
Defining Exposures and Outcomes: Outpatient Considerations

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SHEA Antimicrobial Stewardship Research Workshop

Jeffrey A. Linder, MD, MPH, FACP

Division of General Internal Medicine and Primary Care
Associate Professor of Medicine, Harvard Medical School
Associate Physician, Brigham and Women's Hospital
Partners HealthCare

jlinder@partners.org

@jeffreylinder



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PARTNERS.





Outline

- Defining your goal and specific aim(s)
- Exposures
- Outcomes
 - Antibiotic use
 - Others
- Unintended consequences



Outpatient Antibiotic Prescribing Research

- Antibiotics = Antimicrobials
- “Appropriateness” = Stewardship
- ID (81% of you) vs primary care vs specialty



Outpatient Antibiotic Prescribing Research

- ***Per year in the US***

- 35 million hospitalizations
- 136 million ED visits
- 1.1 billion outpatient visits



- **~80% of antibiotic prescribing is outpatient**



Core Elements of Outpatient Antibiotic Stewardship

Guillermo V. Sanchez, MPH, MSHS¹

Katherine E. Fleming-Dutra, MD¹

Rebecca M. Roberts, MS¹

Lauri A. Hicks, DO¹

¹*Division of Healthcare Quality Promotion, CDC*

1. Commitment
2. Action for policy and practice
- 3. *Tracking and reporting***
4. Education and expertise



Specific Aims and Goals

- What are you hoping to accomplish?
- What is your target?
- What is your goal?
- How?
- Example specific aim:
 - “To implement and evaluate a commitment poster intervention to decrease inappropriate antibiotic prescribing for acute respiratory infections”

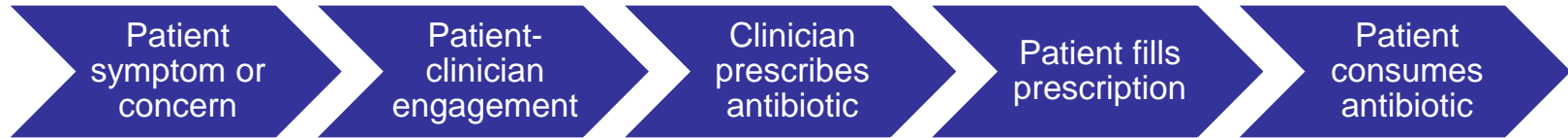


Exposures

- Intervention(s)
- Time



Outpatient Measures of Antibiotic Use



- **Prescription:** EHR, patient report
- **Fill:** claims, pharmacy, patient report
- **Consumption:** patient report, pill counts, monitoring, testing

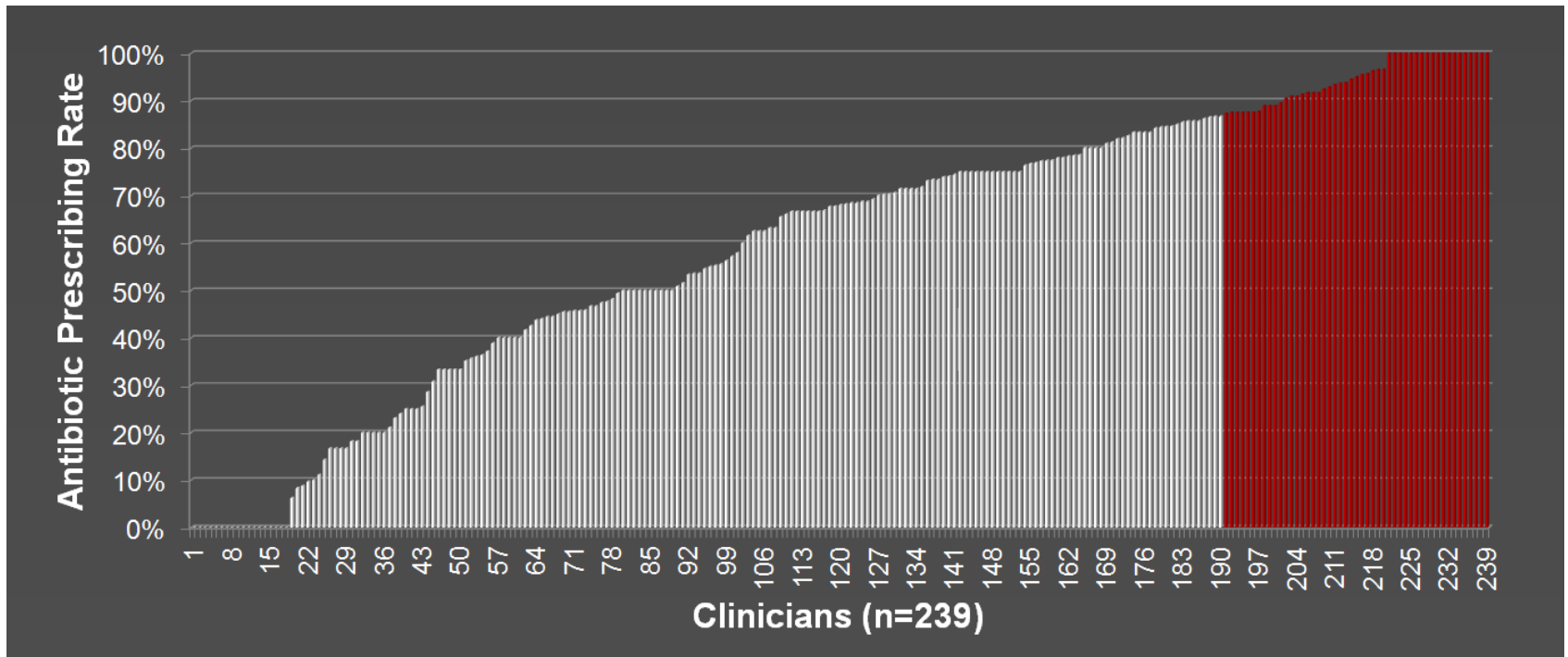


Some Measures of Antibiotic Use

- Inappropriate
- Guideline concordant
- “Comprehensive management”
- “Imperfect antibiotic prescribing”
- Volume
- Prescriptions per unit time: especially for chronic conditions
- % prescribing by individuals/variability



Antibiotic Prescribing Variability



- Eliminate top 20% prescribers by rate: 64% → 50%
- Eliminate top 20% prescribers by volume: 64% → 40%



Stratifying antibiotic prescriptions

- Broader or narrower-spectrum
- Class
- Duration
- ***These can be outcomes as well***



Inappropriate Antibiotic Prescriptions

- ***Inclusion criteria***
 - Patients: attribution
 - Prescriber
 - Time
 - Visit characteristics: diagnosis, site of care
- ***Exclusion criteria***
 - Patients: comorbidities
 - Visit: concomitant infections



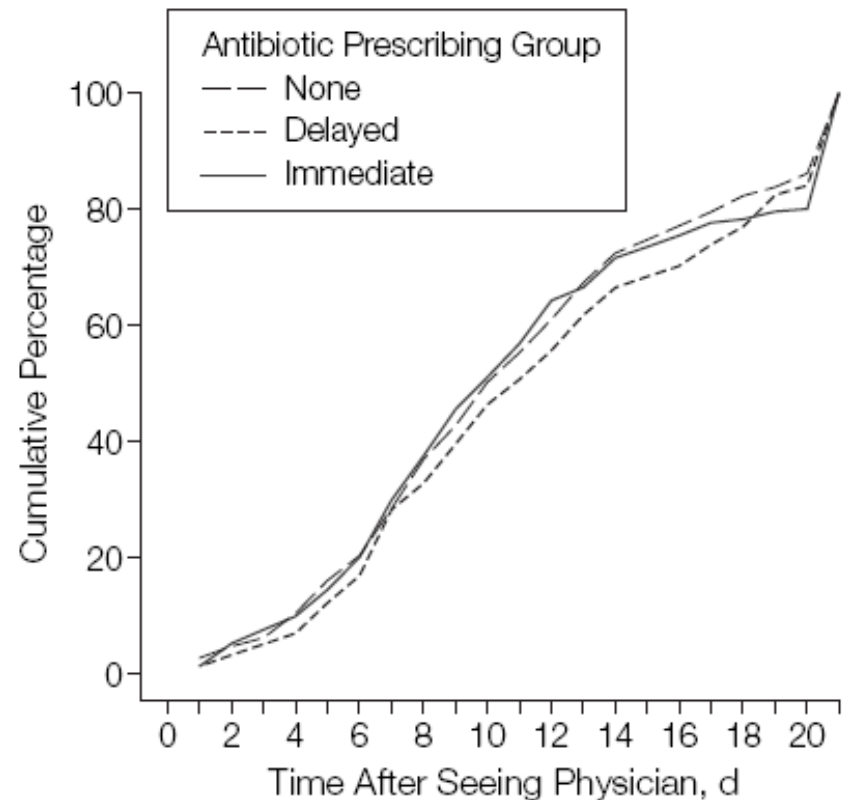
Delayed Antibiotic Prescriptions

- Acute cough/acute bronchitis
 - N = 562
 - Antibiotic use
 - No 16%
 - Delayed 20%
 - Immediate 96%

- **Symptom measures**

Little. JAMA 2005

Figure 2. Duration of Cough After Physician Visit Until Patient Is Feeling Better



Delayed Antibiotic Prescribing

Original Investigation

Prescription Strategies in Acute Uncomplicated Respiratory Infections A Randomized Clinical Trial

Mariam de la Poza Abad, MD; Gemma Mas Dalmau, MD; Mikel Moreno Bakedano, MD, PhD; Ana Isabel González González, MD; Yolanda Canellas Criado, MD; Silvia Hernández Anadón, MD, PhD; Rafael Rotaeché del Campo, MD; Pere Torán Monserrat, MD; Antonio Negrete Palma, MD; Laura Muñoz Ortiz, MD; Eulàlia Borrell Thió, MD; Carl Llor, MD, PhD; Paul Little, MD; Pablo Alonso-Coello, MD, PhD; for the Delayed Antibiotic Prescription (DAP) Group

- ***398 patients randomized***
 - No antibiotics
 - Collection
 - Patient-led
 - Immediate



Delayed Antibiotic Prescribing

	Randomized Groups			
	No abx	Collection	Patient-led	Immediate
Severe symptoms, days	4.7	4.0	5.1	3.6
Health status on follow-up, 0 to 100	95	91	95	95
	%			
Antibiotic collected	NA	26	35	89
Antibiotic use	12	23	33	91
Need for unscheduled health care	6	4	6	4
Absenteeism	40	21	26	33
Belief that antibiotics had no or little effect	20	16	19	8
Will return for similar illness in the future	70	69	69	86
Satisfaction	← No difference →			

de la Poza Abad. JAMA Intern Med 2016



Outcomes: Adverse events

- Adverse drug events: perhaps as a measure of avoiding harm
- Drug-drug interactions
 - Potential drug-drug interactions



Outcomes: Others

- **Utilization:** primary care, specialty, ED, hospitalizations, other sites
- **Microbiology**
 - *Clostridium difficile* infection
 - Infections with antibiotic-resistant organisms
 - Community antibiotic resistance rates
- **Costs**



Covariates to Consider

- Site of care
- Prescriber
 - Trainee status
 - Clinician type
 - PCP or not



Diagnosis	Pre	Post
	%	
Non-specific upper respiratory infections	60	80
Acute bronchitis	60	80
Non-streptococcal pharyngitis	60	80



Diagnosis	Pre (n = 90)	Post (n= 30)
	N (%)	
Non-specific upper respiratory infections	18/30 (60)	8/10 (80)
Acute bronchitis	18/30 (60)	8/10 (80)
Non-streptococcal pharyngitis	18/30 (60)	8/10 (80)
Antibiotic Prescribing	54/90 (60)	24/30 (80)



Diagnosis	Pre (n = 180)	Post (n= 180)
	N (%)	
Non-specific upper respiratory infections	18/30 (60)	8/10 (80)
Acute bronchitis	18/30 (60)	8/10 (80)
Non-streptococcal pharyngitis	18/30 (60)	8/10 (80)
<i>Subtotal</i>	<i>54/90 (60)</i>	<i>24/30 (80)</i>



Gaming

- ***% prescribing does not tell the whole story***
- Diagnosis-specific antibiotic prescribing
- Diagnosis group-specific antibiotic prescribing
- All antibiotic prescribing

- Visit shifting, site-of-care shifting



Clustering

- Intervention
- Antibiotic prescriptions
- ***Level of potential clustering***
 - Patient: shows up more than once
 - Physician: moves between practices
 - Clinic
 - System



Impact of a 16-Community Trial to Promote Judicious Antibiotic Use in Massachusetts

Jonathan A. Finkelstein, MD, MPH^{a,b}, Susan S. Huang, MD, MPH^{a,c}, Ken Kleinman, ScD^a, Sheryl L. Rifas-Shiman, MPH^a, Christopher J. Stille, MD, MPH^d, James Daniel, MPH^e, Nancy Schiff, MPH^f, Ron Steingard, MD^g, Stephen B. Soumerai, ScD^a, Dennis Ross-Degnan, ScD^a, Donald Goldmann, MD^h, Richard Platt, MD^a

- **Practices:** guideline dissemination, small-group education, updates, feedback
- **Parents:** education by mail, PC, child care...
- **Outcome:** abx dispensed per person year, 3 to <72 mo, 4 participating insurers



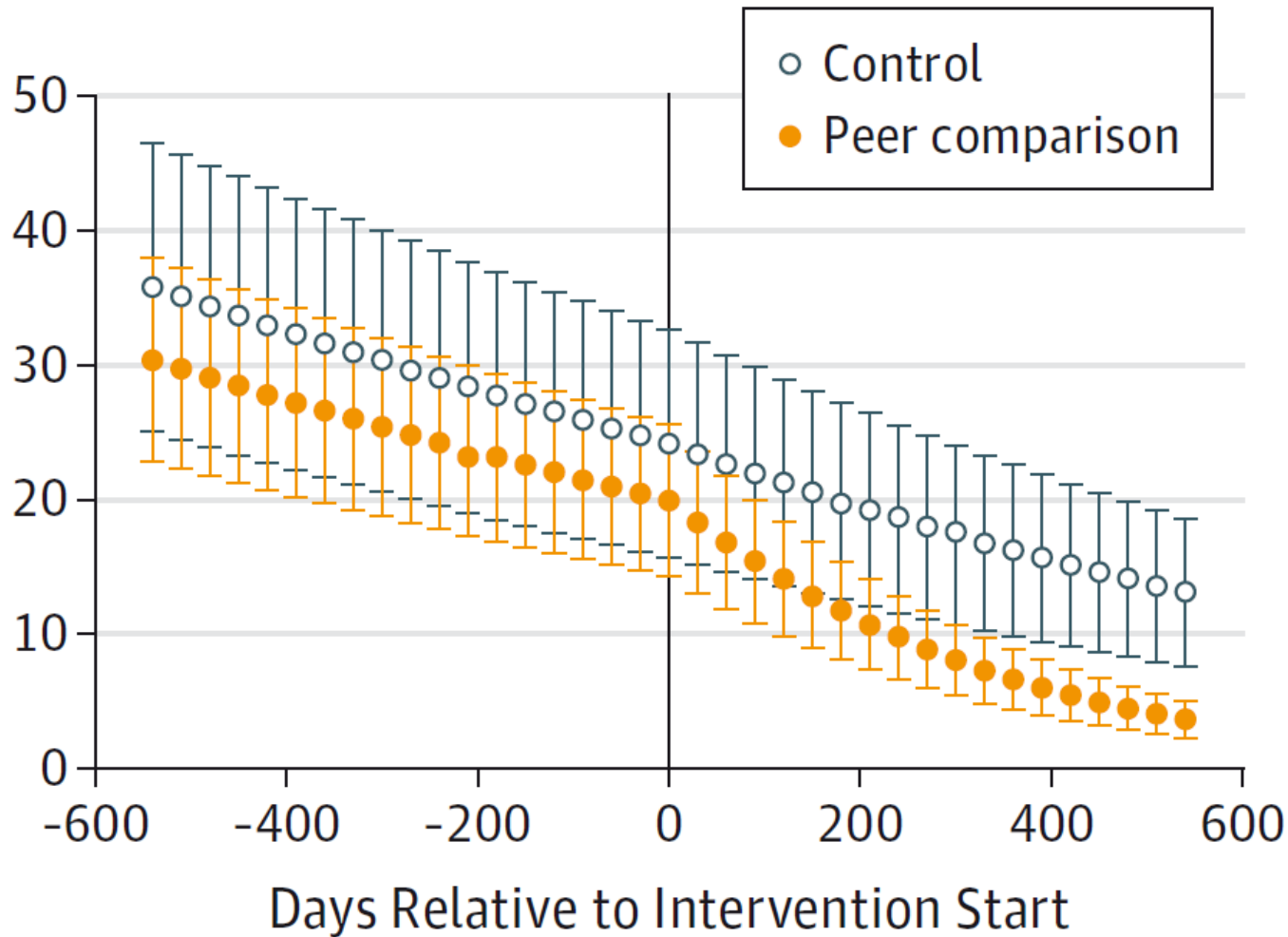
Parameter	Control		Intervention		Intervention Impact ^c	P
	Unadjusted Rate, Baseline Year 1 ^a	Adjusted % Change ^b	Unadjusted Rate, Baseline Year 1 ^a	Adjusted % Change ^b		
Overall						
3 to <24 mo	2.8	−20.7	2.9	−21.2	−0.5	.69
24 to <48 mo	1.7	−10.3	1.7	−14.5	−4.2	<.01
48 to <72 mo	1.4	−2.5	1.4	−9.3	−6.7	<.0001

- More pronounced in Medicaid patients
- Decreased 2nd-line penicillins, macrolides

Finkelstein Pediatr 2008



Main Results: Peer Comparison



-5% $p = <.001$

Take Home Points

- Defining your goal and specific aim(s)
- Exposures
- Outcomes
 - Antibiotic use
 - Others
- Unintended consequences
 - Gaming



Thank You

Questions? Conversation?

jlinder@partners.org

@jeffreylinder



Delayed Antibiotic Prescriptions

- **Why Not?** (*Linder and Friedberg, JAMA Intern Med 2016*)
 1. Guidelines are clear
 2. Microbiologically nonsensical
 3. Ignores natural history
 - Sore throat 5 d, colds 2 wks, cough 3 wks
 4. Abdication of decision-making
 5. Mixed message

