Antibiotic Stewardship in the Outpatient Setting

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Division of Healthcare Quality Promotion
National Center for Emerging and Zoonotic Infectious Diseases
Centers for Disease Control and Prevention
Antibiotics are life-saving medicines that underpin modern medicine.
Antibiotic resistance is a pressing global public health threat.

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

Annual excess direct healthcare cost: $20 billion
Additional annual cost of lost productivity: >$35 billion

www.cdc.gov/drugresistance/threat-report-2013/
Antibiotic resistance is a problem here in LA County.

- Since 2017, LA County has received reports of over 50 confirmed novel organisms highly resistant to antimicrobials.

- LA County sees high rates of carbapenem-resistant Enterobactericeae, especially in long-term acute care settings
  - Community-onset rates of 2.5 per 100 admissions

LACDPh data
Antibiotic use is a major driver of antibiotic resistance.

Date of Antibiotic Market Introduction

- **Penicillin** 1943
- **Methicillin** 1960
- **Vancomycin** 1972
- **Imipenem** 1985
- **Levofloxacin** 1996
- **Ceftaroline** 2010

Date Resistance Identified

- **Penicillin-R Staphylococcus** 1940
- **Methicillin-R Staphylococcus (MRSA)** 1962
- **Vancomycin-R Enterococcus (VRE)** 1988
- **Levofloxacin-R Streptococcus** 1996
- **Imipenem-R Enterobacteriaceae (CRE)** 1998
- **Ceftaroline-R Staphylococcus** 2011

[www.cdc.gov/drugresistance/about.html](http://www.cdc.gov/drugresistance/about.html)
CDC’s response to combat antibiotic resistance is multifaceted.

**CDC’s Office of Antibiotic Stewardship**
Mission: To optimize antibiotic use in human healthcare to combat antibiotic resistance and improve healthcare quality and patient safety.
The majority of antibiotic use in human healthcare occurs in outpatients.

Antibiotic Expenditures for Humans in the United States by Treatment Setting 2010-15: Total $56.0 billion

Approximately 85%–95% of human antibiotic use by volume occurs in outpatient setting.
In 2016, 270 million antibiotic prescriptions were dispensed from US outpatient pharmacies, for a rate of 836 per 1000 population.

Outpatient antibiotic prescriptions dispensed per 1000 population, IQVIA 2016
Part D claims data indicates LA County members were prescribed 981,492 antibiotic prescriptions in 2015 (about 0.1 per member per month).

Rates of broad spectrum antibiotics about twice that of narrow spectrum antibiotics in LA County.
Inappropriate antibiotic use includes all of these.

- Unnecessary antibiotic use
- Improper antibiotic selection
- Errors in antibiotic dosing
- Errors in antibiotic duration
Reducing unnecessary antibiotic use is critical.
Respiratory infections are major drivers of antibiotic use in outpatient settings.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Prescriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinusitis</td>
<td>11%</td>
</tr>
<tr>
<td>Acute otitis media</td>
<td>9%</td>
</tr>
<tr>
<td>Pharyngitis</td>
<td>9%</td>
</tr>
<tr>
<td>Skin and soft tissue infections</td>
<td>8%</td>
</tr>
<tr>
<td>Urinary tract infections</td>
<td>7%</td>
</tr>
<tr>
<td>Bronchitis</td>
<td>5%</td>
</tr>
<tr>
<td>Viral URI</td>
<td>5%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>2%</td>
</tr>
</tbody>
</table>

Top diagnoses leading to antibiotic prescriptions in U.S. doctors’ offices and emergency departments, 2010-11

URI=upper respiratory infection
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URI=upper respiratory infection
At least **30%** of antibiotic prescriptions written in U.S. doctors offices and emergency departments are **unnecessary**.

Antibiotic prescribing for antibiotic-inappropriate acute respiratory infections (ARIs) is common in outpatient settings, especially urgent care.

Percent of visits for antibiotic-inappropriate ARIs with antibiotics prescribed

*Antibiotic-inappropriate ARIs include: Viral URI, bronchitis, bronchiolitis; influenza; nonsuppurative otitis media; viral pneumonia; asthma/allergy. Visits with additional diagnoses of concomitant bacterial infections (e.g. pneumonia, urinary tract infections, acute otitis media, sinusitis) were excluded.

Antibiotic adverse events can be severe, including allergic reactions.
Antibiotic adverse events can lead to emergency department visits.

1 in 1000 antibiotic prescriptions leads to an ED visit for an adverse event

200,000 ED visits/year in U.S.

Clostridioides difficile infection is a serious consequence of antibiotic use.

453,000 infections and 15,000 deaths in the US annually\(^1\)

35% are community-associated\(^1\)

$20,000: average cost of a hospitalization for community-onset \textit{C. difficile} infection in 2015 US$\(^2\)

\textbf{LA County} has high community-onset CDI rates\(^3\)

- 0.3 per 100 admissions in GACH
- 1.4 per 100 admissions in LTAC

1. Lessa NEJM 2015;372(9):825-34
3. LACDPH data
Antibiotic adverse events may have long-term consequences for chronic disease through disruption of the microbiome.

Antibiotic selection needs improvement.
Patients with sinusitis who are prescribed antibiotics too often receive the wrong antibiotic.

Antibiotic Selection for Sinusitis — United States, 2010-11

Percent of visits with first-line antibiotics

- Pediatric sinusitis: 52%
- Adult sinusitis: 37%

Goal 80%

References:
Macrolides are commonly prescribed but are not recommended for sinusitis.

Antibiotic Selection for Sinusitis — United States, 2010-11

Fluoroquinolones are also prescribed to about 16% of adults with sinusitis, but are higher risk for adverse events.

Fluoroquinolones should only be used when other options are not available.

www.fda.gov/Drugs/DrugSafety/ucm500143.htm
https://www.fda.gov/NewsEvents/Newsroom/FDAInBrief/ucm628956.htm
Reported penicillin allergy is a major driver of broad-spectrum antibiotic use.

https://www.cdc.gov/antibiotic-use/community/pdfs/penicillin-factsheet.pdf
Using the minimum effective duration is a key antibiotic stewardship target.
IDSA recommends 5-7 days of antibiotics for adults with uncomplicated acute sinusitis, but most adults receive 10 days.

King et al. *JAMA Intern Med.* Published online March 26, 2018.

Have we made any progress in improving antibiotic use?
National outpatient antibiotic prescription rates decreased **5%** from 2011-16.

IQVIA pharmacy dispensing data

gis.cdc.gov/grasp/PSA/indexAU.html
California outpatient antibiotic prescription rates decreased **10%** from 2011-16.

IQVIA pharmacy dispensing data
gis.cdc.gov/grasp/PSA/indexAU.html
The reductions in antibiotic prescribing have been entirely driven by reductions in children.

IQVIA pharmacy dispensing data
gis.cdc.gov/grasp/PSA/indexAU.html
California outpatient antibiotic prescribing rates to **children** decreased **21%** but rates for **adults** only decreased by **1%**.

IQVIA pharmacy dispensing data

[gis.cdc.gov/grasp/PSA/indexAU.html](http://gis.cdc.gov/grasp/PSA/indexAU.html)
Lesson learned: Vaccines are key antibiotic stewardship tools.

Nuorti P. & Whitney C. *MMWR Rec Rep* 2010; 59(RR-11): 1–18
Lesson learned: Public health and pediatric healthcare providers helped improve antibiotic use in children by working together.
Core Elements of Outpatient Antibiotic Stewardship provide a framework for implementing antibiotic stewardship in outpatient settings.

14 VHA clinics implemented Core Elements to improve antibiotic use for acute respiratory infections (ARIs).

- Data from 2014-2018
- Staggered roll out of intervention
  - 4 sites in 2015
  - 10 sites in 2017
- Total ARI visits included
  - Pre-intervention: 29,782
  - Post-intervention: 8,369
Sites demonstrated **commitment** by recruiting stewardship champions at all sites.

Volunteer “stewardship champions” disseminate stewardship messages, and provide guidance on best practices.
Academic detailing was used to fulfill action for policy and practice.

**VA Intervention Tools - Academic Detailing**

Academic Detailing concerning ARI management was provided as part of this intervention.

**Why?**
- Academic detailing saves providers time and effort in staying up-to-date with current research and best practice!
- Helps apply evidence based medicine to practice!
- Provides an avenue for personalized feedback (Clinic & Provider Reports)

**How?**
- Clinic champions engaged providers in detailing visits for ~20 minute either in small groups or one on one. During these sessions providers received personalized reports and latest evidence concerning the current best practices for ARI encounters.

**Who?**
- Clinic champions trained in academic detailing for ARI encounters identified providers with >15 ARI encounters during the baseline period and every two months post intervention Kick-Off
Antibiotic prescribing was tracked and reported back to providers at all sites.
Education and expertise were provided to healthcare providers and patients at all sites.
Interventions resulted in decreases in antibiotic prescription rates for all acute respiratory infections (ARIs).

Prevalence rate ratio for antibiotic prescribing for ARI post versus pre-intervention

- Bronchitis: 0.40
- Pharyngitis: 0.59
- Sinusitis: 0.87
- All uncomplicated ARIs: 0.58

Madaras-Kelly et al. IDWeek 2018
Interventions were safe, as there were no differences in revisits for acute respiratory infections or hospitalizations within 30 days.

Risk ratio and 95% confidence intervals for ARI visits post- compared to pre-intervention

- 30 day ARI revisits: Risk ratio = 1.15
- 30 day hospitalizations: Risk ratio = 1.03

Madaras-Kelly et al. IDWeek 2018
CMS tasked the QIN-QIOs to implement CDC’s Core Elements of Outpatient Antibiotic Stewardship.

<table>
<thead>
<tr>
<th>Total Recruited Facilities</th>
<th>7,629</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physician practices</td>
<td>5,948</td>
</tr>
<tr>
<td>Hospital Emergency Departments</td>
<td>748</td>
</tr>
<tr>
<td>Standalone Emergency Room/Urgent Care</td>
<td>470</td>
</tr>
<tr>
<td>Others</td>
<td>463</td>
</tr>
</tbody>
</table>

CMS data as of January 2018
CDC Training on Antibiotic Stewardship fulfils Improvement Activities Patient Safety and Practice Assessment (PSPA_23 and PSPA_24) under CMS’s Merit-Based Incentive Payment Program (MIPS).

https://www.train.org/cdctrain/training_plan/3697
CDC’s 6|18 Initiative targeting six common and costly health conditions with 18 proven interventions and includes improving antibiotic use.
Aetna has sent ~2600 letters to clinicians informing them that they prescribed antibiotics over 50% of time for adults with acute bronchitis.
Antimicrobial Resistance (AMR) is a One Health problem. AMR is one of the greatest global health issues of our time, and is threatening our progress in healthcare, food security, and life expectancy.

The U.S. Government is leading a yearlong initiative to bolster global efforts across sectors and around the world to step up, partner, and each play our part in the fight against AMR.

How will you lead?

Across five commitment areas, commit to action and results that combat antimicrobial resistance.

Tracking and Data
Share data and improve data collection

Infection Prevention and Control
Reduce the spread of resistant germs

Antibiotic Use
Improve appropriate antibiotic use, including ensuring access

Environment and Sanitation
Decrease antibiotics and resistance in the environment

Vaccines, Diagnostics, Therapeutics
Invest in development and improved access
The Los Angeles County Department of Public Health (LACDPH) will continue to prevent, detect, and respond to antibiotic-resistant infections in healthcare settings, using surveillance data to identify threats requiring response. LACDPH will promote the appropriate use of antibiotics among the public and human and veterinary healthcare providers, and will train healthcare staff across the continuum of care in appropriate antibiotic use and stewardship.
Conclusions

- Antibiotic stewardship is one of the most important strategies to combat antibiotic resistance and keep our patients safe.

- Antibiotic stewardship must include all settings of healthcare, including the outpatient setting.

- We need to improve outpatient prescribing in the United States.
  - 30% of outpatient antibiotic prescriptions in the United States are unnecessary.
  - We also need improvement in antibiotic selection, dosing and duration.

- Core Elements of Outpatient Antibiotic Stewardship provides a framework for improving outpatient antibiotic prescribing.
“The Right Tool” Public Service Announcement

https://www.youtube.com/watch?v=dETK7Jc-XWA
The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.