

# Antibiotic Stewardship 2016: Saving lives, and avoiding resistance

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What is it?

Coordinated interventions designed to improve and measure the appropriate use of antibiotic agents by promoting the selection of the optimal antibiotic drug regimen including dosing, duration of therapy, and route of administration

# Why Bother in the IHS?

- **Benefits**

- Improved patient outcomes
- Reduced adverse events
  - Clostridium difficile infection
- Improve antibiotic resistance in the community
- Save money!

# Infectious Disease Society of America 2016

- Recommend
  - Preauthorization of selected antibiotics
  - Create local algorithms for treating common infections (UTI, pneumonia)
  - Reduce use of antibiotics that cause **C difficile** infection
  - Antibiotic time outs
  - EHR modification to encourage stewardship
  - Pharmacokinetic monitoring and Extended Infusion antibiotics
  - Early transition from IV to oral antibiotics
  - Shortest effective duration of antibiotics
  - Stratified antiObiograms

# IHS Stewardship priorities 2016

- Identify facility provider and pharmacist champions
  - Larger sites have ASP teams
- Education of medical, pharmacy nursing, lab and other staff
- Report to Pharmacy and Therapeutics (P&T) Committee on implementation progress
- Provide patient educational information for the facility to utilize
- Facility will develop an annual local antibiogram if lab has this capability

# IHS Stewardship priorities 2016

- Develop local antimicrobial treatment guidelines by tailoring the National IHS evidence-based antimicrobial treatment guidelines as necessary reflecting local resistance information
- Antibiotic time out: reassess treatment 48-72 hours once more information is available (culture and sensitivity)
- IV to PO (Oral) conversions
- Develop local clinical pathways for ordering antibiotics in our Electronic Health Record that easily allow providers to follow local guidelines

# Case Presentation

- A 38 year old woman with a history of asthma comes in to the clinic with feverishness, HA, sore throat, cough, and maxillary sinus pain for the last 3 days. On exam her temperature is 100.2 degrees F and her other VS are normal. She appears uncomfortable but not toxic. Her exam is notable for mild maxillary sinus tenderness, normal tympanic membranes, erythematous pharynx but no exudate, no cervical adenopathy and clear lungs.

# Case Presentation

- She says her primary care doctor always give her an antibiotic when she gets like this and she demands an antibiotic now.

What do you do now???



# Rhinosinusitis

- 12% of Americans in 2012 were diagnosed with rhinosinusitis
  - 30 million people total
- 98% of cases of rhinosinusitis cases are viral
- Antibiotics are not indicated for 98% of cases of rhinosinusitis

# Bacterial Sinusitis...the other 2%

- Diagnostic criteria:
  - **Severe** (>3-4 days) of fever >102 deg F, purulent discharge, facial pain
  - **Persistent** without improvement (>10 days) of nasal discharge and cough
  - **Worsening** (3-4 days) of fever, cough nasal discharge after initial improvement of a viral URI lasting 5-6 days
- Sinus films are not indicated for most cases

# Bacterial Sinusitis...the other 2%

- How to treat:
  - Watchful waiting if not severe and good follow up is ensured
  - Drugs
    - Amoxicillin/Clavulanate 875 mg po bid
    - Doxycycline or Levofloxacin/Moxifloxacin if PCN allergic
    - New FDA warning about quinolones May 2016
  - Avoid azithromycin
  - 5 days of therapy are adequate for the majority of cases

# Acute Bronchitis

- Cough is the most common symptom patients visit the PCP for!
- Yellow/Green sputum does not equal bacterial infection!
- The key is to rule out pneumonia:
  - HR >100
  - RR>24
  - T >38 deg F
  - Abnormal breath sounds
- CXR is not needed for most cases if the above are negative
- Treat with cough suppressants, antihistamines and albuterol

# Pharyngitis

- Only group A Streptococcus needs treatment
- Only 5-10% of sore throats are caused by gp A Strep
- Centor Criteria
  - Fever
  - Tonsillar exudates
  - Tender cervical nodes
  - Absence of cough
- Obtain a strep rapid antigen test if 2 or more criteria met
- Treat with PCN VK or Amoxicillin for 10 days if positive

# URI antibiotic stewardship enhancements

- Gallup Indian Medical Center
  - Presentation by stewardship pharmacists to Outpatient clinics
  - Show de-identified provider specific treatment rates
  - EHR order screen listing recommendations when to treat and with what

# EHR order screen

RPMS-EHR IRALU, JONATHAN GALLUP INDIAN MEDICAL CENTER (EHR P18)

User Patient Refresh Data Imaging Practice Management Websites BCMA eSig Tools Clear Clear and Lock Community Alerts Dosing Calculator Help

PRIVACY PATIENT CHART ED DASHBOARD RCHS referrals by provider RESOURCES DIRECT MESSAGING

Demo Patient B 209540 26-Mar-1966 (50) M TELEPHONE 25-Apr-2016 17:21 Laughlin-Gaines, Tamara A Education Add Edit Del

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Lock Clear Pt Post WADF Pharm Ed Problem List Adv React Medications Nds Rvw Nds Rvw Nds Rvw CIC DIA 1 Women's Health Prenatal 1st Trimester Prenatal 2nd Trimester Prenatal 3rd Trimester Current Prenatal Notes AMI

Chart Label Visit IPL info reviewed Updated Visit Summary

Notifications Visit Elements Medications Labs Orders Notes/Consults/Referral RPMS Reports Well Child ASQ Suicide Form Prenatal

File View Action

Active Only Chronic Only 180 days Print... Print New Items Process... New... Check Ed i Outpatient Medications

GIMC Antibiotic Recommendations ADULT...

Female Cystitis	[ ] Nitrofurantoin SA (MacroBID) 100mg BID x5days	[ ] Cotrimoxazole 800mg/160mg po BID x3 days	For non pregnant females
Male Cystitis	[ ] Ciprofloxacin 500mg Q12H x10days	[ ] Cotrimoxazole 800mg/160mg Q12H x10days	
Pyelonephritis	[ ] Cipro 400mg IV ONCE then 500mg po BID x10 days	[ ] Gentamicin 5mg/kg IV x1 then cefdinir 300mg po BID x10d	Gentamicin and cefdinir are reserved for patients who can
Cellulitis without suppuration	[ ] Cephalexin 500mg QID x10days	[ ] Clindamycin 300mg TID x10days	If no wound drainage and no abscess
Cellulitis with suppuration	[ ] Cotrimoxazole 800mg/160mg Q12H x10days	[ ] Clindamycin 300mg TID x10days	Clinda should only be used if MRSA is erythromycin sensi
Cellulitis with suppuration but strep suspected	[ ] Cephalexin 500mg QID + Bactrim DS BID x10days	[ ] Clinda 300mg TID + Bactrim DS BID x10days	Keflex or Clinda to cover strep + Bactrim to cover MRSA
Diabetic Foot	[ ] Augmentin 875mg BID x14days	[ ] Clinda 300mg TID + Cipro 500mg BID x14days	Consider addition of Bactrim to Augmentin if MRSA likely
	[ ] Cotrimoxazole 800mg/160mg po BID x14days	[ ] Ertapenem 1gm IV QDAY	Ertapenem if organisms sensitive and IV therapy needed
Pneumonia no antibiotics in 3 months	[ ] Azithromycin x5day Treatment		
Pneumonia antibiotics given in last 3 months	[ ] ZPak + Amoxicillin 1gm TID x10days	[ ] Levofloxacin 500mg po DAILY x10days	Avoid levofloxacin if possible as can mask TB infections
Bronchitis	Supportive therapy only. No antibiotics indicated	[ ] Doxycycline 100mg BID 10days	Consider doxycycline if has underlying lung disease or h/
Acute sinusitis	Supportive therapy only. No antibiotics indicated		Tx if sxs present >7 days facial pain/fever/purulent disch
Severe sinusitis (sx >7 days)	[ ] Augmentin 875mg BID x7 DAYS	[ ] Levofloxacin 500mg po DAILY x10days	Do NOT give antibiotics for simple URIs with congestion

# Case Presentation

- A 35 year old woman has had a cough for 3 days. On physical exam she has a fever of 102.3, pulse 124, respirations 26 and BP 90/46. She appears toxic and has labored breathing. The lung exam is notable for left base bronchial breath sounds and egophony. Lab exam is notable for BUN 22, Creatinine 0.8, WBC 15K. CXR confirms a LLL pneumonia with a small non-layering effusion





# Inpatient Ward Admission for Pneumonia

- Patients with no drug allergies:
  - Ceftriaxone 1 gm IV daily plus Azithromycin 500 mg IV daily
- Cephalosporin/macrolide allergic patients
  - Clindamycin 600 mg IV q 8h plus Levofloxacin 500 mg po daily
- Cautions
  - Use caution in using macrolides in patients with heart disease
  - Use caution in using macrolides and quinolones in patients with QTc prolongation
  - Doxycycline 100 mg IV q 12h could be substituted for Azithro or Levo

# Inpatient ICU Admission for Pneumonia

- Community Acquired
  - Ceftriaxone 1 gm IV daily plus either Azithromycin 500 mg IV daily OR Levofloxacin 750 mg IV daily
- Pseudomonas suspected (underlying lung disease)
  - Piperacillin 4.5 gm IV q 6h plus Levofloxacin 750 mg IV daily
- Allergic to penicillins:
  - Clindamycin 600 mg IV q8h plus Levofloxacin 750 mg IV daily

# Health Care Acquired Pneumonia

- Triple therapy for high risk patients
  - Piperacillin-Tazobactam 4.5 gm IV q 6 h
  - Levofloxacin 750 mg IV daily
  - Vanco 15 mg /kg q 12h (trough goal 15-20) or Linezolid 600 gm IV q 12h
- Special Considerations
  - Consider prolonged infusion Pip-Tazo (allows for q 8h dosing)
  - Be careful with Levofloxacin in patients with prolonged QT or possible TB
  - Avoid Vancomycin in patients with renal failure
  - Avoid Linezolid in patients on SSRIs and related agents.

# How Long to treat

- Community Acquired Pneumonia
  - 5-7 days
- Health Care Acquired Pneumonia
  - 7-8 days

# RPMS EHR GIMC Antibiotic Guidelines

RPMS-EHR IRALU, JONATHAN GALLUP INDIAN MEDICAL CENTER (EHR P18)

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Inpatient Antibiotic Guidelines Done

PER GIMC ANTIBIOTIC GUIDELINES, REVISED 8.7.14

Diagnosis		Alternate	Rationale
Pneumonia Community Acquired NOT ICU	Ceftriaxone 1gm IV Q24H + azith 500mg IV once then azith 500mg PO once then azith 500mg PO daily	Clindamycin + levofloxacin if allergic to beta lactams...	Covers main pathogens inexpensively
Pneumonia Community Acquired ICU NO lung disease	Ceftriaxone 1gm IV Q24H + levofloxacin 500mg IV Q24H Ceftriaxone 1gm IV Q24H + levofloxacin 500mg PO daily	Clindamycin + levofloxacin if allergic to beta lactams...	Use for patients without underlying lung disease
Pneumonia Community Acquired WITH lung disease	Zosyn 3.375gm IV Q8H extended + levoflox 750mg IV daily Zosyn 3.375gm IV Q8H extended + levoflox 750mg PO daily Meropenem...	Clindamycin + levofloxacin if allergic to beta lactams... Vancomycin... Linezolid...	Use for patients with severe pneumonia Add vancomycin or linezolid if MRSA is possible Meropenem substitute for Zosyn if allergy
Aspiration Pneumonia	Unasyn 3gm IV Q6H + levoflox 750mg IV daily Unasyn 3gm IV Q6H + levoflox 750mg PO Q24H	Clindamycin + levofloxacin if allergic to beta lactams...	Chemical aspiration without PNA does not require antibiotic
Healthcare Acquired Pneumonia	Vancomycin + Zosyn 3.375GM Q8H + Levaquin 750MG Q2		Outpatient treatment regimens are not recommended

# Pneumonia antibiotic stewardship enhancements

- IV to Oral switch program
  - Criteria:
    - Patient does not have diagnosis of endocarditis, neutropenia, meningitis, sepsis, septic arthritis or osteomyelitis
    - Patient has been on IV antibiotics for 48 hours and is hemodynamically stable
    - Patient is afebrile for 24 hours
    - Patient not on antiemetics for 24 hours
    - Patient is not on vasopressor therapy
    - Patient is tolerating oral or liquid diet
- Gallup pilot program April through June 2015:
  - 83% successfully switched by pharmacy!

# Case Presentation

- A 65 year-old female with diabetes and CKD II presents to the clinic with dysuria and urinary frequency. She says “Whenever I get a urinary tract infection, my doctor in Shiprock always give me Cipro!”
- What do you say to that?!



# UTI Stewardship Concerns

- Minimizing quinolone therapy avoids “collateral damage”
  - Toxicity: QT prolongation, tendinopathy, neuropathy, etc
  - Creating drug resistance in the community
  - Clostridium difficile infection
- Oral Cephalosporins are shown to inferior for lower UTIs

# Cystitis- IDSA guidelines

- Women, not pregnant, uncomplicated UTI
  - Nitrofurantoin 1 po bid x 5 days (now OK to use in the elderly)
  - TMP/SMZ DS 1 po bid x 3 days
  - Fosfomycin 1 packet po x 1
  - Avoid using
    - Quinolones→creates resistance and selects for C difficile
    - Keflex→ Less effective but can be used if high resistance
- Men
  - Ciprofloxacin 500 mg po bid for 10 days
  - TMP-sulfa DS 1 po bid for 10 days

# UTI Stewardship enhancements

- Create EHR order set for UTI
- Place local antibiogram on the hospital/clinic home page
- Strategically limit which antibiotics are listed for Gram Negative Rods on the sensitivity panel your micro lab reports!

# EHR UTI Enhancements

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Pyelonephritis	[ ] Cipro 400mg IV ONCE then 500mg po BID x10 days	[ ] Gentamicin 5mg/kg IV x1 then cefdinir 300mg po BID X10d;	Gentamicin and cefdinir are reserved for patients who can

# Sensitivity Pattern for Gram Negative Rods that are Extended Spectrum Beta Lactamase Positive /ESBL (2016)

2015 ESBL ANTIBIOGRAM.pdf - Adobe Acrobat Pro

File Edit View Window Help

Create

1 / 1

129%

Tools Comment Share

George Brasinikas, M.D., Medical Director

## Sensitivity Pattern for Gram Negative Rods that are Extended Spectrum Beta-Lactamase Positive /ESBL (2015)\*

Data represents percent sensitive

Gram Negative Bacteria	Organism	Number of Isolates	E.coli	K.pneumo	Koxyloca	C. freundii	E.aerogenes	E.coli	P.mirabilis	Total Isolates
ANTIBIOTICS	Amikacin				100	100	100	100		
	Ampicillin/Sulbactam	15	0	50					0	
	Aztreonam				0				100	
	Cefazolin	5	20	0	0				0	
	Cefepime				100				100	
	Cefoxitin	44	80	100	0				100	
	Ceftazidime				0				100	
	Ceftriaxone	24	0	50	0				100	
	Ertapenem	100	100	100	100	100	100	100		
	Gentamicin	80	40	100	100	88	71	100		
	Levofloxacin	30	100	100	100	75	57	100		
	Meropenem	100	80	100	100	100	100	100		
	Nitrofurantoin	81	0	0	75	13	43	0		
	Piperacillin/Tazobactam	73	80	100	25	38	0	100		
	Tetracycline				100				0	
	Tobramycin				75				100	
	Trimethoprim/Sulfamethoxazole	49	40	50	100	88	57	100		

\*Data is specific for GIMC patient

Start

5:52 PM 5/31/2016

# Southwest Regional ID Council

## Antibiogram, 2013

	<u>MRSA</u> % Oxicillin susceptible	<u>VRE</u> % E. faecalis Vancomycin susceptible	<u>VRE</u> % E. faecium Vancomycin susceptible	<u>ESBL</u> % E. coli ESBLpositive	<u>ESBL</u> % K. pna ESBLpositive	<u>ESBL</u> % K. oxytoca ESBL-positive	<u>CRE</u> % E. coli carbapenem susceptible	<u>CRE</u> % K. pna carbapenem susceptible	<u>Clostridium</u> <u>difficile</u> #Pos/#Tested (%)
Chinle	72 (182)	100 (35)	100 (2)				100 (894) <sup>Erta</sup>	100 (122) <sup>Erta</sup>	39/267 (15)
Flagstaff Medical Center	50 (470)	99 (93)	42 (36)				100 (989) <sup>Imi</sup>	99 (185) <sup>Imi</sup>	
Ft Defiance /Tsehootsooi	37 (322)	99 (90)	50 (12)	2 (1532)	2 (260)	0 (33)	100 (1532) <sup>Imi</sup>	100 (260) <sup>Imi</sup>	9/124 (7)
GIMC	79 (622)	99 (123)	33 (15)	n/a	n/a	n/a	100 (2078) <sup>Erta, Mero</sup>	100 (327) <sup>Erta, Mero</sup>	51/282 (18)
Hopi	56 (84)	100 (12)	17 (6)	3 (707)	25 (4)	2 (49)	100 (707) <sup>Erta</sup>	100 (111) <sup>Erta</sup>	2/26 (8)
Kingman	43 (292)	95 (207)	13 (6)	10 (899)	7 (256)	9 (54)	100 (1494) <sup>Erta, Imi</sup>	100 (258) <sup>Erta</sup> 98 (258) <sup>Imi</sup>	171/1370 (12)
NNMC	67 (474)	97 (79)	33 (14)	1 (1304)	1 (191)	0 (18)	100 (1304) <sup>Imi</sup>	100 (191) <sup>Imi</sup>	12/146 (8)
Tuba City	63 (364)	98 (54)	78 (9)	2 (1278)	0.5 (194)	n/a	100 (1278) <sup>Imi</sup>	n/a	28/367 (8)
Winslow	40 (152)	100 (14)	n/a	n/a	n/a	n/a	n/a	n/a	n/a

MRSA=Methicillin-resistant *S. aureus*; VRE=Vancomycin-resistant enterococcus  
 ESBL=extended-spectrum beta-lactamase; % = # Tested

# Isolate Group 1616007712-1 Report

Isolate Group: 1616007712-1

Bionumber: 6625534452066210

Selected Organism: Enterobacter aerogenes

Susceptibility Information	Card: AST-GN74		Lot Number: 594383210		Expires: Jun 11, 2017 12:00 GMT-07:00	
	Completed: May 23, 2016 20:05 GMT-07:00		Status: Final		Analysis Time: 10.75 hours	
Antimicrobial	MIC	Interpretation	Antimicrobial	MIC	Interpretation	
Ampicillin/Sulbactam			Meropenem	0.5	S	
Piperacillin/Tazobactam	>= 128	R	Amikacin	<= 2	S	
Cefazolin	>= 64	R	Gentamicin	<= 1	S	
Cefoxitin	>= 64	R	Tobramycin	<= 1	S	
Ceftazidime	>= 64	R	Levofloxacin	1	S	
Ceftriaxone	>= 64	R	Tetracycline	>= 16	R	
Cefepime	<= 1	S	Tigecycline	>= 8	R	
Aztreonam	>= 64	R	Nitrofurantoin	128	R	
Ertapenem	4	R	Trimethoprim/Sulfamethoxazole	<= 20	S	

+ = Deduced drug \* = AES modified \*\* = User modified

# Isolate Number: 1 Enterobacter aerogenes Data

**Isolate Number: 1**    **Enterobacter aerogenes <entaer>**

	1 entaer	
	MIC	Cat.
Amikacin	<=2	S
Gentamicin	<=1	S
Levofloxacin	1	S
Meropenem	0.5	S
Nitrofurantoin	128	R
Piperacillin/Tazobactam	>=128	R
Trimethoprim/Sulfamethoxazole	<=20	S

\*= Deduced



# Summary

- The IHS needs to embrace antibiotic stewardship at every site
- Discourage use of antibiotics for URI and rhinosinusitis
- Modify EHR order pages
  - Encourage a specific narrow spectrum choice for each diagnosis
  - Discourage quinolone use
  - Shortest possible duration
- Know your local anti-biogram to inform local recommendations
- Suppress the antibiotic sensitivity report to hide antibiotics that could select for resistant organisms

# The Metrics of Antimicrobial Stewardship Programs

Data Collection, Analysis & Reporting

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Antimicrobial Stewardship Program (ASP) Manager  
Department of Quality Resources – Infection Control  
Alaska Native Tribal Health Consortium  
Anchorage, Alaska

# Objectives:

- Recall 3 main categories of ASP metrics
- Identify the metrics commonly used in practice
- Acknowledge barriers to measurement
- Establish or optimize reporting structure with a focus on quality of care & disease-based management

*Dodds Ashley ES et al. Antimicrobial Stewardship: Philosophy Versus Practice. CID 2014;59(S3):S112-21.*

# Is there consensus on optimal metrics to demonstrate ASP efficacy?

- RPh & MD Survey:
- "Physicians & pharmacists rate patient-centered outcomes as the most important determinants of success"
  - However, the most common collected information include utilization & cost data

# Is there consensus on optimal metrics to demonstrate ASP efficacy?

- Special Issue in Infection Control and Hospital Epidemiology: 12/15 (80%) of articles focused on Antimicrobial **utilization and cost**
- Pharmacotherapy Special Issue on Stewardship: 8/10 of articles focused on **cost**
  - 1 article - **appropriateness** in prescribing
  - 2 articles - utilization and **patient outcomes**

# Cochrane review 89 studies Inpatient ASPs

- Patient Outcome studies are limited
- 11 (12%) evaluated **mortality**
  - 4 interventions for improved Rx of Abx for PNA
    - **Decreased mortality** RR 0.89; 95 CI (0.82-0.97)
  - 11 interventions for decreased excessive Rx (overall) **did not effect mortality** RR 0.92; 95 CI (0.8-1.06)
  - 6 (7%) evaluated **LOS**
  - 5 (6%) evaluated **risk of readmission**
    - No significant increase in infection related readmissions RR 1.33; 95 CI (0.31-5.66)

# Cochrane review 89 studies Inpatient ASPs

## Unintended Consequences: ADE, CDI, resistance

- 21/89 (24%) evaluated microbial outcomes
  - 5 studies demonstrated **reduction in CDI**
  - 9 studies demonstrated **reduction in R-GNRs**
  - 7 studies demonstrated **reduction in MRSA**
  - 3 studies demonstrated **reduction in VRE**

# Modified Delphi Panel Process to Define Quality Metrics

- 5 Metrics to consider for Internal Quality Indicators:
- Useful for Public Reporting:
  - 1. **DOT/1000 pt days**
  - 2. **No. of pts** with specific drug-resistant organisms
- Useful for Broad Application
  - 3. **Mortality** related to resistant organisms
  - 4. **Conservable days of therapy** for CAP, SSTI, UTI
  - 5. Unplanned **hospital readmission** within 30 days



# Metrics to Embrace

- To demonstrate value to hospital administrators & gain physician buy-in of recommendations, ASP's MUST measure
- 3 Main Categories:
  1. Abx utilization & cost
  2. Process measures
  3. Patient outcomes including unintended consequences

# 1. Antibiotic Utilization & Costs

- Utilization

- Days of therapy (DOT) per 1,000 patient days
  - Overall and for specific agents or group of agents
  - NHSN-AUR module
  - NQF-endorsed measure #2720: benchmarking via Standardized Antimicrobial Administration Ratio (SAAR)
- Length of therapy
- Defined daily dose (DDD) per 1,000 patient days

- Costs

- Antibiotic cost per patient day or per admission
- Total cost of hospitalization from onset of infection to discharge

# Measure overall antibiotic use

- Replace individual antibiotic reviews with review of all abx
- Cycle different antimicrobials through formal review & evaluation (MUE)
- Perform periodic point-prevalence audits
- Utilize innovative means to leverage IT systems to improve efficiency & prioritization
- Disease-based management allows for more evidenced-based approach to interventions
- Focus on the most common conditions
- Avoid limiting stewardship interventions to only costly or targeted medications

# Moving Beyond Antibiotic Costs

- Measure total cost of care and not just drug acquisition
  - Implementation & maintenance of the ASP
  - Drug-related ADEs (VIN)
  - Suboptimal treatment (SAB)
  - Penalty for HAIs

## 2. Process Measures

- Process Measures:
  - Quantify actions of the ASP
  - Essential to determine actions that may or may not be associated with a particular outcome
  - Documents invested resources are being used as anticipated or proposed (i.e. task accomplishment)
  - Allows for benchmarking against other facilities
  - Important for program longevity
  - Process measures assess changes in prescriber behavior but do NOT provide info on how effective interventions are in improving outcomes

# Examples of Process Measures

- Changes in the decision to prescribe an abx
- Changes in agent, dose, route, interval, duration
- Adherence to hospital-specific guidelines
- Acceptance rate of ASP recommendations
- % of patients receiving "appropriate" abx
- Time to appropriate treatment (ex. BCID; sepsis, SAB)
- Proportion of prescribers who record an indication
- Frequency of performance of "antibiotic time-out"
- Timely cessation of abx given for surgical prophylaxis
- No antibiotics for asymptomatic bacteriuria
- Appropriate culture obtained before starting abx

### 3. Patient Outcomes

- Suggested Metrics:
  - Antibiotic associated length of stay
  - 30-day readmission rate for select infections
  - Clinical response / Cure of Infection
  - In-hospital mortality
    - crude mortality for specific infection or MDRO
    - attributable mortality is difficult to define
    - Risk-adjusted mortality preferred

# Unintended Consequences

- Suggested Metrics:
  - *C. difficile* infection rates
  - Proportion of pts with MDRO
    - Key resistance profiles & pathogens need consideration
    - Hospital onset cases most likely to reflect ASP impact
  - Adverse events related to abx (No./%/rate/time between events)
  - Administration of abx to which the pt had a documented allergy



# Barriers to Measurement of Outcomes

- Inadequate Study Design
  - Research in the ASP field is poor with limited evidence base
  - Uncontrolled before-after studies
  - Non-randomized quasi-experimental design without controlling for confounding factors
  - Use of inappropriate statistical methods
  - Limits objective evaluation of causal associations between intervention & outcome

# Barriers to Measurement of Outcomes

- Inherent problems with quality assurance and improvement data:
  - Selection bias
  - Insufficient power
  - Confounding variables
  - Lack of compliance measurement
  - Varying duration of interventions
  - Poor external validity

# Factors other than Healthcare Rx that Affect Abx Resistance & Cost

## Antibacterial Resistance

- Changes in:
  - patterns of organism prevalence
  - patient demographic profile
  - patient case mix
  - infection control measures or intensity
  - care practices (ambulatory vs. hospital)

## Cost

- Changes in:
  - cost of drug acquisition
  - cost for drug administration
  - occurrence of drug toxicity
  - drug formulary
  - patient case mix
  - cost for ASPs
  - value of bed-days

# Barriers: Funding & Time Constraints

- Lack of funding for personnel is one of the biggest constraints
- >50% OF ID MD's remain uncompensated
- ASP's compete for \$ with other mandated quality- & cost-containment measures
- Often priority given to projects directly tied to incentives or requirements
- Many ASP's depend upon personnel/activities who derive financial support from other programs/departments
- Limited advocacy for collection of additional data tied to patient outcomes

## Barrier: Assessing Appropriateness

- Standardized definitions of appropriate & inappropriate tx are lacking
- Studies have used a variety of definitions:
  - Selection of an Abx that has in vitro activity against the isolated pathogen
  - Use consistent with:
    - Current practice guidelines
    - Accepted norms for the site of infection
    - In agreement with institutional protocols
    - Expert evaluation by ID specialists

# In the Eye of the Interpreter

- The study compared proportion of abx orders considered appropriate according to different definitions
- Differences were found whether definitions were compared by **drug** or indication
  - Clinical Pharmacology/Micromedex & Susceptibility data support:
    - Resulted in the highest rate of appropriateness
    - Greatest variation in appropriateness observed with daptomycin & linezolid
    - Comparisons show that appropriateness by PI opinion differed significantly compared to other definitions

# In the Eye of the Interpreter

- Appropriateness of Tx According to Indication:
  - No single definition consistently resulted in appropriate use when applied across all indicators
  - Susceptibility data support was the definition with the highest rate of appropriate use
  - Nosocomial PNA & UTI had the greatest variation across the definitions
  - Comparisons show that appropriateness assessed by PI opinion differed significantly with all other definitions

# Appropriateness is Subjective

- In clinical practice, appropriateness changes on a daily basis as more info becomes available
- Clinical judgment often needed to ascertain the most appropriate drug for individual with complicated scenarios
- Patient-specific physiologic changes that alter PK/PD may influence abx selection outside of protocol/guideline
- Previous antibiotic exposure, history & response have an impact on what might be considered appropriate
- Site of infection highly influences regimen selection (ie. drug concentration at site of infection)
- Expert opinion is influenced by previous experience & hospital formulary & varies widely across institutions



# Considerations with “Appropriateness”

- Define appropriateness & be consistent
- Prescribers must be provided with feedback about inappropriate use & educated on strategies
- Assessment should be required as a benchmark
- Understand the level of appropriateness relative to use
  - allows for recognition of a threshold to which a high proportion of use is appropriate & judicious
  - acknowledge when no further reduction in use is warranted

# Reporting Structure

- ASP's are not stand-alone programs
- Integrated into institutional quality- and safety-enhancing infrastructure
- Encourage funding through these programs
- Variance in medical practice & poor adherence to standards of care compromise quality & lessen control on costs
- Quality & Safety oversee regulatory criteria
  - Joint Commission measure for pneumonia
  - Surgical Care Improvement Project
- CMS Pay for Performance Criteria (Value-based purchasing)
- Movement to quality facilitates movement toward outcome measures

# Demonstrating Value to Hospital Administrators

- Familiarize yourself with current quality, safety & cost incentives by which health systems are being measured
  - Take actions that will positively impact these
- Hospital administrators determine value as they continually assess the economic success & quality of patient care
- Meet with the C-suite
  - establish goals
  - clarify expected outcomes
  - obtain adequate authority
  - obtain resources needed to successfully track & achieve goals
- Continually engage in data analysis & correlate with specific outcome measures

# Clinical Decision Support Systems (CDSS)

- Expensive
- Require integration
- Time for customization
- Adequate personnel, funding, time
- IT support for data collection & analysis
- Improve efficiency
- Identify targeted patients
- Prioritize daily activities
- Track & organize interventions
- Facilitate implementation of initiatives

# Clinical Decision Support Systems (CDSS)

- Get to know your hospital informatics service
- Seek individuals capable of extracting data from large databases
- Understand the variability reported with different data points:
  - Experience with the VA system:
  - Order data overestimated amount used and average daily dose of each antibiotic assessed
  - Pilot study demonstrated best data source to be BCMA
  - DDD differences likely attributed to VA's older population

# Concise Reporting at Regular Intervals

- On a committee level, conduct monthly or quarterly updates
  - Consider creating a Stewardship Dashboard
  - Make readily available to committee members
  - Post on the intranet
  - E-mail to stakeholders
- Demonstrate impact but include transparency with challenges of the ASP
- Report to:
  - Hospital Administration
  - Infection Control Committee
  - Medication Safety Committee
  - Clinical Quality Improvement Committee

# Abx Cost—A Metric to Abandon?

- Estimating cost of care is a better measure of the savings accrued/costs avoided
- Shift efforts to measuring the value of care (health outcomes achieved per \$ spent)
- Cost = total costs of care for the patient's medical condition
- Partner with finance department to help with determining overall cost of care

# Drug Audits or Intervention Tracking – Other Metrics to Abandon?

- MUE's/DUE's
  - Evidence based disease state reviews should replace routine individual drug audits
  - case can be made for agents with considerable variability in use from year to year or if the agent is associated with increased resistance or ADE's
- No. of ASP interventions performed or abx tracked provide no information on actual outcomes
  - Note: if monitoring of interventions is necessary for time tracking, gather data quickly with IT infrastructure to limit "busy work"
  - Can be used as an audit tool of compliance but not as a measure to demonstrate impact



# Summary

- No consensus exists on optimal metrics to demonstrate ASP efficacy.
- Utilization & antibiotic cost data are most frequently collected by ASPs but are deemed less important by clinicians.
- Process metrics describe the activities of the program, assist with targets for intervention & should be collected with new programs.
- Outcome metrics including adverse events, cure, LOS & mortality should be embraced but current literature is limited and data collection is complex.

# Summary

- Standardized definitions of appropriateness in antimicrobial prescribing are lacking but local guideline adoption should be considered.
- Each program should define appropriateness and be consistent.
- Barriers to measurement are unique to each program but can be mitigated with strong IT support and planning.

# Summary

- Program reporting structure should focus on patient safety and quality improvement
- Engage administrators early
- Correlate program activities with specific outcome metrics (ex. Sepsis, SAB)
- Prescriber feedback sustains program efforts and reinforces change through peer review
- Establish regular interval reporting
- Participate in benchmarking if available
- Get involved, be a steward of a shared and limited resource!

# Suggested Reading

## Antibiotic Stewardship in Acute Care: A Practical Playbook

National Quality Forum

National Quality Partners

Antibiotic Stewardship Action Team

[www.qualityforum.org](http://www.qualityforum.org)