Antimicrobial stewardship and public health

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Healthcare-Associated Infections/Antimicrobial Resistance Program
May 29, 2019
Statement of Disclosure

No presenter has an actual or potential conflict of interest in relation to this educational activity or presentation.
Objectives

- Identify antibiotic resistance threats to public health
- Identify approaches to antibiotic stewardship in hospitals and nursing homes
- Identify approaches to antibiotic stewardship in the outpatient setting
Section 1

*Antibiotic resistance threats*
Antibiotic resistance threats

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

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

*bacteria and fungus included in this report

Antibiotic resistance threats

**Clostridiodes difficile**

500,000 infections, 15,000 deaths

**Carbapenem-resistant Enterobacteriaceae**

9,000 infections, 600 deaths

**ESBL*-*producing Enterobacteriaceae**

26,000 infections, 1,700 deaths

*Extended-spectrum β-lactamase

Emerging antibiotic resistance threats

Colistin- and Carbapenem-Resistant *Escherichia coli* Harboring *mcr-1* and *bla*<sub>NDM-5</sub>, Causing a Complicated Urinary Tract Infection in a Patient from the United States

José R. Mediavilla, a Amee Patrawalla, b Liang Chen, a Kalyan D. Chavda, a Barun Mathema, c Christopher Vinnard, a Lisa L. Dever, d Barry N. Kreiswirth a

Public Health Research Institute Tuberculosis Center, New Jersey Medical School, Rutgers University, Newark, New Jersey, USA a; Division of Pulmonary and Critical Care Medicine, New Jersey Medical School, Rutgers University, Newark, New Jersey, USA a; Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, New York, USA a; Division of Infectious Diseases, New Jersey Medical School, Rutgers University, Newark, New Jersey, USA a

Mediavilla. mBio 2016.
Emerging antibiotic resistance threats


Eleanor Adams, Monica Quinn, Sharon Tsay, Eugenie Poirot, Sudha Chaturvedi, Karen Southwick, Jane Greenko, Rafael Fernandez, Alex Kallen, Snigdha Vallabhaneni, Valerie Haley, Brad Hutton, Debra Blog, Emily Lutterloh, Howard Zucker; Candida auris Investigation Workgroup

NATIONAL STRATEGY FOR COMBATING ANTIBIOTIC-RESISTANT BACTERIA

Vision: The United States will work domestically and internationally to prevent, detect, and control illness and death related to infections caused by antibiotic-resistant bacteria by implementing measures to mitigate the emergence and spread of antibiotic resistance and ensuring the continued availability of therapeutics for the treatment of bacterial infections.

September 2014

MARCH 2015

THE WHITE HOUSE
WASHINGTON

COLORADO
Antibiotic Resistance Solutions Initiative—CDC

- Detection, response, and containment
  - Laboratory capacity
  - Epidemiology capacity
- Prevention
  - Infection prevention
  - Antibiotic stewardship
- Innovation, research and development

Fiscal Year Appropriation

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Appropriation</th>
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<tbody>
<tr>
<td>2016</td>
<td>$160 million</td>
</tr>
<tr>
<td>2017</td>
<td>$163 million</td>
</tr>
<tr>
<td>2018</td>
<td>$168 million</td>
</tr>
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</table>

Healthcare-Associated Infections & Antibiotic Resistance (HAI&AR) Programs

Work together to better detect outbreaks, prevent infections, and improve prescribing. With a coordinated approach, healthcare facilities and public health authorities share information and implement targeted infection prevention and control actions.

The Coordinated Approach

Core elements of antibiotic stewardship

2014; CDC 2015; CDC 2016.
Stewardship to improve antibiotic use

- “the effort to measure and improve how antibiotics are prescribed by clinicians and used by patients”

- “implementing effective strategies to modify prescribing practices to align them with evidence-based recommendations for diagnosis and management”

- “to ensure that the right drug, dose, and duration are selected when an antibiotic is needed”

CDC. The core elements of outpatient antibiotic stewardship. 2016.
Benefits of antibiotic stewardship

ANTIBIOTIC STEWARDSHIP PROGRAMS AND ACTIVITIES CAN:

**IMPROVE PATIENT OUTCOMES**
By reducing unnecessary antibiotic prescribing, antibiotic stewardship programs and activities can improve the treatment of infections and prevent avoidable side effects, reactions, and other problems for patients.

**DECREASE C. DIFFICILE INFECTIONS**
Antibiotic stewardship programs and activities significantly reduce *C. difficile* infections. For example, reducing the use of high-risk antibiotics (fluoroquinolones) by 30 percent can lower *C. difficile* infections by 26 percent in hospitals. Reducing overall antibiotic prescribing in outpatient settings by 10 percent could lower *C. difficile* infections in the community by 17 percent.

**DECREASE ANTIBIOTIC RESISTANCE**
Preventing infections and improving antibiotic prescribing could save 37,000 lives from antibiotic-resistant infections over 5 years.

**DECREASE COSTS**
Antibiotic stewardship programs have consistently demonstrated annual savings of $200,000 to $400,000 in hospitals and other healthcare facilities. According to a University of Maryland study, implementation of an antibiotic stewardship program saved one hospital a total of $17 million over 8 years.

Locations of antibiotic use and estimates of inappropriate use*

- **Hospitals**: 30-50% (Fridkin 2014, Magill 2014)
- **Outpatient**: 30-50% (Hicks 2015, Fleming-Dutra 2016, Palms 2018)
- **Long-Term Care**: 25-75% (Nicolle 2014 & 2015, Daneman 2015)
- **Animals**: 25-75% (Nicolle 2014 & 2015, Daneman 2015)
- **Unknown**: 30-50% (Hicks 2015, Fleming-Dutra 2016, Palms 2018)

*Inappropriate = not indicated, wrong drug, dose, duration, or route.*
Section 2

Hospitals and nursing homes
Summary of Core Elements of Hospital Antibiotic Stewardship Programs

- **Leadership Commitment:** Dedicating necessary human, financial and information technology resources.
- **Accountability:** Appointing a single leader responsible for program outcomes. Experience with successful programs show that a physician leader is effective.
- **Drug Expertise:** Appointing a single pharmacist leader responsible for working to improve antibiotic use.
- **Action:** Implementing at least one recommended action, such as systemic evaluation of ongoing treatment need after a set period of initial treatment (i.e. “antibiotic time out” after 48 hours).
- **Tracking:** Monitoring antibiotic prescribing and resistance patterns.
- **Reporting:** Regular reporting information on antibiotic use and resistance to doctors, nurses and relevant staff.
- **Education:** Educating clinicians about resistance and optimal prescribing.
Antibiotic Stewardship in Acute Care Hospitals by State | 2016

**NATIONAL 2016 PERCENTAGE**
64%
3057 Facilities meeting all 7 elements
4764 National survey respondents

**COLORADO 2016 PERCENTAGE**
63%
52 Facilities meeting all 7 elements
82 State survey respondents

Footnotes:
- The Antibiotic Stewardship Practices data reporting in this Atlas is collected by a survey that acute care facilities complete each year.
- Although the vast majority of hospitals in the United States participate in NHSN, the Antibiotic Stewardship Practices data collected include acute care facilities in the United States. Also, because participation in NHSN varies by state and by year, comparisons of practices between states and across years vary.
Figure 3. Prevalence of an Antimicrobial Stewardship Program that Meets All Seven Core Elements of Antibiotic Stewardship\(^1\) by Hospital Size – Colorado, 2014-2017

Data from the National Healthcare Safety Network (https://www.colorado.gov/pacific/cdphe/hai-data)
Broad interventions to improve antibiotic use

• Prior-authorization

• Prospective audit and feedback

• Antibiotic time-out

• Pharmacy-driven interventions

• Syndrome-specific interventions: urinary tract infection, pneumonia, skin/soft-tissue infection

CDC. Core elements of hospital antibiotic stewardship programs. 2014.
A Statewide Antibiotic Stewardship Collaborative to Improve the Diagnosis and Treatment of Urinary Tract and Skin and Soft Tissue Infections

Timothy C. Jenkins,1,2,4,5 Teresa Hulett,6 Bryan C. Knepper,3 Katherine C. Shihadeh,7 Marc J. Meyer,6 Gerard R. Barber,9 John H. Hammer,10 and Heidi L. Wald4,6

1Department of Medicine, 2Division of Infectious Diseases, and 3Department of Patient Safety and Quality, Denver Health, 4Department of Medicine and 5Division of Infectious Diseases, University of Colorado Anschutz Medical Campus, Aurora, 6Colorado Hospital Association, Englewood, 7Department of Pharmacy, Denver Health, 8Infection Prevention and Clinical Pharmacy, Southwest Health System, Cortez, 9Department of Pharmacy, University of Colorado Anschutz Medical Campus, Aurora, and 10CarePoint Infectious Diseases, Denver, Colorado
Antibiotic stewardship collaborative

- Design: Colorado Hospital Association Collaborative
- Objective: Improve the management of urinary tract infections and skin/soft-tissue infections
- Setting: 26 hospitals in Colorado, range of 15-567 beds
- Time: January 2015—December 2016
- Interventions: evidence-based guidelines, quarterly performance reports, educational meetings, webinars, newsletters, and local and national expertise

Collaborative outcomes

• Use of fluoroquinolones for treatment of urinary tract infection decreased from 49% to 40%

• Use of broad-spectrum gram-negative antibiotics for treatment of skin/soft-tissue infection decreased from 61% to 53%

• Total duration of therapy for skin/soft-tissue infection decreased from a median of 11 to 10 days

The Colorado Antibiogram

• An educational reference for antibiotic activity and antibiogram creation

• A resource for antibiotic stewardship program planning

• A resource for tracking antibiotic resistance in Colorado

## Statewide Antibiogram for Gram Negative Bacteria in Hospitals—Colorado, 2016

<table>
<thead>
<tr>
<th>Organism</th>
<th>Number of Isolates Tested For Each Antibiotic</th>
<th>Ampicillin</th>
<th>Ampicillin-Sulbactam</th>
<th>Amoxicillin-Clavulanate</th>
<th>Aztreonam</th>
<th>Ceftazolin</th>
<th>Cefepime</th>
<th>Ceftoloxime</th>
<th>Ceftazidime</th>
<th>Ceftazidime</th>
<th>Cefturoxime</th>
<th>Ertapenem</th>
<th>Imipenem</th>
<th>Meropenem</th>
<th>Piperacillin-Tazobactam</th>
<th>Amikacin</th>
<th>Gentamicin</th>
<th>Tobramycin</th>
<th>Ciprofloxacin</th>
<th>Levofloxacin</th>
<th>Trimeprin-Sulfamethoxazole</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Escherichia coli</em></td>
<td>42,281</td>
<td>5,941-57,252</td>
<td>59</td>
<td>64</td>
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<td>83</td>
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</tr>
<tr>
<td><em>Klebsiella species</em></td>
<td>8,848</td>
<td>966-11,580</td>
<td>R</td>
<td>84</td>
<td>95</td>
<td>96</td>
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<td><em>Klebsiella oxytoca</em></td>
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<td><em>Klebsiella pneumoniae</em></td>
<td>7,404</td>
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<td><em>Proteus species</em></td>
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<td>255-4,041</td>
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<td>82</td>
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<td><em>Enterobacter aerogenes</em></td>
<td>527</td>
<td>68-798</td>
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<td>R</td>
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<td><em>Enterobacter cloacae</em></td>
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</tr>
<tr>
<td><em>Citrobacter freundii</em></td>
<td>799</td>
<td>158-1,051</td>
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<td>R</td>
<td>R</td>
<td>R</td>
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<td>96</td>
<td>93</td>
<td>95</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>3,661</td>
<td>1,256-4,909</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
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<td>87</td>
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</tr>
</tbody>
</table>

1. Data presented as percent susceptible; “R” = intrinsic resistance; “--” = not tested or <30 isolates.
3. The number of isolates differs for each antibiotic-organism combination. Median and range number of isolates tested for antibiotics in the row are presented.
4. Some hospitals/laboratories provided aggregate data for Klebsiella and/or Enterobacter “species” without providing species-specific data. Therefore, Klebsiella and Enterobacter “species” combined data may include more isolates than the sum of isolates presented for Klebsiella oxytoca and pneumoniae or Enterobacter aerogenes and cloacae.
# Gram negative bacteria—nursing facilities

<table>
<thead>
<tr>
<th>Organism</th>
<th>Number of Isolates Tested For Each Antibiotic&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Ampicillin</th>
<th>Ampicillin-Sulbactam</th>
<th>Amoxicillin-Clavulanate</th>
<th>Aztreonam</th>
<th>Ceftazolin</th>
<th>Cefepime</th>
<th>Ceftriaxone</th>
<th>Ertapenem</th>
<th>Imipenem</th>
<th>Meropenem</th>
<th>Piperacillin-Tazobactam</th>
<th>Gentamicin</th>
<th>Tobramycin</th>
<th>Ciprofloxacin</th>
<th>Levofloxacin</th>
<th>Trimethoprim-Sulfamethoxazole</th>
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</thead>
<tbody>
<tr>
<td><em>Escherichia coli</em></td>
<td>Median 943, Range 198-967</td>
<td>52</td>
<td>58</td>
<td>80</td>
<td>89</td>
<td>16</td>
<td>91</td>
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<td>87</td>
<td>61</td>
<td>60</td>
<td>75</td>
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<tr>
<td><em>Klebsiella species</em></td>
<td>Median 380, Range 45-385</td>
<td>R</td>
<td>87</td>
<td>93</td>
<td>96</td>
<td>36</td>
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<tr>
<td><em>Proteus species</em></td>
<td>Median 223, Range 60-232</td>
<td>66</td>
<td>75</td>
<td>100</td>
<td>70</td>
<td>38</td>
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<td><em>Enterobacter species</em></td>
<td>Median 82, Range 30-88</td>
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<td>R</td>
<td>R</td>
<td>R</td>
<td>90</td>
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<td>76</td>
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<td>93</td>
<td>94</td>
</tr>
<tr>
<td><em>Citrobacter freundii</em></td>
<td>Median 50, Range 30-50</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>--</td>
<td>R</td>
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<td>84</td>
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<td>--</td>
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<td>86</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>Median 109, Range 58-115</td>
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<td>R</td>
<td>R</td>
<td>R</td>
<td>83</td>
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<td>--</td>
<td>64</td>
<td>62</td>
</tr>
</tbody>
</table>

1. Data presented as percent susceptible; “R” = intrinsic resistance; “—” = not tested or <30 isolates.
2. N = 86 skilled nursing facilities and 170 assisted living facilities.
3. Eastern Colorado includes the Denver metropolitan, northeast, and southeast regions. Regions are determined by the county where the facility is located: Denver (Adams, Arapahoe, Denver, Douglas, and Jefferson), northeast (Boulder, Broomfield, Cheyenne, Clear Creek, Elbert, Gilpin, Kit Carson, Larimer, Lincoln, Logan, Morgan, Phillips, Sedgwick, Washington, Weld, and Yuma), and southeast (Baca, Bent, Chaffee, Crowley, Custer, El Paso, Fremont, Huerfano, Kiowa, Lake, Las Animas, Otero, Park, Prowers, Pueblo, and Teller).
4. The number of isolates differs for each antibiotic-organism combination. Median and range number of isolates tested for antibiotics in the row are presented.

[Source: Colorado Department of Public Health and Environment.](https://www.colorado.gov/pacific/cdphe/hai-data)
The Core Elements of Antibiotic Stewardship for Nursing Homes

Leadership commitment
Demonstrate support and commitment to safe and appropriate antibiotic use in your facility.

Accountability
Identify physician, nursing and pharmacy leaders responsible for promoting and overseeing antibiotic stewardship activities in your facility.

Drug expertise
Establish access to consultant pharmacists or other individuals with experience or training in antibiotic stewardship for your facility.

Action
Implement at least one policy or practice to improve antibiotic use.

Tracking
Monitor at least one process measure of antibiotic use and at least one outcome from antibiotic use in your facility.

Reporting
Provide regular feedback on antibiotic use and resistance to prescribing clinicians, nursing staff, and other relevant staff.

Education
Provide resources to clinicians, nursing staff, residents and families about antibiotic resistance and opportunities for improving antibiotic use.
CMS requirements for long-term care facilities

“As part of their infection prevention and control programs, facilities must develop an antibiotic stewardship program that promotes the appropriate use of antibiotics and includes a system of monitoring to improve resident outcomes and reduce antibiotic resistance.” (effective 11/28/17)

Opportunities for antibiotic stewardship in nursing homes

- 50-70% of residents receive an antibiotic in a 1-year period
- Urinary, respiratory, and skin/soft-tissue infections drive antibiotic use
- Use of broad spectrum antibiotics is common (e.g., fluoroquinolones)
- Durations of therapies are often longer than necessary and chronic prophylaxis is common

Challenges to antibiotic stewardship in nursing homes

- Diagnostic uncertainty
- Positive bacterial cultures
- Physicians are often off site
- Limited availability of infectious diseases expertise
- Limited resources; frequent staff turnover
- Few published data/examples of antibiotic stewardship; comprehensive programs not feasible*

*Infectious disease consultation, collaboration with an acute care hospital, telemedicine

Targets for antibiotic stewardship

- **Urinary Tract Infection**
  - Diagnosis
  - Choice of Antibiotic
  - Duration of Antibiotic

- **Respiratory Infection**
  - Diagnosis
  - Choice of Antibiotic
  - Duration of Antibiotic

- **Skin/Soft Tissue Infection**
  - Diagnosis
  - Choice of Antibiotic
  - Duration of Antibiotic
Approach to antibiotic stewardship

Guidelines

Documenting, tracking, and reporting

Antibiotic time-out
"Does the resident have new or worsening signs or symptoms that meet one of three criteria for suspected urinary tract infection?"

☐ CRITERIA 1. Painful urination (meets criteria alone) or

☐ CRITERIA 2. Fever; any fever >100°F or repeated temperatures >99°F or >2°F over resident’s baseline plus at least one new or worsening sign or symptom, including:
  - Frequency of urination
  - Sensation of urgency to urinate
  - Incontinence
  - Bloody urine
  - Pain in the area over the urinary bladder, just above the pubic bone (no other known cause)
  - Rrain pain or tenderness

☐ CRITERIA 3. No fever, but two or more of the signs or symptoms above.

If the resident meets one of the criteria above, ask the healthcare provider to consider:

  - Sending urine for urinalysis and culture and
  - Ordering empiric antibiotics until culture results return.

If the resident does not meet the above criteria, refer to the facility’s care paths for considering alternative diagnoses and when to contact the provider.

Healthcare providers should hold an antibiotic time-out to review and document patient signs and symptoms and urine culture results within 48 hours. Healthcare providers should then narrow or stop antibiotics as indicated and determine appropriate duration.

Guidance for management of urinary tract infection and asymptomatic bacteriuria can be found in the Infectious Diseases Society of America Practice Guidelines at www.idsociety.org.


This tool is for informational purposes only and does not constitute medical advice; the tool is not intended to be a substitute for professional medical advice, diagnosis, or treatment.
Antibiotic Time-Out Checklist

Use this checklist to take a Time-Out to reassess every antibiotic within 38-72 hours after antibiotic start. Refer to practice guidelines and/or facility-specific treatment recommendations when appropriate.

Resident name or ID ___________________________ Date of review ____________
Prescriber (MD, DO, NP, PA) participating in Time-Out ____________________________
Checklist completed by ____________________________
Antibiotic name ____________________________ Start date ____________ Stop date ____________

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Antibiotic Time-Out</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Based on review of the clinical assessment, laboratory test results (including culture and sensitivity testing, if available), and/or other diagnostic test results, does this resident have a bacterial infection that will respond to antibiotics?</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>If so, is the resident on the most appropriate antibiotic(s)? Can the spectrum of the antibiotic be narrowed (de-escalation)?</td>
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<tr>
<td></td>
<td></td>
<td>Is the antibiotic being given in the correct dose?</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Is the antibiotic being given by the most appropriate route (example: IV vs PO)?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>How long will the antibiotic be needed? Can the duration of therapy be shortened?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is the necessary documentation present to support the clinical team’s assessment and decisions?</td>
<td></td>
</tr>
</tbody>
</table>

See reverse for instructions

Antibiotic Time-Out Instructions

☐ IDENTIFY RESIDENTS. Antibiotic stewardship champion will identify residents who have taken a new antibiotic for 48-72 hours.

☐ GATHER INFORMATION. Antibiotic stewardship champion (or designee) will complete an Antibiotic Time-Out SBAR.

☐ CONDUCT THE ANTIBIOTIC TIME-OUT: Complete the Antibiotic Time-Out Checklist (see reverse) with the prescribing clinician and ensure appropriate documentation.

SAMPLE ANTIBIOTIC TIME-OUT SBAR

Situation
“Resident on antibiotic therapy for 48-72 hours, new clinical assessment, laboratory test results (including culture and sensitivity testing, if available), and/or other diagnostic test results available for review”

Background
Include details about:
- The initial order and reason for antibiotic
- The drug, dose, duration and route
- Any known drug allergies
- Vital signs
- Clinical assessment
- Culture and sensitivity laboratory results
- Other diagnostic test results

Assessment
Include details about:
- Whether the resident is tolerating the antibiotic
- How the resident’s signs and symptoms have changed since starting the antibiotic

Recommendation
Complete the Antibiotic Time-Out Checklist (see reverse) with prescribing clinician to determine whether antibiotic should be continued, modified or stopped.

**Nursing home collaboratives**

C. difficile community collaborative (2016-2018)

- Participants: 3 hospitals, 2 long-term acute care facilities, 7-10 nursing homes
- Focus: 1) communication during patient transfer, 2) antibiotic stewardship, 3) environmental cleaning

“Tag Busters” Collaborative (2019-present)

- Participants: 28 nursing homes
- Focus: 1) infection prevention, 2) antibiotic stewardship

Telligen (QIN/QIO), Colorado Health Care Association, Colorado Hospital Association, Colorado Department of Public Health and Environment, and community partners
Section 3

Outpatient settings
US outpatient antibiotic prescribing

• 262.5 million courses of outpatient antibiotics in 2011

• Most commonly prescribed antibiotics included azithromycin and amoxicillin

• Top prescribers were family practice physicians, physician’s assistants, nurse practitioners, pediatricians, internists, and dentists

## Antibiotic indication

<table>
<thead>
<tr>
<th>PERCENT OF ANTIBIOTIC PRESCRIPTIONS THAT WERE UNNECESSARY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All conditions</strong></td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>0-19 year olds</td>
</tr>
<tr>
<td>20-64 year olds</td>
</tr>
<tr>
<td>≥65 year olds</td>
</tr>
<tr>
<td>All ages</td>
</tr>
</tbody>
</table>

*All conditions included acute respiratory conditions, urinary tract infections, miscellaneous bacterial infections, and other conditions.

**Acute respiratory conditions included ear infections, sinus infections, sore throats, pneumonia, acute bronchitis, bronchiolitis, upper respiratory infections (i.e., common colds), influenza, asthma, allergy, and viral pneumonia.

# Antibiotic choice

<table>
<thead>
<tr>
<th>Condition</th>
<th>Adults (20+ years of age)</th>
<th>Children (0–19 years of age)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinus infection</td>
<td>37%</td>
<td>52%</td>
</tr>
<tr>
<td>Pharyngitis (sore throat)</td>
<td>37%</td>
<td>60%</td>
</tr>
<tr>
<td>Middle ear infection</td>
<td>N/A</td>
<td>67%</td>
</tr>
</tbody>
</table>

*Based on the prevalence of allergy to first-line antibiotics and estimated treatment failures after first-line antibiotics, at least 80% of patients presenting with these conditions should receive first-line antibiotics. Analysis is based on NAMCS and NHAMCS data.*

**Conditions for which antibiotics are rarely, sometimes, or usually indicated**

<table>
<thead>
<tr>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute bronchitis</td>
<td>Acute otitis media</td>
<td>Bacterial pneumonia</td>
</tr>
<tr>
<td>Upper respiratory infection</td>
<td>Pharyngitis</td>
<td>Urinary tract infection</td>
</tr>
<tr>
<td>Influenza</td>
<td>Sinusitis</td>
<td></td>
</tr>
<tr>
<td>Asymptomatic bacteriuria</td>
<td>Skin/soft-tissue infection</td>
<td></td>
</tr>
</tbody>
</table>

SHEA. Practical implementation of an antibiotic stewardship program 2018.
The Core Elements of Outpatient Antibiotic Stewardship

**Commitment**
Demonstrate dedication to and accountability for optimizing antibiotic prescribing and patient safety.

**Action for policy and practice**
Implement at least one policy or practice to improve antibiotic prescribing, assess whether it is working, and modify as needed.

**Tracking and reporting**
Monitor antibiotic prescribing practices and offer regular feedback to clinicians, or have clinicians assess their own antibiotic prescribing practices themselves.

**Education and expertise**
Provide educational resources to clinicians and patients on antibiotic prescribing, and ensure access to needed expertise on optimizing antibiotic prescribing.
Outpatient interventions

- Provider/patient education
- Guidelines
- Rapid diagnostic tests
- Biomarkers
- Clinical decision support
- Communications training
- Delayed prescribing
- Commitment posters
- Peer comparison
Rapid diagnostic tests, diagnostic stewardship

Examples

- Group A streptococcus
- Influenza
- Molecular detection panels
- Urinary tract infection
- C. difficile

Biomarkers (procalcitonin)

- Procalcitonin algorithms can reduce overall antibiotic exposure (initiation and duration) for lower respiratory tract infection (Schuetz. JAMA 2009; Briel et al. Arch Intern Med 2008.)

- Recent large, pragmatic trial in the US indicated no difference in antibiotic use within 30 days (Huang. New Engl J Med 2018)

Clinical pathways/clinical decision support

Evidence-Based Management of Acute Respiratory Tract Infections

- **Assess clinical probability of pneumonia**

  **LOW** (<5%)
  - No abnormal vital signs and normal chest exam
  - No CXR
  - No Abx

  **INTERMEDIATE** (5%-30%)
  - One or more abnormal vital signs or abnormal chest exam
  - Consider CXR
  - Abx based on CXR results

  **HIGH** (>30%)
  - One or more abnormal vital signs and abnormal chest exam
  - Perform CXR
  - Consider empiric Abx

* CXR should be ordered on all patients with focal lung findings on physical examination.
** Abnormal vital signs are common with uncomplicated influenza infection when influenza is circulating in the community.

In the absence of pneumonia, consider the following diagnoses in adults with acute cough illness

- URI or Rhinosinusitis
  - Dx criteria
    - cough plus nasal, throat, and/or ear pain
    - no dominant Sk

- Acute bronchitis
  - Dx criteria
    - cough dominant
    - no visible chest retractions
    - rhonchi/whistling common

- Influenza
  - Dx criteria
    - if cough + fever + myalgia/tetrad + present, prevalence ≥ 60%

- Acute bacterial sinusitis
  - Dx criteria
    - illness > 7 days
    - purulent nasal discharge
    - facial, head or teeth pain

Gonzales. JAMA Intern Med 2013
Communications training

1. Review the physical exam
2. Give a clear diagnosis
3. Use a two-part negative-positive recommendation
4. Provide a contingency plan

New York State Department of Health.
https://www.youtube.com/watch?v=YHYmb2OKoMU

Delayed prescriptions

Antibiotic use for acute respiratory infection within 14d:

- No Rx given: 26%
- Post-dated Rx: 37%
- Patient to re-contact practice for Rx: 37%
- Patient to return to office to collect Rx: 33%
- Rx given, patient to decide when to fill: 39%

Commitment posters

- 18 x 24 inch commitment poster with photographs and signatures posted in exam rooms for 12 weeks

- 20% reduction in inappropriate antibiotic prescribing for acute respiratory infection relative to standard practice

A Commitment to Our Patients About Antibiotics

Antibiotics only fight infections caused by bacteria. Like all drugs, they can be harmful and should only be used when necessary. Taking antibiotics when you have a virus can do more harm than good: you will still feel sick and the antibiotic could give you a skin rash, diarrhea, a yeast infection, or worse.

Antibiotics also give bacteria a chance to become more resistant to them. This can make future infections harder to treat. It means that antibiotics might not work when you really do need them. Because of this, it is important that you only use an antibiotic when it is necessary to treat your illness.

How can you help? When you have a cough, sore throat, or other illness, tell your doctor you only want an antibiotic if it is really necessary. If you are not prescribed an antibiotic, ask what you can do to feel better and get relief from your symptoms.

Your health is important to us. As your healthcare providers, we promise to provide the best possible treatment for your condition. If an antibiotic is not needed, we will explain this to you and will offer a treatment plan that will help. We are dedicated to prescribing antibiotics only when they are needed, and we will avoid giving you antibiotics when they might do more harm than good.

If you have any questions, please feel free to ask us.

Sincerely,

Peer comparison (prescriber feedback)

- Monthly e-mail to clinicians indicating “top performer” or “not a top performer”
- Outcome was inappropriate prescribing rate for URI, acute bronchitis, or influenza
- 16% reduction; 5% relative to control
- Reduction in antibiotic prescriptions relative to control sustained 12 months after intervention

American Academy of Pediatrics Chapter Quality Network Initiative

• A project of AAP-Colorado, AAP-National, and CDC

• 8 pediatric practices in CO, 6 month collaborative

• Objective: improve outpatient antibiotic prescribing

• Methods: quality improvement

• Outcomes:
  • Treatment of acute otitis media, including use of, and education for, safety-net antibiotic prescriptions (SNAP)
  • Diagnosis and treatment of pharyngitis
American Academy of Pediatrics Chapter Quality Network Initiative—Key Drivers

1. Accountable leadership
2. Implement evidence-based care
3. Collect and report data
4. Access expertise and resources
5. Peer-to-peer learning
PDSA RAMPS:
INCREMENTAL CHANGE ACROSS MULTIPLE TESTS

Hunches
Theories
Ideas

Very Small Scale Test:

Follow-up Tests:

Wide-Scale Tests of Change:

Changes That Result in Improvement

Implement Change:

Multiple PDSA Cycles – Sequential Building of Knowledge – include a wide range of conditions in the sequence of tests before implementing the change

*PDSA: Plan, Do, Study, Act
American Academy of Pediatrics Initiative

Use of first-line antibiotics to treat AOM

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Bl
n=919
Jan
n=689
Feb
n=871
Mar
n=777
Apr
n=601
May
n=0
Jun
n=0

Colorado Chapter
Goal

Slide courtesy of Jennifer Monti, PhD, Chapter Quality Network, American Academy of Pediatrics
American Academy of Pediatrics Initiative

Use of safety-net antibiotic prescriptions (SNAPs) for patients with AOM

- **Bl** n=919
- **Jan** n=689
- **Feb** n=871
- **Mar** n=777
- **Apr** n=601
- **May** n=0
- **Jun** n=0

- **Colorado Chapter**
- **Goal**

Slide courtesy of Jennifer Monti, PhD, Chapter Quality Network, American Academy of Pediatrics
American Academy of Pediatrics Initiative

Appropriate testing for patients with pharyngitis

<table>
<thead>
<tr>
<th>Month</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bl</td>
<td>457</td>
<td></td>
</tr>
<tr>
<td>Jan</td>
<td>247</td>
<td></td>
</tr>
<tr>
<td>Feb</td>
<td>278</td>
<td></td>
</tr>
<tr>
<td>Mar</td>
<td>207</td>
<td></td>
</tr>
<tr>
<td>Apr</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Jun</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Colorado Chapter Goal
American Academy of Pediatrics Initiative

Use of first-line antibiotics to treat pharyngitis

- Colorado Chapter
- Goal

Slide courtesy of Jennifer Monti, PhD, Chapter Quality Network, American Academy of Pediatrics
Closing remarks

• Antibiotic stewardship is a core public health action to prevent antibiotic resistance and improve patient care

• The core elements are a framework for antibiotic stewardship programs in healthcare settings

• You can prevent antibiotic resistance by implementing evidence-based interventions in your practice
Core elements, treatment recommendations, educational materials, stewardship course
