should not be used to infer cefdinir susceptibility

\*FDA recommends avoiding fluoroquinolones for uncomplicated UTI unless no other treatment options available because of the risk of serious side effects outweighing benefit

NS = non-susceptible; UTI = urinary tract infection

## Ambulatory Urinary Antibiogram - Pediatric

Data from ambulatory sites, January - December 2022

Gram-negative		Total Isolates	Amoxicillin	Amox/clav	Cephalexin*	Ceftriaxone^	Nitrofurantoin	TMP/SMX	Ciprofloxacin*
<i>Escherichia coli</i>	1858	63%	90%	95%	97%	98%	84%	93%	
<i>Klebsiella pneumoniae</i>	177	NS	94%	94%	95%	28%	89%	99%	
<i>Proteus mirabilis/penneri</i>	79	90%	100%	99%	100%	NS	92%	97%	

Gram-positive		Total Isolates	Amoxicillin	Oxacillin	Nitrofurantoin	TMP/SMX	Ciprofloxacin*	Levofloxacin*
Coag neg <i>Staphylococcus</i> spp.	184	NS	61%	100%	89%	95%	96%	
<i>Enterococcus faecalis</i>	232	97%	NS	100%	NS	97%	98%	

Textured shading denotes preferred agent for uncomplicated cystitis

\*Cefazolin susceptibility may be used as surrogate for cefaclor, cefdinir, cefpodoxime, cefprozil, cefuroxime, cephalexin, and loracarbef for uncomplicated UTIs

^Ceftriaxone susceptibility should not be used to infer cefdinir susceptibility

\*FDA recommends avoiding fluoroquinolones for uncomplicated UTI unless no other treatment options available because of the risk of serious side effects outweighing benefit

NS = non-susceptible; UTI = urinary tract infection

# Next Steps to Improve Prescribing for UTI

Internal guideline (Care Pathways) for Pediatric and Adult UTI created to serve as provider reference and basis for recommendations

Creating metrics for appropriate antibiotic selection and duration

Currently determining baseline data and opportunities for improvement

# Considering broader approaches for disseminating and applying national guidelines

Provider feedback is effective but labor intensive

- Mechanism of getting data reliably to providers in crucial
- Metrics that are relevant to prescribers

Focused QI projects provide successes but may have limited impact

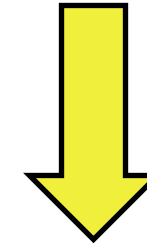
- Good engagement
- Can leverage for creation of metrics that may be broadly applicable

Broader approaches for ambulatory antimicrobial stewardship

- Accessible internal guidelines and prescribing resources
- Use of Smart sets and Preference Lists
- EMR nudges to improve prescribing



# Prescriber Resources: Care Pathways



## NOVANT ANTIMICROBIAL STEWARDSHIP PROGRAM

Novant Health Antimicrobial Stewardship Program is focused on delivering remarkable patient care as it relates to antimicrobial prescribing through improvement in the frequency of guideline-concordant (evidence-based) antimicrobial use and reduction in suboptimal or unnecessary antimicrobial prescribing, enterprise-wide.

**Mission:** Every patient who has an indication for an antibiotic will receive the correct antibiotic, at the correct dose, for the correct duration, every time.

### Site Links

ID Clinical Resources

Ambulatory Care Pathways

Antibiotics (Acute and Ambulatory)



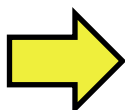
### NHMG Care Pathways

Infectious Disease	Mental Health/Social	OB/GYN	Heart/Lung/
Antibiotic Treatment Guide (Adult) Antibiotic Treatment Guide (Pediatric) Acute Otitis Media Acute Uncomplicated Bronchitis Asymptomatic Bacteriuria Infectious Diseases Testing Penicillin Allergy Assessment Pneumonia, CAP Inpatient (Adult) Pneumonia, CAP Inpatient ( Pediatric) Pneumonia, CAP Outpatient (Adult) Pneumonia, CAP Outpatient(Pediatric) Sinusitis Strep Pharyngitis Urinary Tract Infection (Adult) Urinary Tract Infection (Pediatric)	Adolescent Depression Advanced Directives- Choices & Champions Anxiety (Pediatrics) Depression (Adults) Depression, Post-partum Depression Metric Navigator Transgender care	Abnormal Uterine Bleeding Depression, Post-partum Diabetes, Gestational	Anticoagulation for require Interruption Anticoagulation M&PE and Non-Valvula COPD Heart Failure with r Outpatient Hypertension

# Prescriber Resources: Antibiotic Treatment Guide Provides Quick Reference

## Infectious Disease

Antibiotic Treatment Guide (Adult)  
Antibiotic Treatment Guide (Pediatric)



### Novant Health ADULT Ambulatory Empiric Antibiotic Treatment Guide

These guidelines are based on local and national published guidelines and the antibiogram at Novant Health. Guidelines cannot account for all factors in an individual patient and should be used in conjunction with clinical judgement. All doses reflect normal renal and hepatic function. Durations listed assume improvement within 48-72h of starting antibiotics.

Diagnosis	First-Line Therapy	Alternative Therapy	Clinical Pearls
Acute Sinusitis	Amoxicillin 875 mg – 2 g BID x 5-7 days OR  <u>Comorbidity*</u> , > 65y, severe sinusitis, antibiotics in the past 30d: Amoxicillin/clavulanate 875 mg/125 mg BID x 5 – 7 days  <b>Duration:</b> 5-7 days	<u>PCN allergy:</u> Doxycycline 100 mg BID or 200 mg daily x 5 – 7 days  <b>*Comorbidity:</b> Alcoholism; asplenia; chronic heart/lung/liver/kidney disease; DM; immunosuppression; malignancy	Consider Intranasal steroid +/- intranasal saline irrigation if history of allergic rhinitis.  Avoid azithromycin due to local <i>S. pneumoniae</i> resistance >25%. Avoid trimethoprim-sulfamethoxazole due to <i>S. pneumoniae</i> and <i>H. influenzae</i> resistance
Community Acquired Pneumonia (CAP)	Amoxicillin 1 g TID x 5 days  <u>Comorbidity*</u> (see above), tobacco use or antibiotic in past 3 months: Amoxicillin/clavulanate (875/125 mg or 2 g/125 mg) BID PLUS doxycycline 100 mg BID OR azithromycin 500 mg x 3 days (for atypical coverage)  <b>Duration:</b> 5 days (except azithromycin)	<u>Mild PCN allergy (non-type 1)</u> Use 2 <sup>nd</sup> or 3 <sup>rd</sup> gen cephalosporin (cefuroxime, cefdinir, cefpodoxime) in place of amoxicillin or amoxicillin/clavulanate  <u>Mod/Severe PCN allergy OR high concern for atypical pneumonia:</u> Doxycycline 100 mg BID	Avoid azithromycin monotherapy due to local <i>S. pneumoniae</i> resistance >25%. Avoid trimethoprim-sulfamethoxazole due to <i>S. pneumoniae</i> and <i>H. influenzae</i> resistance
Group A strep (GAS) pharyngitis	Amoxicillin 1 g daily or 500 mg BID OR penicillin 500 mg BID  <u>Not tolerating PO or concern for compliance:</u> Penicillin G benzathine (Bicillin L-A) 1.2 million units IM x 1  <b>Duration:</b> 10 days	<u>Mild PCN allergy:</u> Cephalexin 500 mg BID OR cefadroxil 1 g daily  <u>Mod/Severe PCN allergy:</u> Azithromycin 500 mg on day 1 then 250 mg daily on day 2-5 OR clindamycin 300 mg TID x 10 days OR	Testing should be performed prior to treatment since 35-50% of patients identified by scoring systems (e.g. Centor) will have viral etiology
Skin/Soft Tissue Infection (SSTI)	<u>Impetigo:</u> Mupirocin 2% ointment TID or cephalexin 500 mg TID <u>Non-purulent cellulitis</u> (including ecthyma and erysipelas): Cephalexin 500 mg TID <u>Purulent cellulitis / abscess:</u> I&D +/- Trimethoprim-sulfamethoxazole 160 mg TMP (1 DS) BID OR doxycycline 100 mg BID  <b>Duration:</b> Cellulitis or Impetigo (topical therapy): 5 days Ecthyma or Impetigo (oral therapy): 7 days	<u>PCN allergy:</u> Clindamycin 450 mg TID OR (purulent) Doxycycline 100 mg BID  <u>Human/Animal Bite:</u> Amoxicillin/clavulanate 875 mg BID PCN allergy: Clindamycin 450 mg TID + TMP/SMX 160 mg BID  Antibiotic prophylaxis (3-5 days): hand/ facial wounds, penetrating cat bite wounds, crush/deep tissue wounds, joint penetration, or immunocompromise	Oral antibiotics are recommended for most abscesses based on improved clinical resolution and reduced risk of recurrence. It is reasonable to withhold oral antibiotics for small, single abscesses (<2cm) in patients who have complete I&D and have no comorbidity, signs of systemic illness, or risk factors for transmission.
UTI (does not include pregnant women, renal transplant or prostatitis/STI treatment)	<u>Uncomplicated UTI (Cystitis)</u> Nitrofurantoin (Macrobid) 100 mg BID OR cephalexin 500 mg BID <b>Duration:</b> Nitrofurantoin 5 days, TMP/SMX 3 days, cephalexin 3-7 days  <u>Complicated UTI / Pyelonephritis</u> Ciprofloxacin 500mg BID or Levofloxacin 750mg daily <b>Duration:</b> Cipro/Levo 7 days, Cephalosporin 10 days, TMP/SMX 14 days	<u>Uncomplicated UTI (Cystitis):</u> TMP-SMX 160 mg TMP (1 DS) BID  <u>Complicated UTI/Pyelonephritis</u> Ceftriaxone 1g IM x 1 may be given prior to starting oral therapy For mild illness, can consider cephalexin 500 mg <u>TID</u>	<i>E. coli</i> were 93% sensitive to cephalexin, 97% sensitive to nitrofurantoin, and 81% sensitive to TMP/SMX in 2021 ambulatory adult urine cultures.

# Addressing duration with EMR nudges

cephALEXin 250 mg capsule ✓ Accept ✗ Can

Reference 1. Micromedex

Links:

Product: **CEPHALEXIN 250 MG PO CAPS** [View Available Strengths](#)

Sig Method: **Specify Dose, Route, Frequency** [Use Free Text](#) [Taper/Ramp](#) [Combination Dosage](#)

Dose:  mg **250 mg** 500 mg 750 mg

**cephALEXin (KEFLEX) 250 mg capsule** [Details](#)

↑ Frequency of **4 doses/day** exceeds recommended maximum of **2 doses/day**

Override Reason/Comment: [Medically Necessary](#) [Benefit Outweighs Risk](#) [Patient Taken Safely Before](#)

Override Reason...

Prescribed Dose: 250 mg  
Prescribed Amount: 1 capsule

Route:  **Oral**

Frequency:

Duration:

Starting:   Ending:

- Cephalexin default duration changed from 10 to 7 days on Facility Preference list
- Speed buttons added for duration and default to 7 days

# Revisiting the objectives

**Describe how data can inform the local application of national guidelines**

- Local susceptibility data incorporated into guidelines
- Prescribing data to identify priority guidelines
- Provider preferences on data dissemination
- Create metrics to monitor guideline-adherent prescribing

**Describe ways in which data can be used to improve antibiotic use**

- Provider feedback on appropriate prescribing
- Focused quality improvement projects
- Benchmarked data to identify areas of opportunity
- Support interventions based on clinical decision support and the electronic medical record

# Acknowledgments

**Ambulatory Antimicrobial Stewardship:** Jacinta Chin, Becky DeCamillis, Crystal Redfern

**Data Analysts:** David Sheedy Shanae Foxx Lisa Mathis

**Clinicians:** Steve Ezzo, Peter Mack, Andrea Dupont

**Quality Improvement:** Sarah Hreyo, Analese Travina, Cordelia Hargrave

**Support/Mentorship:** David Priest, Herb Clegg

---

# Thank You

[kbflett@novanthealth.org](mailto:kbflett@novanthealth.org)