Antibiotic Stewardship - We’re In This Together

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NDSU Dept. of Public Health
Management of Infectious Diseases
“A desire to take medicine is, perhaps, the greatest feature which distinguishes man from animals”

“One of the first duties of the physician is to educate the masses not to take medicines”

Sir William Osler
A Tale of Two Countries: Rate of Outpatient Antibiotic Use, 2014

835 / 1000 population / yr

328 / 1000 population / yr
Estimated 50 million unnecessary outpatient antibiotic prescriptions / yr

CDC
Geographic Variability in HEDIS Measures Related to Appropriate Antibiotic Use

Children diagnosed with VURI not receiving an antibiotic, 2008-2012

Adults with acute bronchitis not receiving an antibiotic, 2008-2012

Overuse of Antibiotics in Nursing Homes

- 5 million people will pass through a NH each year
- 1.6 million long-term residents in 20,000 NHs
- 70-80% will receive an antibiotic each year
- 50% of antibiotics will be unnecessary or inappropriate
- 70-80% will receive an antibiotic each year
- 2 million will receive unnecessary or inappropriate antibiotics
Trends in Hospital Antibiotic Use

- Study of 22 academic medical centers from 2002-2006 with claims data
- 64% of all discharged patients received abx during hosp’n
- There was a 7% overall increase in use of abx over time period
  - **Vancomycin** use up **43%** - most commonly used drug in latter 2 yrs of study
  - **Carbapenem** use up **59%**
  - **Pipracillin-Tazobactam** use up **84%**
- Quinolones overall were most frequently used class
- Estimated **30-50% of inpatient antimicrobial use is inappropriate**

NATIONAL SUMMARY DATA

Estimated minimum number of illnesses and deaths caused by antibiotic resistance*:

At least 2,049,442 illnesses, 23,000 deaths

*bacteria and fungus included in this report

Estimated minimum number of illnesses and death due to Clostridium difficile (C. difficile), a unique bacterial infection that, although not significantly resistant to the drugs used to treat it, is directly related to antibiotic use and resistance:

At least 250,000 illnesses, 14,000 deaths

WHERE DO INFECTIONS HAPPEN?

Antibiotic-resistant infections can happen anywhere. Data show that most happen in the general community, however, most deaths related to antibiotic resistance happen in healthcare settings, such as hospitals and nursing homes.

Deaths caused by C. difficile infections*

*Age-adjusted rate of C. difficile as the primary (underlying) cause of death.
SOURCE: CDC National Center for Health Statistics, 2012
# CDC Hazard Level for Antibiotic Resistance Threats - 2013

<table>
<thead>
<tr>
<th>Concerning</th>
<th>Serious</th>
<th>Urgent</th>
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<tbody>
<tr>
<td>VRSA</td>
<td>MRSA</td>
<td><em>Clostridium difficile</em> (C. diff)</td>
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<td>Ery-R GABHS</td>
<td>VRE</td>
<td>Carbapenem-R Enterobacteriaceae</td>
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<td>Clinda-R GBBHS</td>
<td>MDR-Pseudomonas</td>
<td>Drug-resistant <em>N. gonorrhoeae</em></td>
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<td>ESBL-Enterobacteriaceae</td>
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<td>DR-Campylobacter</td>
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<td>DR-Salmonella</td>
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<td>Fluconazole-R Candida sp</td>
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<td>MDR-Acinetobacter</td>
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<td>MDR/XDR TB</td>
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Results - Projected CRE Encounters

8x Increase!

Total = 227,828

Schneider G. SHEA 2017.
CRE Incidence - Geographic Trends

- 462 per 100K Admissions
  27 per 100K Hospital Days

- 1064 per 100K Admissions
  84 per 100K Hospital Days

- 159 per 100K Admissions
  30 per 100K Hospital Days

- 1007 per 100K Admissions
  53 per 100K Hospital Days

- 918 per 100K Admissions
  65 per 100K Hospital Days

- 305 per 100K Admissions
  63 per 100K Hospital Days

- 304 per 100K Admissions
  13 per 100K Hospital Days

- 338 per 100K Admissions
  40 per 100K Hospital Days

- 1500 per 100K Admissions
  97 per 100K Hospital Days
Approved Antibiotics in U.S. 1983 - 2012

Antibiotic Development Is Dwindling

# of New Abx

- 1983-87
- 1988-92
- 1993-97
- 1998-02
- 2003-07
- 2008-12
- 2013-15
Frequency of ADEs due to Antibiotics in Outpatient Setting

- Up to 1:4 will experience some ADE with an antibiotic

- 142,505 estimated emergency department visits/year due to untoward effects of antibiotics (~ 1:1000 abx prescriptions)
  - Antibiotics account for 19.3% of drug related adverse events
    - 78.7% for allergic events
    - 19.2% for adverse events (e.g. diarrhea, vomiting)
  - Approximately 50% due to penicillin & cephalosporin classes
  - 6.1% required hospital admission

2004-2005 NEISS-CADES project
Vangay, et al. Cell host & Microbe 2015;17;553-64
### Adjusted Risk of Miscarriage with Antibiotic Exposure

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<tr>
<th>Drug</th>
<th>Adjusted Odds Ratio (95% CI)</th>
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<tr>
<td>Azithromycin</td>
<td>1.65 (1.34-2.02)</td>
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<tr>
<td>Doxycycline</td>
<td>2.81 (1.93-4.10)</td>
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<td>Ciprofloxacin</td>
<td>2.45 (1.98 - 3.03)</td>
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<td>Levofloxacin</td>
<td>3.28 (1.73-6.24)</td>
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<td>Sulfonamides</td>
<td>2.01 (1.36-2.97)</td>
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<td>Metronidazole</td>
<td>1.70 (1.27-2.26)</td>
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# Risks with Use of the Quinolones

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<th>Condition</th>
<th>Relative Risk</th>
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<td>Achilles tendon rupture</td>
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<td>Current exposure overall</td>
<td>4.3 (95% CI, 2.4-7.8)</td>
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<td>Age 60-79</td>
<td>6.4 (95% CI, 3.0-13.7)</td>
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<td>Age &gt; 80</td>
<td>20.4 (95% CI, 4.6-90.1)</td>
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<td>Serious arrhythmia</td>
<td>2.43, 95% (CI, 1.6–3.8)</td>
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<td>Death 1-5 d after Levofloxacin</td>
<td>2.49 (95% CI, 1.7–3.6)</td>
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<tr>
<td>Aortic dissection</td>
<td>2.43 (95% CI, 1.8 - 3.2)</td>
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<tr>
<td>C. Diff infection</td>
<td>12.7 (95% CI, 2.6–61.6)</td>
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<tr>
<td>Risk of acquiring MRSA</td>
<td>3.0 (95% CI 2.5 to 3.5) (c/w 1.8 RR for other abx)</td>
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</tbody>
</table>
- 2nd line abx for pneumonia and UTIs with a black box warning
- Over 23 million prescriptions of quinolones / yr in U.S. (most commonly prescribed class)
- Over 2,000 lawsuits filed for injuries in 2011
Diversity of Bacteroides Species in Gut After 7 day Course of Clindamycin

Microbiology (2010), 156, 3216–3223
Human Microbiome

$10^{13}$ Human Cells
$10^{14}$ Bacterial Cells

“Dysbiosis” Associations

- Asthma
- IBD
- Obesity
- Auto-immune dz
- Metabolic syndrome
- Diabetes
- Allergy
- Autism
Antibiotics and Risk of Acquiring Type 2 Diabetes Mellitus

Figure 1. OR for type 2 diabetes according to the number of antibiotics prescriptions prior to the initiation of treatment for type 2 diabetes.
Figure 3. Impact of Antibiotic Class, Frequency, and Timing on the Risk for Obesity

(A) No. of exposures

(B) Timing of exposure
Antibiotic Exposure and Development of Juvenile Rheumatoid Arthritis

Risk of Developing JRA (OR)

n = 152 for cases, 1520 for controls

Number of courses of Antibiotics

Horton DB. Pediatrics 2015
Prevalence of colorectal adenomas on screening colonoscopy in the Nurses Health Study based on > 2mos of antibiotic exposure at a younger age

- **36% increased risk** if received age 20-39
- **69% increased risk** if received age 40-59
Gut bacteria associated with cancer immunotherapy response in melanoma

Date: February 21, 2017
Source: University of Texas M. D. Anderson Cancer Center
Summary: Melanoma patients’ response to a major form of immunotherapy is associated with the diversity and makeup of trillions of potential allies and enemies found in the digestive tract.

Share: Facebook, Twitter, Google+, Pinterest, LinkedIn, Email

We must come to the belief that casually writing for an antibiotic is not a benign act!
Call for Antimicrobial Stewardship - Preserve a Precious Resource

- American Academy of Pediatrics
- American Society of Health-System Pharmacists
- Infectious Diseases Society for Obstetrics and Gynecology
- Society for Hospital Medicine
- Society of Infectious Diseases Pharmacists
- Society for Healthcare Epidemiology of America
- Infectious Diseases Society of America
- Centers for Disease Control and Prevention
What Is Antimicrobial Stewardship?
Right Drug, Right Dose, Right Duration, Right Time, Every Time

**Antibiotic Risks**
- ADEs
- C diff
- Abx resistance

**Antibiotic Benefits**
- Resolution of Infxn
- \(\downarrow\) Morbidity & mortality
Regulatory and Cost Imperatives for Antimicrobial Stewardship
Regulatory and Cost Imperatives for Antimicrobial Stewardship

The Joint Commission

CMS

CENTERS for MEDICARE & MEDICAID SERVICES
Rules for CMS Participation for acute care hospitals, critical access hospitals, and LTCFs:

- Implementation of a hospital-wide ASP
- Evidence of coordinated efforts across hospital departments including infection prevention, quality, medical staff, nursing service, and pharmacy
- Identified leadership at all levels
- LTCFs - antibiotic use protocols and a system to monitor antibiotic use

**Implementation dates:**

Acute care and critical access hospitals: January 2017
Long-term care facilities: November 2017
1. Leaders establish antimicrobial stewardship program as an organizational priority
2. Educates staff involved in abx ordering/dispensing/administration on resistance and stewardship practices. Upon hire and periodically thereafter.
3. Educates patients and families as needed re: appropriate use of abx (e.g. GetSmart)
4. Multi-disciplinary team including ID/IP/Ph/Practitioners
5. Program has 7 core CDC elements
6. ASP uses organization-approved multidisciplinary protocols (e.g. formulary restrictions, appropriateness assessments, C diff care, abx use guidelines, IV-PO conversion, preauth requirements
7. ASP collects/analyzes/reports data on a regular basis
8. Hospital takes action on improvement opportunities identified by its ASP

*Standard went into effect Jan 2017*
CDC Guidelines 7 Core Elements

- **Leadership commitment** - dedicating necessary human, financial, and IT resources to the program

- **Accountability** - leader who is responsible for program outcomes

- **Drug expertise** - pharmacist in charge of working to improve abx use

- **Action** - implementing one or more CDC-recommended actions

- **Education** - teaching clinicians, relevant staff, and patients and families about abx resistance and optimal prescribing habits

- **Tracking** - monitoring patterns of prescribing and resistance

- **Reporting** - relaying information on abx use and resistance within institution on a regular basis
CMS Estimated Costs to Develop ASPs

CMS Rule 482.42b Estimates for ASP Staffing

<table>
<thead>
<tr>
<th>Hospital Beds</th>
<th>PharmD CMS FTEs*</th>
<th>MD CMS FTEs*</th>
<th>IT CMS FTEs*</th>
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<tr>
<td>124 (average size)</td>
<td>0.25</td>
<td>0.1</td>
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<td>800</td>
<td>1.6</td>
<td>0.65</td>
<td>0.3</td>
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<tr>
<td>1000</td>
<td>2</td>
<td>0.8</td>
<td>0.4</td>
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*CMS recommendations represent a minimum and do not account for patient complexity

- CMS estimates average hospital with no ASP will need to spend ~ $109,000
- Studies consistently show avg savings of $200,000 - $400,000
<table>
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<tr>
<th>HAI</th>
<th>Attributable Cost</th>
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<tbody>
<tr>
<td>MRSA SSI</td>
<td>$42,300</td>
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<td>MRSA CLABSI</td>
<td>$58,614</td>
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<tr>
<td>VAP</td>
<td>$40,144</td>
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<tr>
<td>C. Difficile infxn</td>
<td>$11,285</td>
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<tr>
<td>CAUTI</td>
<td>$896</td>
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</table>

JAMA Intern Med, Sept 2013
• Costs adjusted to 2012 dollars
Percent of Hospitals with Antibiotic Stewardship Programs by State, 2015*

Nationally, 48.1% of all hospitals have stewardship programs (2,199 of 4,549); the national goal is 100% of hospitals by 2020.

* A hospital stewardship program is defined as a program following all 7 of CDC’s Core Elements of Hospital Antibiotic Stewardship Programs.

Source: CDC’s National Healthcare Safety Network (NHSN) Survey
Where to Start? - Leadership

Peter Drucker -
“Management is doing things right, leadership is doing the right things”

Leadership must step up
• Recognize the need
• Make it an organizational priority
• Dedicate resources
Where to Start?

YOU CAN’T CHANGE WHAT YOU DON’T MEASURE

Peter Drucker - author and management thinker
# Measure Something*

## Acute Care
- Days of Therapy (DOT)
- Defined Daily Doses
- Abx spending
- Specific abx DOTs
  - e.g. quinolones, carbapenems
- C diff HAIs
- Prevalence of abx resistance in lab isolates
  - %MRSA, %VRE, %CRE
- Utilization by provider

## Outpatient
- Overall use in URIs
  - % of sinusitis w abx
  - % of otitis w abx
  - % of bronchitis w abx
- Abx appropriateness
- Overall use of 2\textsuperscript{nd} line abx
  - esp quinolones
- Utilization and/or appropriateness by provider

## LTCFs
- DOTs
- Antibiotic starts
  - % facility initiated
  - % hospital initiated
- Specific abx DOTs
  - esp quinolones
- Abx durations > 7 days
- U/A & U/C ordered w/o specific indication
- Inappropriate abx starts for UTIs
- Utilization by provider

* Most measures other than prevalence should be tied to a volume denominator (e.g. 1000 patient-days)
Do Something

- Target an area for improvement and use a tool
  - Formulary restrictions and prior authorization
  - Guidelines and clinical pathways
  - IV to oral conversion program
  - Pharmacy dose optimization review
  - Provider and staff education
  - Hardwired ordersets and forced antibiotic indications
  - Retrospective audit and feedback to providers
  - Prospective audit and feedback - gold standard
Do Something

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Variability of Antibiotic Use in LTCFs

% of Residents on an Antibiotic

Quintile 1 | Quintile 2 | Quintile 3 | Quintile 4 | Quintile 5

N = 363 nursing homes

Daneman N. J Antimicrob Chemother. 2011;66
Prescriber Practice in Ontario LTCFs Drives Large Proportion of Inappropriate Antibiotic Use

Targeting just these high prescribing, long duration prescribing providers could have significant impact on the whole province

Daneman N. JAMA Intern Med. 2013;173
Targeting Outlier Prescribers?
Hospitalists: Antimicrobial IP DOT Per 1000 Hospital E&M RVUs July 2015 - June 2016 (Year)

- **Other**
- **Azithro + Doxy**
- **Ceftriaxone**
- **Piperacillin/Tazobactam**
- **Quinolone**
- **Carbapenem**
- **Anti-MRSA**

<table>
<thead>
<tr>
<th>Provider</th>
<th>Other</th>
<th>Azithro + Doxy</th>
<th>Ceftriaxone</th>
<th>Piperacillin/Tazobactam</th>
<th>Quinolone</th>
<th>Carbapenem</th>
<th>Anti-MRSA</th>
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**Notes:**
- Anti-MRSA includes vancomycin, linezolid, ceftaroline, and clindamycin.
- DOT includes all other antimicrobial DOT (eg. antifungals, antivirals, metronidazole, cephalosporin, TMP/SMX, aztreonam, amp/sulbactam, cephalexin, clindamycin, ceftazidime, etc.)
- Provider and Hospital E&M RVUs
- Attributed by Authorizing Provider on Drug Order.
## Targeting the Low Hanging Fruit

<table>
<thead>
<tr>
<th>Target Area</th>
<th>Facility Type</th>
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<tbody>
<tr>
<td>No abx for Asx bacteriuria</td>
<td>Acute Care, LTCF, Outpt</td>
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<tr>
<td>Duration of abx</td>
<td>Acute Care, LTCF, Outpt</td>
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<tr>
<td>Appropriate empiric abx</td>
<td>Acute Care, LTCF, Outpt</td>
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<tr>
<td>De-escalation of abx</td>
<td>Acute Care, LTCF?</td>
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<tr>
<td>Appropriate use in URIs</td>
<td>Outpt, LTCF?</td>
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<tr>
<td>Decreased quinolone use</td>
<td>Acute Care, LTCF, Outpt</td>
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<tr>
<td>Decreased carbapenem use</td>
<td>Acute Care, LTCF?</td>
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</table>
ASP..... It Works!
Targeted antibiotic consumption and Nosocomial C. difficile disease

Tertiary care hospital; Quebec, 2003-2006

How About Us?
Sanford Region Carbapenem DOTs/1000 Pt-days

- Start of ASP
- ASP Summit
- Meeting w CCS/Hospitalist leadership, CMO

Forced Indication for Carbapenem order entry

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<th>Year</th>
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<th>2016</th>
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<td>MAY</td>
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<td>DEC</td>
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</tr>
</tbody>
</table>
Pseudomonas aeruginosa
Resistance to Carbapenems

% Resistant

FY15  FY16  FY17

31  19  9
Antimicrobial Use and Costs Before and After ASP Inception

- DDD / 1000 Pt-days
- Abx $ / Pt-days
- Projected Abx$ / Pt-days

FY 03 | FY 04 | FY 05 | FY 06
--- | --- | --- | ---
Projected Abx$ / Pt-days
## Antimicrobial Costs at MeritCare/Sanford and Inferred Savings in 1st Four Years After ASP Inception in 2007

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Abx Expenditures</th>
<th>Patient Days</th>
<th>Abx $ / Pt-day</th>
<th>Actual Savings c/w FY 06&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Projected Abx $ / Pt-day&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Projected Cost Savings&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 06</td>
<td>$1,758,433</td>
<td>92,873</td>
<td>$18.93</td>
<td>ref</td>
<td></td>
<td>$350,134</td>
</tr>
<tr>
<td>FY 07</td>
<td>$1,657,295</td>
<td>96,990</td>
<td>$17.09</td>
<td>$174,582</td>
<td>$20.70</td>
<td>$350,134</td>
</tr>
<tr>
<td>FY 08</td>
<td>$1,729,034</td>
<td>100,667</td>
<td>$17.18</td>
<td>$171,133</td>
<td>$22.60</td>
<td>$545,615</td>
</tr>
<tr>
<td>FY 09</td>
<td>$1,579,291</td>
<td>91,798</td>
<td>$17.20</td>
<td>$156,056</td>
<td>$24.50</td>
<td>$670,125</td>
</tr>
<tr>
<td>FY 10</td>
<td>$1,707,946</td>
<td>91,494</td>
<td>$18.67</td>
<td>$29,278</td>
<td>$26.30</td>
<td>$698,099</td>
</tr>
</tbody>
</table>

**Total Estimated Savings Since ASP Inception**

$2,263,973.00

---

<sup>a</sup> (FY 06 Abx$/Pt-day - Current year Abx$/Pt-day) x Pt-days

<sup>b</sup> Based on projections by linear regression of trend rise in costs for 2003-2006

<sup>c</sup> (Projected Abx$/Pt-day – Current year Abx$/Pt-day) x Pt-days
Incidence of Hospital – Acquired Infections at MeritCare/Sanford Hospital 2003-2010

New Hospital-Acquired Cases / 1000 Pt-Days

- MRSA
- VRE
- C. difficile

2003 2004 2005 2006
What Can We Target in a 2’ Mini-Consult?
Questions to Ask on Every Case

- Is it really an infection? Are abx warranted?
- Is the source healthcare-acquired or community-acquired?
- Are they giving empiric vs definitive Rx?
- What is the narrowest spectrum drug(s) they can give to accomplish the goal?
- Have they set the right duration?
Keep in Mind the Big Picture Goals

- Reducing broad spectrum agents, esp the carbapenems, quinolones, anti-pseudomonal drugs, unless definite indication
- Reducing very expensive antibiotics (Ceftaroline, Daptomycin, Lipo Ampho, Micafungin, carbapenems)
- What is data showing for particular target or focus areas in your region?
- Are there outlier departments or physicians that merit special attention
Infected?

No

Raise Question

Yes

HCA or CA

Empiric

Guidelines

Right Abx?*

Definitive

Cx data & Guidelines

Right Abx?*

Possible Actions:
1) Intervene
2) Revisit when more data
3) OK – Revisit near end of expected duration

*Allergies

*Dosing

*Abx history/filter
Common Infectious Diseases and Areas for Potential Improvement

- UTI
- Pneumonia
- Cellulitis / SSTI / Wounds
- Intra-abdominal infection
Antibiotics…… How Long Is Enough?
## Duration of Therapy

### It May Be Shorter Than You Think!

<table>
<thead>
<tr>
<th>Disease</th>
<th><strong>Duration of Treatment (days)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Short</strong></td>
</tr>
<tr>
<td>Pharyngitis</td>
<td>3-6</td>
</tr>
<tr>
<td>Acute Sinusitis</td>
<td>5</td>
</tr>
<tr>
<td>COPD exacerbation</td>
<td>≤ 5</td>
</tr>
<tr>
<td>CAP</td>
<td>3-5</td>
</tr>
<tr>
<td>HCAP, HAP</td>
<td>≤ 8</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>5-6</td>
</tr>
<tr>
<td>UTI – Cystitis</td>
<td>5 days (macrodantin) 3 days (TMP-SMX, quinolones)</td>
</tr>
<tr>
<td>UTI – Pyelonephritis</td>
<td>5 days (quinolones)</td>
</tr>
<tr>
<td>Peritonitis</td>
<td>4-7 days after source control</td>
</tr>
</tbody>
</table>

*Altimimi S. Cochrane Database 2012*

*Spellberg B. JAMA Int Med 2016*
Urinary Tract Infection – What is It?
**UTI Definitions (IDSA)**

- **Asymptomatic Bacteriuria**: $> 10^5$ cfu/mL voided specimen (? X2) or chronic foley, or $> 10^2$ cfu/mL from a new catheterized specimen.

- **Acute uncomplicated cystitis and pyelonephritis**: typical symptoms in an otherwise healthy non-pregnant adult. Dx confirmed with + UA and/or $> 10^2$ cfu/mL on UC.

- **Complicated cystitis or pyelonephritis**: lower or upper tract UTI in patient with underlying risk of treatment failure (diabetes, pregnancy, renal failure, obstruction or anatomic abnormality, indwelling device, recent instrumentation, transplant, immunosuppression, hospital-acquired).

- **Catheter-associated UTI**: presence of symptoms or signs of UTI with no other identifiable source with $> 10^3$ cfu/mL.
# Prevalence of Asymptomatic Bacteriuria and Pyuria

<table>
<thead>
<tr>
<th>Population</th>
<th>Bacteriuria</th>
<th>Pyuria w Bacteriuria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy Adult Women</td>
<td>2-5%</td>
<td>32%</td>
</tr>
<tr>
<td>Pregnant Women</td>
<td>2-11%</td>
<td>50%</td>
</tr>
<tr>
<td>Diabetic Women</td>
<td>8-14%</td>
<td>70%</td>
</tr>
<tr>
<td>Elderly: Nursing Home</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>25-53%</td>
<td>90%</td>
</tr>
<tr>
<td>Male</td>
<td>15-35%</td>
<td>90%</td>
</tr>
<tr>
<td>Spinal Cord Injury</td>
<td>50%</td>
<td>33-86%</td>
</tr>
<tr>
<td>Indwelling urinary catheter</td>
<td>100%</td>
<td>70%</td>
</tr>
</tbody>
</table>

Asymptomatic Bacteriuria ≠ UTI

- Common, esp. elderly women and compromised pts
- 20-50% of treated “UTI” is actually Asx Bacteriuria
- Ratio of asx bacteriuria to symptomatic UTI in LTC is > 100:1
- Good evidence that Rx gives no benefit and causes harm (ADEs, resistance, more UTI)

Nicolle et al. NEJM 1983
UTI is #1 reason for Abx in LTCFs

**Problem:** What constitutes symptoms in an elderly, incontinent, and demented patient with limited ability to communicate?

ASB is common as are atypical presentations for infection.
Do UTI’s Do That?

- Unexplained falls
- Weakness

**Evidence for this is overall poor quality**

- Delirium
- Change in mental status
- Change in urine character

Campbell AJ. BMJ2008;337:a2320
Nicolle, L. J Amer Geri Soc 2009;57:113-49
Rituparna, D. Infect Control and Hosp Epid 2011;32:84-6
Sundvall PD.BMC Family Practice 2011, 12:36
Juthan-Mehta M. JAMA2014;312:1687-8
When to Order Testing and Treatment

Any of the Following:
1. Fever
2. Leukocytosis (WBC > 14,000)
3. P > 100, Syst BP < 100*

AND ONE or more of the following, or 2 of the following alone:

• CV angle pain/tender
• New or incr SP tenderness
• Gross hematuria
• New or marked increased incont
• New or marked increased urgency
• New or marked increased frequency
• Change in urine character and change in mental status

Or

1. Acute dysuria AND ONE or more of the following:
   • Change in character of the urine
   • Change in mental status
   • Gross hematuria

OR

2. Acute pain, swelling, or tenderness of the testes, epididymis, or prostate

Urinary dipstick or UA

*Carson addition
When to Order Testing and Treatment in the NH

Urinary dipstick or UA

- Negative for both leukocyte esterase and nitrite (dipstick) or UA ≤ 10 WBC / hpf
  Consider other dx, Increased monitoring

+ Obtain UCx
  Definite Dx if:
  1. > 10⁵ CFU/mL of no more than 2 organisms from voided specimen
  2. > 10² CFU/mL of any organism from straight cath

Empric Rx while waiting Cx results:
- TMP/SMX 160/800 mg (DS tab) bid x 3d or
- Nitrofurantoin macrocrystals 100 mg bid x 5d

Inf Dis Clin NA. March 2014
UTI Pathway to Assist with Antibiotic Use for Sub-Acute Care, LTC & Nursing Home Facilities

START: Suspected UTI. What are the patient’s symptoms?

STOP

Mental Status Changes (resident seems “off”), Foul Smelling Urine, OR Urine Color Changes (dark or cloudy)

WAIT

Antibiotics and Urine Culture NOT INDICATED, further monitoring required

GO

Seek alternative causes changes (e.g. dehydration, medications, environmental changes, metabolic problems, bleeding, cardiovascular, stroke, etc.)

PLACE RESIDENT ON CLOSE MONITORING PROTOCOL
Increased fluid intake (unless contraindicated)
Monitor & document I/Os and VS every shift for next 24h

Acute Dysuria (pain or discomfort when urinating) OR FEVER (single temp > 100°F, or repeated temp >99°F or increase in single temp greater than 2°F over baseline)

AND

At least ONE of the following symptoms to indicate urine is source: Urgency, frequency, suprapubic pain, gross hematuria, CV angle tenderness, incontinence

THEN take a clean catch urine (per protocol) and send for UA and/or C&S

LaPlante KL, 2016
Nursing Home Antimicrobial Stewardship Guide

Overview of the Guide
The Nursing Home Antimicrobial Stewardship Guide provides toolkits to help nursing homes optimize their use of antibiotics.

Browse Antimicrobial Stewardship Toolkits
Toolkits on four topic areas are available.

Implement, Monitor, and Sustain a Program
Two toolkits help nursing homes start and maintain antimicrobial stewardship programs.

Determine Whether To Treat >
Choose the Right Antibiotic >
Engage Residents and Family >

Suspected UTI SBAR

Complete this form before contacting the resident's physician.

Nursing Home Name ____________________________ Date/Time ________________

Resident Name ____________________________ Date of Birth ________________

Physician/MP/PA ____________________________ Phone ________________

Facility Phone ________________

Submit by: [ ] Phone [ ] Fax [ ] In Person [ ] Other

S Situation
I am contacting you about a suspected UTI for the above resident.

Vital Signs
BP _________ / _________ HR _________ Resp. rate _________ Temp. _________

Background
Active diagnoses or other symptoms (especially, bladder, kidney/urinary conditions)
Specify:
[ ] No [ ] Yes The resident has an indwelling catheter
[ ] No [ ] Yes The resident is on dialysis
[ ] No [ ] Yes The resident is incontinent. If yes, new/worsening? [ ] No [ ] Yes
[ ] No [ ] Yes Advance directives for limiting treatment related to antibiotics/or hospitalizations
Specify:
[ ] No [ ] Yes Medication Allergies
Specify:
[ ] No [ ] Yes The resident is on Warfarin [Coumadin®]
# Empiric Antimicrobial Management of UTI

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>Antibiotic</th>
<th>Duration</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uncomplicated Cystitis</strong></td>
<td>Nitrofurantoin 100 mg bid</td>
<td>5 days</td>
<td>First choice, low resistance, Avoid if GFR &lt; 30</td>
</tr>
<tr>
<td></td>
<td>TMP-SMX DS bid</td>
<td>3 days</td>
<td>Avoid if regional resistance &gt; 20% or recent use</td>
</tr>
<tr>
<td></td>
<td>Fosfomycin 3 gm</td>
<td>Single dose</td>
<td>Minimal resistance, avoid if any suspicion of pyelo</td>
</tr>
<tr>
<td></td>
<td>Cipro or Levo 250 mg bid</td>
<td>3 days</td>
<td><strong>2nd line agents</strong>, should be reserved if can’t take above</td>
</tr>
<tr>
<td><strong>Pyelonephritis</strong></td>
<td>- Cipro 500 mg bid</td>
<td>7 days</td>
<td>Definitive therapy should be based on C&amp;S data. Consider carbapenem if ESBL risk is high</td>
</tr>
<tr>
<td>- Outpatient</td>
<td>- IV FQ, <strong>CP</strong> or ES-PCN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Inpatient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Complicated Cystitis</strong></td>
<td>- Cipro 500 mg bid</td>
<td>5-10 days</td>
<td>Need to empirically cover for pseudomonas and consider ESBL. Definitive rx based on C&amp;S data</td>
</tr>
<tr>
<td><strong>Pyelonephritis</strong></td>
<td>- IV CP, ES-PCN, FQ</td>
<td>5-14 days</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- **CP** denotes Cefepime.
- ESBL: Extended Spectrum Beta-Lactamases.
The art of medicine is to amuse the patient while nature cures the disease

Voltaire
AHRQ: Nursing Home Antimicrobial Stewardship Guide
http://nhguide.airprojects.org

CDC: The Core Elements of Antibiotic Stewardship for Nursing Homes
https://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html

CDC: Get Smart for Healthcare in Hospitals and Long-Term Care
https://www.cdc.gov/getsmart/healthcare/index.html

http://www.ndhealth.gov/disease/hai/Resources/ (Patient Education)
Any questions?
MAD-ID offers two Antimicrobial Stewardship Training Programs:

**Basic Program:** Designed to teach the basic skills and provide an overview of Antimicrobial Stewardship practice needed to develop an Antimicrobial Stewardship Program.

**Advanced Program:** Designed to meet the needs of pharmacists, physicians and other providers that have some antimicrobial stewardship experience and/or basic skills in this area. CPE and CME credit for didactic portion provided by MAD-ID and NFID, respectively.
Potential Educational “One-Liners” for Patients Expecting an Antibiotic

- You should know, that by giving you an antibiotic, we may increase your chance of........
  - Altering the bacteria in your gut for months
    • This is starting to be linked with allergy problems, immune problems, nutrient metabolism changes, and maybe even obesity
  - Having an adverse drug event - about 1:4 chance
    - sometimes quite serious, 2-16x increased risk for C diff
  - Carrying a variety of resistant bacteria, and passing these onto your family
    - MRSA 2-3x increase risk    - Drug resistant pneumococcus - 2-5x increase risk
    - 9x increased risk of drug resistant E coli in stool

Katsarolis. BMC Infect Dis 2009
Nasrin. BMJ 2002
Hannah. Emerg Infect Dis 2005
**Antibiotics**

When you need them—and when you don’t

Antibiotics are strong medicines that can kill bacteria. But we have overused antibiotics for many years. As a result, we now have bacteria that resist antibiotics. Resistant bacteria cause infections that are harder to cure and more costly to treat.

Drug-resistant infections kill at least 23,000 children and adults in the U.S. every year.

Taking antibiotics makes you more likely to get a resistant infection in the future. Sometimes you need antibiotics to prevent or treat an infection. But half of antibiotics prescriptions are not needed. It is normal to have bacteria on your skin and in your body. Many bacteria are harmless. They can even keep you healthy. When you use an antibiotic, it kills most bacteria, including the friendly ones. But a few bacteria survive. These resistant bacteria can multiply and take over.

Antibiotics have side effects.

Each year, 14,000 Americans die from severe diarrhea caused by antibiotics. Other side effects include allergic reactions, nausea and vomiting. Serious allergic reactions include blisters, rashes, swelling of the face and throat, and breathing problems. Some antibiotics can cause permanent nerve damage and tendonitis.

Resistant infections cost a lot.

Resistant infections usually need more costly drugs, more medical care or longer hospital stays. It costs over $40,000 extra to treat a resistant bloodstream infection in one hospital patient. Resistant infections cost $20 billion each year.

Do You Need Antibiotics?

People use antibiotics incorrectly for many common conditions. Medical organizations are alarmed about this problem and have listed some of these conditions below.

**RESPIRATORY INFECTIONS**

*Children’s sore throat: cough, runny nose*

**American Academy of Pediatrics**

The problem: Different conditions need different treatments:

- **Colds, flu** and most other respiratory infections are caused by a virus. Antibiotics don’t kill viruses.
- **Bronchitis** is usually caused by a virus or an irritant in the air like cigarette smoke.
- **Stridor** is caused by bacteria. Symptoms include fever, redness and trouble swallowing. Most children with these symptoms do not have stridor. Your child should get a strep test before taking antibiotics.

Consider antibiotics if:

- A cough doesn’t get better in 14 days.
- The doctor diagnoses a bacterial illness, like strep throat.

**Sinus Infections (sinusitis)**

**American Academy of Allergy, Asthma & Immunology**

The problem: Sinusitis is almost always caused by a virus. Symptoms include a stuffy-up feeling, a runny nose and pain in the face. Even when bacteria are the cause, the infections usually clear up on their own in about a week.

Consider antibiotics only if:

- You don’t get better after 10 days.
- You get better and then worsen again.
- You have a high fever and thick, colored mucus for three or more days in a row.

**EAR INFECTIONS**

*Children’s ear infections*

**American Academy of Family Physicians**

The problem: Most ear infections improve on their own in two or three days, especially in children age two or older. Give your child over-the-counter pain relievers for a few days, and avoid antibiotics. Take your child to a doctor if symptoms aren’t better in two to three days or they get worse at any time.

Get antibiotics right away for:

- Babies age six months or younger.
- Children from six months to two years old with moderate to severe ear pain.
- Children age two or older with severe symptoms.

**Children with ear tubes**

**American Academy of Otolaryngology-Head & Neck Surgery**

The problem: For children with ear tubes, antibiotic ear drops work better than oral antibiotics. Drops go straight through the ear tube into the middle ear—where most children’s ear infections are. Drops are also less likely to cause resistant bacteria.

Consider oral antibiotics if the child:

- Is very ill.
- Needs antibiotics for another reason.
- Doesn’t get better with ear drops.

**Swimmer’s Ear**

**American Academy of Otolaryngology-Head & Neck Surgery**

The problem: Swimmer’s ear is caused by water trapped in the ear canal. Usually, over-the-counter ear drops help as much as antibiotics, and they don’t cause resistance. But if you have a hole or tube in your eardrum, check with your doctor first. Non-prescription ear drops could damage your hearing.

If you do need antibiotics:

- Antibiotic ear drops work better than oral antibiotics against swimmer’s ear.
- Consider oral antibiotics if the infection spreads beyond the ear or you have other conditions, such as diabetes, that increase the risk of complications.