Antimicrobial Stewardship in Primary Care and Long Term Care in Ontario

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Assistant Professor, Dalla Lana School of Public Health, University of Toronto
Objectives

• Overview on the importance of AMR

• Review antibiotic use in Ontario during COVID-19

• Discuss antimicrobial stewardship activities in primary care in Ontario

• Review approach to asymptomatic bacteriuria and antimicrobial stewardship in LTC in Ontario
Antimicrobial Resistance (AMR)

“AMR is a slow tsunami that threatens to undo a century of medical progress”
-Dr. Tedros, Director-General, WHO
Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis

Antimicrobial Resistance Collaborators

Summary

Background Antimicrobial resistance (AMR) poses a major threat to human health around the world. Previous publications have estimated the effect of AMR on incidence, deaths, hospital length of stay, and health-care costs for specific pathogen–drug combinations in select locations. To our knowledge, this study presents the most comprehensive estimates of AMR burden to date.

Methods We estimated deaths and disability-adjusted life-years (DALYs) attributable to and associated with bacterial AMR for 23 pathogens and 88 pathogen–drug combinations in 204 countries and territories in 2019. We obtained data from systematic literature reviews, hospital systems, surveillance systems, and other sources, covering 471 million individual records or isolates and 7355 study-location-years. We used predictive statistical modelling to produce estimates of AMR burden for all locations, including for locations with no data. Our approach can be divided into five broad components: number of deaths where infection played a role, proportion of infectious deaths attributable to a given infectious syndrome, proportion of infectious syndrome deaths attributable to a given pathogen, the percentage of a given pathogen resistant to an antibiotic of interest, and the excess risk of death or duration of an infection associated with this resistance. Using these components, we estimated disease burden based on two counterfactuals: deaths attributable to AMR (based on an alternative scenario in which all drug-resistant infections were replaced by drug-susceptible infections), and deaths associated with AMR (based on an alternative scenario in which all drug-resistant infections were replaced by no infection). We generated 95% uncertainty intervals (UIs) for final estimates as the 25th and 97.5th ordered values across 1000 posterior draws, and models were cross-validated for out-of-sample predictive validity. We present final estimates aggregated to the global and regional level.

Findings On the basis of our predictive statistical models, there were an estimated 4.95 million (3.62–6.57) deaths associated with bacterial AMR in 2019, including 1.27 million (95% UI 0.911–1.71) deaths attributable to bacterial AMR. At the regional level, we estimated the all-age death rate attributable to resistance to be highest in Western Sub-Saharan Africa, at 27.3 deaths per 100,000 (20.9–35.3), and lowest in Australasia, at 6.5 deaths (4.3–9.4) per 100,000. Lower respiratory infections accounted for more than 1.5 million deaths associated with resistance in 2019, making it the most burdensome infectious syndrome. The six leading pathogens for deaths associated with resistance were Staphylococcus aureus, Klebsiella pneumoniae, Streptococcus pneumoniae, Acinetobacter baumannii, and Pseudomonas aeruginosa; they were responsible for 929,000 (660,000–1,270,000) deaths attributable to AMR and 3.57 million (2.62–4.78) deaths associated with AMR in 2019. One pathogen–drug combination, meticillin-resistant S. aureus, caused more than 100,000 deaths attributable to AMR in 2019, while six more each caused 50,000–100,000 deaths: multidrug-resistant tuberculosis, third-generation cephalosporin-resistant E. coli, carbapenem-resistant A. baumannii, fluoroquinolone-resistant E. coli, carbapenem-resistant K. pneumoniae, and third-generation cephalosporin-resistant K. pneumoniae.

Interpretation To our knowledge, this study provides the first comprehensive assessment of the global burden of AMR, as well as an evaluation of the availability of data. AMR is a leading cause of death around the world, with the highest burdens in low-resource settings. Understanding the burden of AMR and the leading pathogen–drug combinations contributing to it is crucial to making informed and location-specific policy decisions, particularly about infection prevention and control programmes, access to essential antibiotics, and research and development of new vaccines and antibiotics. There are serious data gaps in many low-income settings, emphasising the need to expand microbiology laboratory capacity and data collection systems to improve our understanding of this important human health threat.

Funding Bill & Melinda Gates Foundation, Wellcome Trust, and Department of Health and Social Care using UK aid funding managed by the Fleming Fund.
Antibiotic Use
Figure 12: Consumption of antimicrobials in defined daily doses per 1,000 inhabitant-days, Canada and 30 European countries, 2019

Source: The European Centre for Disease Prevention and Control and the Public Health Agency of Canada
COVID-19

Daily new confirmed COVID-19 cases per million people
7-day rolling average. Due to limited testing, the number of confirmed cases is lower than the true number of infections.

COVID-19: Stringency Index
The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest).
The collapse of infectious disease diagnoses commonly due to communicable respiratory pathogens during the COVID-19 pandemic: A time series and hierarchical clustering analysis

Ali Zhang, Matthew D. Surette, Kevin L. Schwartz, James I. Brooks, Dawn M.E. Bowdish, Roshanak Mahdavi, Douglas G. Manuel, Robert Talarico, Nick Daneman, Jayson Shurgold, Derek MacFadden
Visits for Infectious Diseases during COVID-19

Highly impacted

Minimally impacted

![Graph showing visits for infectious diseases during COVID-19.](image)
The Impact of COVID-19 on Outpatient Antibiotic Prescriptions in Ontario, Canada; An Interrupted Time Series Analysis

Taito Kitano,1,2 Kevin A. Brown,2,3,4 Nick Daneman,2,4,5 Derek R. MacFadden,4,6 Bradley J. Langford,2 Valerie Leung,2,7, Miranda So,8,9 Elizabeth Leung,9,10,11 Lori Burrows,12,© Douglas Manuel,6,© Dawn M. E. Bowdish,13 Colleen J. Maxwell,4,14 Susan E. Bronskill,15,16,© James I. Brooks,17,18 and Kevin L. Schwartz2,3,4,19

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Antibiotic Prescriptions

Adjusted Relative Change -31.2% (95%CI -35.1% to -27.0%)
Indication Specific Antibiotic Prescriptions per 1,000 Patient Visits

- Respiratory antibiotics: -6.8%
- Urinary antibiotics: -11.0%
- Skin and soft tissue antibiotics: -4.7%
- Respiratory, urinary tract or skin and soft tissue antibiotics: -5.5%
COVID-19 and Antibiotic Use

• 30% decrease in antibiotic use in 2020
• Largely explained by a decrease in respiratory infections
  • Most of these are viral
• Prescribing has **not** fundamentally changed
• Expect to see a rebound to pre-pandemic levels
Number of Antibiotic Prescriptions in Ontario By Specialty, 2018-2021

Source: IQVIA
Monthly AMU in Ontario 2018 - 2021

Source: IQVIA
ANTIBIOTIC USE ➔ RESISTANCE
Antibiotic Use and Resistance in Europe
Fluoroquinolone neighborhood consumption by GSA (DDD/1,000 patients per day)

Figure 1: Multiple logistic regression adjusted* odds ratios for *Escherichia coli* resistant and susceptible bacteria growth associated with neighbourhood fluoroquinolone consumption.

*FQ-R*—fluoroquinolone resistant. *FQ-S*—fluoroquinolone susceptible. SEV—sterile event. *Adjusted for: age, nursing home residence, ethnicity, BMI, comorbidity score, number of hospitalisations in the previous year, and personal consumption of fluoroquinolones, socioeconomic status, population density, proportion of people insured by CHS, and neighbourhood fluoroquinolone consumption in the previous year.
Antimicrobial Stewardship =

How the appropriate use of antibiotics can maximize both their current effects and the chances of their being available for future generations.
Unnecessary antibiotic prescribing in a Canadian primary care setting: a descriptive analysis using routinely collected electronic medical record data

Figure 2: Percentage of all antibiotics prescribed, by tier classification system. Tier 1 = conditions for which antibiotics are always indicated (expected prescribing rate 100%), Tier 2a = conditions for which antibiotics are frequently indicated (expected prescribing rate 51%–99%), Tier 2b = conditions for which antibiotics are sometimes indicated (expected prescribing rate 21%–50%), Tier 2c = conditions for which antibiotics are rarely indicated (expected prescribing rate 1%–20%), Tier 3 = conditions for which antibiotics are never indicated (expected prescribing rate 0%). *These antibiotics were not associated with an encounter included in the study.

Schwartz KL CMAJ Open 2020
The New Antibiotic Mantra—“Shorter Is Better”

Brad Spellberg, MD

In AD 321, Roman Emperor Constantine the Great codified that there would be 7 days in a week. Even in the modern era of evidence-based-medicine, this 1695-year-old decree remains a primary reference for duration of antibiotic therapy: it leads physicians to treat infections in intervals gratifying when clinical trials challenge the antibiotic duration of 7 to 14 days.

In the past, community-acquired pneumonia (CAP) with a 7- to 14-day course of antibiotic therapy is at least as effective as 10 days for the treatment of community-acquired pneumonia. In his keynote address at an annual meeting of the Infectious Diseases Society of America, Louis B. Rice, MD, pointed out that shorter courses of antibiotics are as efficacious, if not more so, compared to the longer duration of therapy.

Table. Infections for Which Short-Course Therapy Has Been Shown to Be Equivalent in Efficacy to Longer Therapy

<table>
<thead>
<tr>
<th>Disease</th>
<th>Treatment, Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community-acquired pneumonia&lt;sup&gt;1-3&lt;/sup&gt;</td>
<td>Short  Long</td>
</tr>
<tr>
<td>Nosocomial pneumonia&lt;sup&gt;6,7&lt;/sup&gt;</td>
<td>≤8  10-15</td>
</tr>
<tr>
<td>Pyelonephritis&lt;sup&gt;10&lt;/sup&gt;</td>
<td>5-7  10-14</td>
</tr>
<tr>
<td>Intraabdominal infection&lt;sup&gt;11&lt;/sup&gt;</td>
<td>4  10</td>
</tr>
<tr>
<td>Acute exacerbation of chronic bronchitis and COPD&lt;sup&gt;12&lt;/sup&gt;</td>
<td>≤5  ≥7</td>
</tr>
<tr>
<td>Acute bacterial sinusitis&lt;sup&gt;13&lt;/sup&gt;</td>
<td>5  10</td>
</tr>
<tr>
<td>Cellulitis&lt;sup&gt;14&lt;/sup&gt;</td>
<td>5-6  10</td>
</tr>
<tr>
<td>Chronic osteomyelitis&lt;sup&gt;15&lt;/sup&gt;</td>
<td>42  84</td>
</tr>
</tbody>
</table>
NONSENSE!!
(warning rant to follow)

Is it time to stop counselling patients to “finish the course of antibiotics”?

Bradley J. Langford, BScPhm, ACPR, PharmD, BCPS; Andrew M. Morris, MD, SM(Epi), FRCPC
Variability in antibiotic duration of treatment by Ontario family physicians

- 10,616 primary care MDs
- 5,600,000 antibiotic courses
- 35% for >8 days
Inter-physician variability in prolonged duration by career stage for respiratory and urinary antibiotics

Fernandez CID
Estimating Daily Antibiotic Harms
Umbrella Review and Meta-Analysis

35 Systematic Reviews
71 Short vs. Long Antibiotic Duration Trials
92% studies evaluated respiratory tract and urinary tract infections
23,174 patients evaluated

**Adverse Events**
- N=20,345
- 4%↑ odds ratio/day

**Antibiotic Resistance**
- N=2,330
- 3%↑* odds ratio/day

**Super-infections**
- N=5,776
- 2%↓* odds ratio/day

**Each Additional Day Can Cause Harm**
- 5 vs 3 Days
- 9%↑ odds ratio
  Of adverse events
- 7 vs 3 Days
- 19%↑ odds ratio
  Of adverse events

* Non-statistically significant difference

How to perform antimicrobial stewardship in the community
Box. The Imbalance in Factors Related to Antibiotic Prescribing

Factors Driving Antibiotic Prescribing: Immediate and Emotionally Salient
- Belief that a patient wants antibiotics
- Perception that it is easier and quicker to prescribe antibiotics than explain why they are unnecessary
- Habit
- Worry about serious complications and “just to be safe” mentality

Factors Deterring Antibiotic Prescribing: More Remote and Less Emotionally Salient
- Risks of adverse reactions and drug interactions
- Recognizing the need for antibiotic stewardship
- Desire to deter low-value care and decrease unnecessary health care spending
- Prefer to follow guidelines
Managing Respiratory Tract Infections

### CAN BE MANAGED VIRTUALLY OR IN PERSON

**USE VITAL PRESCRIPTION**

**SHOULD BE ASSESSED IN PERSON**

- **Suspected or confirmed COVID-19**
  - Fever
  - Respiratory symptoms
  - No shortness of breath

- **Ear pain**
  - Symptoms <48 hours
  - Fever <39°C
  - Pain controlled with oral pain medication
  - Otherwise feels well

- **Sore throat**
  - Mild symptoms <48 hours
  - No red flags

- **Sinus congestion**
  - Mild symptoms <7 days
  - No red flags

- **COPD exacerbation**
  - Assessment in person

- **Influenza-like illness, bronchitis, common cold, asthma**
  - High fever controllable with antipyretic
  - Cough
  - Congestion
  - Body aches
  - Mild illness

**Red flags for patient with viral infection:**
- For children, may include fast breathing or trouble breathing, bluish lips or face, ribs pulling each breath, chest pain, child refuses to walk, signs of dehydration, history of seizure, any 1 week of age.
- In adults, may include difficulty breathing or shortness of breath, acute chest pain or abdomen pain, dizziness, confusion, signs of dehydration.

**Red flags for patient with sinusitis:**
- Altered mental status, restlessness, systemic toxicity, swelling of the orbit, change in voice or neurologic deficits.

### Points to Remember: The Role of Antibiotics

#### Specific Situations Where Antibiotics Are Recommended

**Upper Respiratory Tract Infection (Common Cold)**
- Not indicated

**Bronchitis/Asthma**
- Not indicated

**Otitis Media**
- Perforated tympanic membrane with purulent discharge or a bulging tympanic membrane with either:
  - Fever >39°C OR
  - Moderate to severe pain OR
  - Symptoms lasting >48 hours

**Pharyngitis**
- Center score is ≥2 AND throat swab culture (rapid antigen test, if available) confirms presence of Group A beta-hemolytic streptococcus

**Sinusitis**
- Patient has at least 2 of the below PODS symptoms, OR those being 8 or 9 AND:
  - Symptoms lasting greater than 7-10 days OR
  - The symptoms are severe OR
  - There is no response after a 72-hour trial with nasal corticosteroids

**Pneumonia**
- If the patient has compatible symptoms and radiographic confirmation of pneumonia

**Acute exacerbation of COPD**
- Increase in sputum purulence with either increase in sputum volume and/or increased dyspnea

**Recommended Antibiotic Duration**
- Antibiotics never indicated
- Age 6 months to 2 years: 10 days
- Age greater than 2 years: 5 days
- 10 days
- 5 days
- 5 days
- 5 days

*See table on role of antibiotics

**Red flags for patient with viral infection:**
- For children, may include fast breathing or trouble breathing, bluish lips or face, ribs pulling each breath, chest pain, child refuses to walk, signs of dehydration, history of seizure, any 1 week of age.
- In adults, may include difficulty breathing or shortness of breath, acute chest pain or abdomen pain, dizziness, confusion, signs of dehydration.

**Red flags for patient with sinusitis:**
- Altered mental status, restlessness, systemic toxicity, swelling of the orbit, change in voice or neurologic deficits.

*PublicHealthOntario.ca*
Coping with ‘the grey area’ of antibiotic prescribing: a theory-informed qualitative study exploring family physician perspectives on antibiotic prescribing

Michelle Simeoni\textsuperscript{1,3}, Marianne Saragosa\textsuperscript{2}, Celia Laur\textsuperscript{3}, Laura Desveaux\textsuperscript{4,5}, Kevin Schwartz\textsuperscript{1} and Noah Ivers\textsuperscript{3,5}\textsuperscript{*}
Sorry, but no amount of antibiotics will get rid of your cold.

The best way to treat most colds, coughs or sore throats is with plenty of fluids and rest. Talk to your health care provider.

To learn more, visit www.choosingwiselycanada.org/antibiotics
Nudging Guideline-Concordant Antibiotic Prescribing: A Randomized Clinical Trial

Daniella Meeker, PhD; Tara K. Knight, PhD; Mark W. Friedberg, MD, MPP; Jeffrey A. Linder, MD, MPH; Noah J. Goldstein, PhD; Craig R. Fox, PhD; Alan Rothfeld, MD; Guillermo Diaz, MD; Jason N. Doctor, PhD

Table 4. Changes in Adjusted Rates\(^a\) of Inappropriate Antibiotic Prescribing for ARIs

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Poster Condition</th>
<th>Control Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Final Measurement</td>
</tr>
<tr>
<td>Inappropriate prescribing rate, % (95% CI)</td>
<td>43.5 (38.5 to 49.0)</td>
<td>33.7 (25.1 to 43.1)</td>
</tr>
<tr>
<td>Absolute percentage change, baseline to final measurement (95% CI)</td>
<td>-9.8 (0.0 to -19.3)</td>
<td>9.9 (0.0 to 20.2)</td>
</tr>
<tr>
<td>Difference in differences between poster condition and control (95% CI)</td>
<td>-19.7 (-5.8 to -33.04)(^b)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: ARI, acute respiratory infection.
\(^a\) Adjusted for demographic characteristics and insurance status.
\(^b\)
Audit and Feedback = Measuring an individuals professional practice compared to standards or targets
RCT: Effect of Antibiotic-Prescribing Feedback to High-Volume Primary Care Physicians on Number of Antibiotic Prescriptions

**POPULATION**
2405 Men, 1060 Women

Primary care physicians (PCPs) with high antibiotic-prescribing volume

**INTERVENTION**
3500 Randomized

1500 Initiation letter
Informed PCP that they were in the highest quartile of prescribers and provided guidance on appropriate antibiotic initiation for respiratory infections

1500 Duration letter
Informed PCP that they were in the highest quartile of prescribers and provided guidance on appropriate antibiotic durations

500 Control
PCP did not receive a letter

**FINDINGS**
Receipt of the antibiotic duration letter resulted in a small relative difference in fewer antibiotic prescriptions compared with controls at 12 mo; there was no statistical difference with receipt of the initiation letter

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Dr. Jane Smith
123 Family Doctor Ave.
Toronto, ON
M1N 2O3

Dear Dr. Smith,

Every day, family doctors like you are doing everything you can to help your patients become and stay healthy. Choosing when and how you prescribe antibiotics is a crucial decision-making step, especially during flu season. That’s why we’re writing to you personally, to support you in prescribing antibiotics appropriately for your patients.

Across care settings, research has shown that practice habits and expectations around antibiotic prescribing are leading causes of over-prescription. Knowing where each of us are on the spectrum of prescribing habits provides a chance to reflect and consider changes.

How you prescribe antibiotics compared to your peers

You are receiving this letter because you prescribe more antibiotics than 75% of your peers.

As a context, it might be useful for you to be aware that you’re one of the 25% of primary care physicians who prescribe 65% or antibiotics. Reviewing the reasons why that may be happening, and considering how unnecessary prescriptions can be avoided are important ways to improve the health of your patients. Enclosed, you’ll find tools and information to help reduce antibiotics safely.

Aside from the immediate risks of adverse reactions, research shows us that antibiotics are overprescribed for many respiratory infections, and this is contributing to growing antibiotic resistance in many of our communities. We’re putting patients and families at risk when we over-prescribe antibiotics. Each time you’re faced with the choice, you’ll now have options that make our communities’ future safer, so we have antibiotics that still work when we really need them.

With your own eyes, you’ve seen how medical treatments have come a long way in recent decades. New and growing bodies of evidence give us more reassurance that we’re doing the right thing when we choose to avoid or delay initiating antibiotics. Enclosed you’ll find a quick reference guide from Choosing Wisely Canada with tools and information to help you decide if you need to initiate antibiotics in clinical settings. This gives you options to help ensure reduce the medication and side effect burden for your patients.

By taking on the challenges to improve their care for patients, family physicians have shown incredible adaptive skills and abilities. We see the evidence in the greater depth and breadth of care you provide every day. Your commitment to assess and improve the quality of care your patients receive can be seen in your daily efforts, and there are resources to support you to achieve that goal.

How can you receive a confidential practice report from Health Quality Ontario to support you in caring for your patients?

As of right now, 3000+ of your peers have signed up to receive MyPractice Primary Care reports. If you’re a non-salaried family physician, visit this website to sign up and see what indicators are currently available for your practice.

Use this link or scan the barcode with your smartphone:
www.hqontario.ca/pr-sign-up

Thanks for all you do to keep improving the care you provide for your patients! Each step you take in our shared fight against antimicrobial resistance helps to improve outcomes for our patients and communities.

Sincerely,

Dr. Gary Garber MD FRCPC
Chief, Infection Prevention and Control
Public Health Ontario

Dr. Asad Razzaghi, MD CCFP
Family Physician
Chair, OMA Section on General and Family Practice

The data for this letter is derived from IQVIA Xponent™. If you have questions about this letter or wish to opt-out of future letters please email the Public Health Ontario antimicrobial stewardship team: asd@oahpp.ca
How can you optimize antibiotic prescribing for acute uncomplicated respiratory infections?

Here's some helpful tips endorsed by Choosing Wisely Canada. For more information and resources, visit: choosingwiselycanada.org/antibiotics

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>Criteria for antibiotics in Canadian primary care settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Otitis media in vaccinated children &gt;6 months</td>
<td>Perforated tympanic membrane with purulent discharge or a bulging tympanic membrane with either: - fever ≥39°C OR - moderately or severely ill OR - symptoms lasting &gt; 48 hours</td>
</tr>
<tr>
<td>Pharyngitis</td>
<td>Centor score is ≥ 2 AND throat swab culture (or rapid antigen test if available) confirms presence of Group A Streptococcus. Don't perform throat swabs at all for patients with Centor score ≤ 1, OR if there are symptoms of a viral infection such as rhinorrhea, oral ulcers or hoarseness.</td>
</tr>
<tr>
<td>Sinusitis</td>
<td>Patient has at least 2 of the below PODS symptoms, one of those being O or D AND - Symptoms lasting greater than 7-10 days OR - The symptoms are severe OR - There is no response after a 72 hour trial with nasal corticosteroids. P: Facial Pain/pressure/fullness; O: Nasal Obstruction; D: Purulent/dischcolored nasal or postnasal Discharge; S: Hyposmia/anosmia (Smell)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>Objective evidence on a chest x-ray if available.</td>
</tr>
<tr>
<td>Upper respiratory infection (Common cold)</td>
<td>Not indicated unless there is clear evidence of secondary bacterial infection (see the recommendations for otitis media, pharyngitis, sinusitis, pneumonia).</td>
</tr>
<tr>
<td>Bronchitis/asthma</td>
<td>Not indicated</td>
</tr>
<tr>
<td>Acute exacerbation of Chronic Obstructive Pulmonary Disease</td>
<td>Increase in sputum purulence with either increase in sputum volume and/or increased dyspnea.</td>
</tr>
</tbody>
</table>

How can you optimize antibiotic prescribing durations?

Antibiotics are often prescribed for too long. As you may know, unnecessarily prolonged courses of antibiotics lead to antibiotic related side effects (e.g., diarrhea, allergic reactions) and resistance. The majority of bacterial infections can be treated with 7 days of antibiotics or less, however more than one third of antibiotic prescriptions by primary care physicians in Ontario are for more than 7 days.

These are the recommended antibiotic durations for treating uncomplicated bacterial infections based on most current evidence for the majority of patients:

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>Recommended duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute sinusitis</td>
<td>5 days</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>5 days</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>5-7 days</td>
</tr>
<tr>
<td>Otitis Media</td>
<td>5 days (10 days in children &lt;2 years)</td>
</tr>
<tr>
<td>Cystitis</td>
<td>3-5 days</td>
</tr>
<tr>
<td>Pyelonephritis</td>
<td>7 days</td>
</tr>
<tr>
<td>Acute exacerbation of Chronic Obstructive Pulmonary Disease</td>
<td>5 days</td>
</tr>
</tbody>
</table>
Primary results from Ontario Audit and Feedback RCT

If all 3,500 MDs received the Duration Letter = \( \downarrow 147,000 \) total, \( \downarrow 84,000 \) prolonged, and \( \downarrow 2,700,000 \) per year

*\( p<0.025 \)
Figure 3. Forest Plot Showing Subgroup Analysis of Duration Letter Arm Compared With Control for the Outcome of Prolonged Antibiotic Duration

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>Relative risk (95% CI)</th>
<th>Favors duration letter</th>
<th>Favors control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female physicians</td>
<td>0.95 (0.89-1.02)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male physicians</td>
<td>0.91 (0.85-0.96)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physicians in rural regions</td>
<td>0.96 (0.82-1.12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physicians in urban regions</td>
<td>0.92 (0.87-0.96)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High baseline prescribing level (&lt;90%)</td>
<td>0.94 (0.89-0.99)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very high baseline prescribing level (≥90%)</td>
<td>0.91 (0.84-0.97)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;11 y Since medical graduation</td>
<td>1.25 (0.98-1.59)</td>
<td></td>
<td></td>
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<tr>
<td>11-24 y Since medical graduation</td>
<td>0.92 (0.85-1.01)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥25 y Since medical graduation</td>
<td>0.88 (0.84-0.93)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescribing to female patients &lt;18 y</td>
<td>0.93 (0.83-1.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescribing to male patients &lt;18 y</td>
<td>0.92 (0.82-1.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescribing to female patients 18-64 y</td>
<td>0.90 (0.83-0.97)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescribing to male patients 18-64 y</td>
<td>0.90 (0.83-0.96)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescribing to female patients ≥65 y</td>
<td>0.96 (0.86-1.08)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescribing to male patients ≥65 y</td>
<td>1.03 (0.90-1.18)</td>
<td></td>
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<tr>
<td>All</td>
<td>0.92 (0.88-0.96)</td>
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</tr>
</tbody>
</table>

Error bars indicate 95% CIs.  
\(^a\) \(P = .006\) for interaction.
Antimicrobial Stewardship in Primary Care

- 90% of antibiotic use
- ~25% of antibiotic unnecessary
- ~1/3 too long
- Not a knowledge gap
  - Habit, fear, perceived patient expectations
- Need to use behavioural science tools to drive change
- Audit and Feedback including education on durations can be effective on a population scale
Long Term Care
Long Term Care Residents are Vulnerable to Infection and Antibiotic Associated Harms

• immuno-senescence with aging

• high frequency of comorbidities

• close proximity to other vulnerable individuals

Slide courtesy of Nick Daneman

Nicolle ICHE 2000; Daneman Drugs Aging 2012; Crnich Drugs Aging 2015
Asymptomatic Bacteriuria

Symptom Free Pee... Let it Be!
Asymptomatic Bacteriuria is Common in LTC

Up to 40% of Men

Up to 50% of Women

Up to 100% of catheterized patients

Asymptomatic bacteriuria (ASB) in non-pregnant adults:

- Six prospective trials showing no benefit

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nicolle LE et al, NEJM, 1983</td>
<td>Elderly non-catheterized men</td>
</tr>
<tr>
<td>Boscia et al, JAMA, 1987</td>
<td>Elderly ambulatory women</td>
</tr>
<tr>
<td>Abrutyn et al, Ann Intern Med, 1994</td>
<td>Elderly ambulatory women</td>
</tr>
<tr>
<td>Harding et al, NEJM, 2002</td>
<td>Women with diabetes</td>
</tr>
<tr>
<td>Cai et al, <em>Clin Infect Dis</em>, 2012</td>
<td>Young women with recurrent UTI</td>
</tr>
</tbody>
</table>

Slide c/o Dr. Jerome Leis
What About Mental Status Changes?

Delirium alone is not a sign of UTI.

Antibiotics do not alter delirium scores in patients with bacteriuria.


Slide courtesy of Brad Langford
The Urine-culturing Cascade: Variation in Nursing Home Urine Culturing and Association With Antibiotic Use and *Clostridioides difficile* Infection

Kevin Antoine Brown,1,2,3,4 Nick Daneman,1,2,5 Kevin L. Schwartz,1,2,4,6 Bradley Langford,1 Allison McGeer,3,7 Jacquelynn Quirk,1 Christina Diong,2 and Gary Garber1,8
When to Send a Urine Culture

• Dysuria

OR

Two or more of:

• Fever

• New flank pain or suprapubic pain/tenderness

• New or increased frequency

• Gross hematuria
Virtual learning collaboratives reduce urine culturing and antibiotic prescribing in long-term care

Target

Unnecessary antibiotic use in long-term care. A focus on best practices to assess and manage urinary tract infections (UTIs). Targeting unnecessary urine culturing that can drive antibiotic overprescribing.

Intervention

Virtual learning collaborative sessions with 45 long-term care homes to support implementation of Public Health Ontario’s UTI Program.

Impact

Compared to 127 matched controls

Rates of urine cultures performed 19% lower

Rates of antibiotic prescriptions 13% lower

No signs of under treatment of UTIs (mortality, acute care admissions)

Population-Wide Peer Comparison Audit and Feedback to Reduce Antibiotic Initiation and Duration in Long-Term Care Facilities with Embedded Randomized Controlled Trial

Nick Daneman,1,2,3,4,5 Samantha M. Lee,3 Heming Bai,6 Chaim M. Bell,3,4,5,7 Susan E. Bronskill,1,3,4,5,8 Michael A. Campitelli,3 Gail Dobell,6 Longdi Fu,3 Gary Garber,2,9 Noah Ivers,3,5,8 Jonathan M.C. Lam,6 Bradley J. Langford,2 Celia Laur,8 Andrew Morris,5,7 Cara Mulhall,6 Ruxandra Pinto,1 Farah E. Saxena,3 Kevin L. Schwartz,2,3 and Kevin A. Brown2,3
Antimicrobial Stewardship in LTC

- Unnecessary urine culturing drives unnecessary antibiotic use for asymptomatic bacteriuria
- Learning collaborative intervention can improve urine cultures and antibiotic use
- Audit and Feedback to the physicians effective at reducing prolonged durations
- Essential to include nursing/PSWs
For More Information About This Presentation, Contact:
Kevin.schwartz@oahpp.ca
@DrKevinSchwartz

Questions?

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