



System-wide Approach to Improve Outpatient Antibiotic Use

Jessica Holt, PharmD, BCPS-AQ ID
Infectious Diseases Pharmacy Coordinator
Abbott Northwestern Hospital, Minneapolis, MN

Background on Allina Health

- Not-for-profit healthcare system serving MN and western WI
- Patient care facilities include
 - 12 hospitals (1,775 staffed beds)
 - Metro sites include Abbott Northwestern, United, Mercy, Unity
 - **13 Emergency Departments**
 - **13 Urgent Cares**
 - **62 Allina Health clinics**
 - **23 Hospital-based clinics**
 - 49 Rehabilitation locations
 - 15 Retail pharmacy sites
 - 2 Ambulatory care centers

Antibiotic Stewardship in Allina Health

- Primary focus has been inpatient
- A key driver for *Clostridium difficile* reduction
- Leadership commitment at the site and system level
- Multiple private ID provider groups across the system
 - All are members of the Allina ID Physician/Pharmacy Task Force
- Two ID pharmacists at Abbott drive several system initiatives
- Monthly antibiotic use report for inpatient antibiotic use
- Reporting structure varies at each site
- Standardized mandatory education for all employees and patients

3

Allina Health 

Expansion to Outpatient Antibiotic Stewardship

- Initially driven by pharmacists in the ED
 - Providers asking for antibiotic recommendations for patients leaving
 - Pharmacists review cultures of patients discharged from ED
 - Pharmacists observing lack of standardization/best practice
 - Collaborative practice agreements for culture reviews
- Initially was a pharmacy student's project to develop a guide to use in the ED at Abbott (2015)
- Due to increased interest and usage, expanded Allina-wide (2017)

4

Allina Health 

Outpatient Antibiotic Guides

- Separated adult and pediatric recommendations
- Utilized guidelines, local antibiograms, current literature, clinical experience, and antibiotic stewardship principles
- Included:
 - First line and second line options
 - Duration of therapy
 - Additional comments useful for provider (e.g., resistance rates)
 - Tables with antibiotics requiring renal adjustment, brand/generic names, max doses for pediatrics

5

Allina Health 

Outpatient Antibiotic Guides

- Adult Guide
 - Feedback from ED providers/pharmacists on original guide
 - Updated by ID pharmacists at Abbott
 - Feedback and endorsement by the Allina ID MD/RX Task Force
 - Endorsement by the Allina Primary Care Council
 - Utilized Allina Sepsis Leadership Team to prioritize ED Smart Set build

6

Allina Health 

Outpatient Antibiotic Guides

• Pediatric Guide

- Feedback from ED providers/pharmacists on original guide
- Updated Abbott ID pharmacy resident and Children's Minnesota ASP pharmacist
- Approval process at Children's Minnesota
- Feedback by Allina Pediatric Council
- Feedback and endorsement by the Allina ID MD/RX Task Force
- Endorsement by the Allina Primary Care Council
- Utilized Allina Sepsis Leadership Team to prioritize ED Smart Set build

7

Outpatient Antibiotic Guides

2017 Allina Health Adult Outpatient & ED Antibiotic Reference Guide

Endorsed by the Allina Health Primary Care Council and Allina Health Infectious Diseases Physician/Pharmacy Task Force

Condition	Skin/Soft Tissue		Notes
	First Line Therapy	Second Line Therapy	
Cellulitis, Purulent	SMX/TMP DS 1-2 tabs PO BID x5-14 days	Doxycycline 100mg PO BID x5-14 days	<ul style="list-style-type: none"> ▪ <i>Staph aureus</i> resistance to Clindamycin = 22% ▪ Duration: usually 7 days ▪ Extend duration if immunocompromised
Cellulitis, Non-purulent	Cephalexin 500mg PO QID x5-14 days	Clindamycin 450mg PO QID x 5-14 days	<ul style="list-style-type: none"> ▪ Duration: usually 7 days ▪ Extend duration if immunocompromised
Diabetic Foot, Mild	Amox/clav 875mg PO BID x7-14 days	Cephalexin 500mg PO QID x7-14 days	
Diabetic Foot, Moderate	Amox/clav 875mg PO BID	Levofloxacin 750mg PO daily +/- Metronidazole 500mg PO BID (add for anaerobic coverage)	<ul style="list-style-type: none"> ▪ Duration: usually 2-4 weeks; depends on clinical improvement ▪ Pseudomonas: use Levofloxacin

2017 Allina Health and Children's Minnesota Joint Pediatric Outpatient & ED Antibiotic Reference Guide For Children ≥ 2 months old

Endorsed by the Allina Primary Care Council, Allina Health Infectious Diseases Physician/Pharmacy Task Force, and Children's Minnesota

Condition	Skin/Soft Tissue		Notes
	First Line Therapy	Second Line Therapy	
Cellulitis, Purulent	SMX/TMP dose based on TMP; 5mg/kg/dose PO BID (max: 320mg/day)	Clindamycin 10mg/kg/dose PO TID (max: 1.8g/day)	<ul style="list-style-type: none"> ▪ Duration: 7 days ▪ I&D alone is the preferred treatment. Consider abx for systemic symptoms/incomplete abscess drainage
Cellulitis, Non-purulent	Cephalexin 15mg/kg/dose PO TID (max: 3g/day)	Clindamycin 10mg/kg/dose PO TID (max: 1.8g/day)	<ul style="list-style-type: none"> ▪ Duration: 7 days

8

Outpatient Antibiotic Guides

Generic (Brand)	Require Renal Adjustment	Antibiotic	Pediatric Maximum Dose
1st Generation Cephalosporins <ul style="list-style-type: none"> Cefazolin (Ancef) Cephalexin (Keflex) Cefadroxil (Duracef) 	<ul style="list-style-type: none"> Amoxicillin Amoxicillin/clavulanate Cefdinir Cefotaxime Cefoxitin Ceftin Ciprofloxacin Ertapenem Imipenem Levofloxacin Meropenem Nitrofurantoin Penicillin Sulfamethoxazole/Trimethoprim 	<i>Doses should never exceed the recommended adult dose; maximum doses listed below are for MOST indications – certain indications may permit higher dosing.</i>	
2nd Generation Cephalosporins <ul style="list-style-type: none"> Cefuroxime axetil (Ceftin) Cefoxitin (Mefoxin) Cefprozil (Cefzil) Cefpodoxime (Vantin) 		Amoxicillin Amox/Clav	<40 kg: 1000 mg/dose ≥40 kg: 2 GM/day
3rd Generation cephalosporins <ul style="list-style-type: none"> Cefotaxime (Claforan) Cefdinir (Omnicef) Ceftriaxone (Rocephin) Ceftazidime (Fortaz) Cefixime (Suprax) 		Azithromycin (≥ 6 months)	500 mg/day on day 1 250 mg/day on days 2-4
4th Generation Cephalosporins <ul style="list-style-type: none"> Cefepime (Maxipime) 		Cefdinir	600 mg/day
Fluoroquinolones <ul style="list-style-type: none"> Moxifloxacin (Avelox) Levofloxacin (Levaquin) Ciprofloxacin (Cipro) 		Cephalexin	3 GM/day
Carbapenems <ul style="list-style-type: none"> Imipenem/cilastatin (Primaxin) Ertapenem (Invanz) Meropenem (Merrem) 		Ciprofloxacin	1.5 GM/day
Other <ul style="list-style-type: none"> Amoxicillin/clavulanate (Augmentin) Azithromycin (Zithromax) Clarithromycin (Biaxin) Clindamycin (Cleocin) Doxycycline (Vibramycin) Sulfamethoxazole/Trimethoprim (Bactrim, Septra) (SMX/TMP) 		Clarithromycin (≥ 6 months)	1 GM/day
		Clindamycin	600 mg/dose
		Levofloxacin	750 mg/day
		Metronidazole	500 mg/dose
		SMX/TMP (≥ 2 months)	160 mg TMP/dose
		Tinidazole	2 GM/dose

9



Putting the Guides into Practice


- Allina antibiotic stewardship webpage
- Education through email with link to the guides
 - ED providers
 - Primary care providers
 - ED pharmacists
- ED smart sets
 - Adult (1/2018)
 - Pediatric (2/2018)
- Clinics
 - Individual orders (3/2018)
 - Order Panels (TBD)

10




ED Smart Sets

- Indications are collapsed by organ systems

ED SS ADULT Infectious Diseases Treatments 

For STD treatments – refer to a separate order set and/or smart set.

- ▼ Antibiotics for Skin/Soft Tissue Infections
 - ▶ For Cellulitis - Purulent _____
 - ▶ For Cellulitis - Non-Purulent _____
 - ▶ For Diabetic Foot Infection - Mild _____
 - ▶ For Diabetic Foot Infection - Moderate _____
- ▼ Antibiotics for Genitourinary Infections
 - ▶ For Uncomplicated Cystitis - Females, non-pregnant _____
 - ▶ For Uncomplicated Pyelonephritis - Females, non-pregnant _____
 - ▶ For Complicated Cystitis - Males, pregnant, functional abnormality, immunocompromised, indwelling or recent catheter/stent _____
- ▼ Antibiotics for Lower Respiratory Tract Infections
 - ▶ For Community-Acquired Pneumonia _____




11

ED Smart Sets

- When indication is opened, provider is given 1st and 2nd line treatment options

- ▼ Antibiotics for Skin/Soft Tissue Infections
 - ▼ For Cellulitis - Purulent _____
 - sulfamethoxazole-trimethoprim DS (BACTRIM DS) PO - 1st line
R-0, First occurrence now until 4/18/18
 - doxycycline (VIBRAMYCIN) PO - 2nd line
R-0, First occurrence now until 4/18/18



12

ED Smart Sets

- Pediatric options include both liquid and tablet/capsule forms

ED SS PED Infectious Diseases Treatments

- ▼ Antibiotics for Skin/Soft Tissue Infections
 - ▶ For Cellulitis - Purulent
 - ▼ For Cellulitis - Non-Purulent
 - cephalexin (KEFLEX) 250 mg capsule - 1st line
R-0, First occurrence now until 4/18/18
 - cephalexin (KEFLEX) 500 mg capsule - 1st line
R-0, First occurrence now until 4/18/18
 - cephalexin (KEFLEX) 125 mg/5 mL suspension - 1st line
R-0, First occurrence now until 4/18/18
 - cephalexin (KEFLEX) 250 mg/5 mL suspension - 1st line
R-0, First occurrence now until 4/18/18
 - clindamycin (CLEOCIN) PO solution - 2nd line
R-0, First occurrence now until 4/18/18
 - clindamycin (CLEOCIN) 300 mg capsule - 2nd line
R-0, First occurrence now until 4/18/18

13

ED Smart Set Usage

	Adult Smart Set	Pediatric Smart Set
Go-Live Date	1/2/2018	2/6/2016
Usage through March 2018	242	12
Number of ED Locations	10	5
Number of Providers	62	5

14

Implementation in Clinics

Order Search: ADULT UTI

growse Preference List Database

Panels (No results found)

After visit Medications

Future State: Nested order panels

Current State: using synonyms in the display names

Name	Dose	Frequency	Dispen	Ref	Sig
ADULT COMPLICATED CYSTITIS ABX GUIDELINES (aka adult uti)					
ADULT PYELONEPHRITIS ABX GUIDELINES (aka adult uti)					
ADULT UNCOMPLICATED CYSTITIS ABX GUIDELINES (aka adult uti)					
ADULT CEPHALEXIN 500mg BIDx10 days (2nd line Strep Throat) (GAS, Group A Strep, Strep Pharyngitis) (KEFLEX)	500 mg	BID	20 ta...	0	
ADULT CEPHALEXIN 500mg BIDx7 days (1st line Uncomplicated Cystitis) (UTI, Bladder Infection) (KEFLEX)	500 mg	BID	14 ta...	0	
ADULT CEPHALEXIN 500mg QIDx10-14 days (1st line Pyelonephritis) (KEFLEX)	500 mg	QID		0	
ADULT CEPHALEXIN 500mg TIDx7-14 days (1st line Complicated Cystitis, CONSIDER W/ CEPHTRIAZONE 1G 1X IV/IM) (Complicated UTI, Bladder Infection)(KEFLEX)	500 mg	TID		0	
ADULT CIPROFLOXACIN 250mg BIDx3 days (2nd line Uncomplicated Cystitis) (UTI, Bladder Infection) (CIPRO)	250 mg	BID	6 tab...	0	
ADULT CIPROFLOXACIN 500mg BIDx5-10 days (2nd line Complicated Cystitis CONSIDER W/ CEPHTRIAZONE 1G 1X IV/IM) (Complicated UTI, Bladder Infection)	500 mg	BID		0	
ADULT CIPROFLOXACIN 500mg BIDx5-7 days (2nd line Salmonellosis after supportive cares) (Salmonella) (CIPRO)	500 mg	BID		0	
ADULT CIPROFLOXACIN 500mg BIDx7 days (2nd line Pyelonephritis) (CIPRO)	500 mg	BID	14 ta...	0	
ADULT CIPROFLOXACIN 500mg BIDx7-10 days (1st line Diverticulitis WITH METRONDAZOLE 500BID)	500 mg	BID		0	
ADULT NITRUFURANTOIN 100mg BIDx5 (1st line Uncomplicated Cystitis) (UTI, Bladder Infection) (MACROBID, MACRODANTIN)	100 mg	BID	10 c...	0	
ADULT TMP/SMX DS BIDx3 days (2nd line Uncomplicated Cystitis) (UTI, Bladder Infection) (BACTRIM DS, SEPTRA DS, TRIMETHOPRIM SULFAMETHOXAZOLE)	1 tablet	BID	6 tab...	0	
ADULT TMP/SMX DS BIDx5-10 days (2nd line Complicated Cystitis, CONSIDER W/ CEPHTRIAZONE 1G 1X IV/IM) (Complicated UTI, Bladder Infection) (BACTRIM DS)	1 tablet	BID		0	
MISCELLANEOUS MEDICAL SUPPLY MISC (aka B & B ARM SLING ADULT)					

15

Allina Health

Implementation in Clinics

- Selecting 1st line for uncomplicated cystitis (current state):

Medications & Orders

Search for new order + New Order

Review open orders

Name Dose, Route, Frequency

Medications

ciprofloxacin HCl (CIPRO) 250 mg tablet 250 mg, Oral, BID

Unsigned Orders new orders, reorders, and modifications

After visit Medications (1 Order)

nitrofurantoin macrocrystals/monohydrate (MACROBID) 100 mg capsule

Take 1 capsule by mouth 2 times daily for 5 days, Disp-10 capsule, R-0, BID starting 4/11/2018 until 4/16/2018 or ending after 10 doses, eRx

Implementation in Clinics

- Selecting 1st line for uncomplicated cystitis (future state):

The screenshot shows the 'Medications & Orders' interface. At the top, there is a search bar for new orders and a '+ New Order' button. Below this is a 'Review open orders' section. The main area is divided into 'Medications' and 'Unsigned Orders'. Under 'Medications', 'ciprofloxacin HCl (CIPRO) 250 mg tablet' is listed. Under 'Unsigned Orders', there is a section for 'After visit Medications (0 Orders)'. A red box highlights a nested panel titled 'Adult Uncomplicated Cystitis ABX Guidelines' with the criteria '-Female < 65 years old, non-pregnant'. Inside this panel, there are two radio button options: 'First Line Therapy' and 'Second Line Therapy'. A red callout box points to the nested panel with the text: 'Use the nested panel as a decision tree when prescribing a medication'.

17



Implementation in Clinics

- Selecting 1st line for uncomplicated cystitis (future state):

This screenshot is similar to the one above, showing the 'Medications & Orders' interface. The 'Unsigned Orders' section is expanded to show the 'Adult Uncomplicated Cystitis ABX Guidelines' panel. This panel lists specific medication options under the 'First Line Therapy' radio button: 'nitrofurantoin macrocrystals/monohydrate (MACROBID) 100 mg capsule' (Disp-10 capsule, First occurrence now until 4/16/18, eRx) and 'Cephalexin 500 mg tablet' (Disp-14 tablet, First occurrence now until 4/18/18, eRx). A red callout box points to the 'First Line Therapy' radio button with the text: 'Select First or Second line therapy to see which meds are recommended'.

18



Barriers Encountered

- Getting input from key stakeholders
 - May need to go outside of your organization to find the expertise needed
 - Opinions vary and recommendations are not always straight forward
 - Moving from an inpatient focus to outpatient
- Putting recommendations into practice
 - Education, education, education
 - Prioritizing build of electronic tools to make it easier for providers
 - Ensuring providers have the most updated guide

19

Allina Health 

Advice for Others

- Identify key stakeholders early
- Identify the expertise needed to create
 - Providers
 - Pharmacists
 - Informatics
- Get feedback but find a balance between too little and too much
- Determine how to provide the information and develop a plan
- Connect inpatient and outpatient IS resources

20

Allina Health 



Key Acknowledgements

- Sandy Fritzlär, MD
- Ramsey Peterson, MD
- Angel Becker, PharmD
- Steve Grapentine, PharmD
- Mike Wankum, PharmD
- Allina ID Physician/Pharmacy Task Force
- Allina Primary Care Council