Long-term Care Syndromic Antimicrobial Stewardship Session #3

Focused Initiatives for

Upper and Lower Respiratory Infections and Immunizations

Kellie Wark, MD, MPH | August 17, 2023 click here to view recording

Kansas Department of Health and Environment
Division of Public Health

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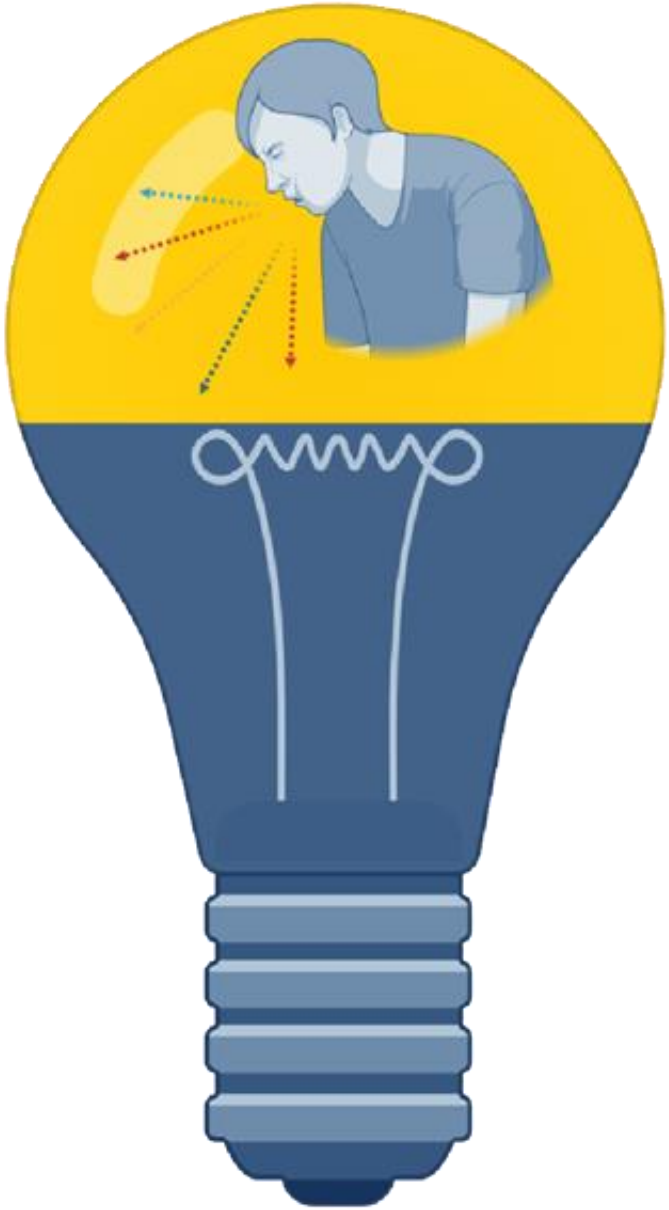


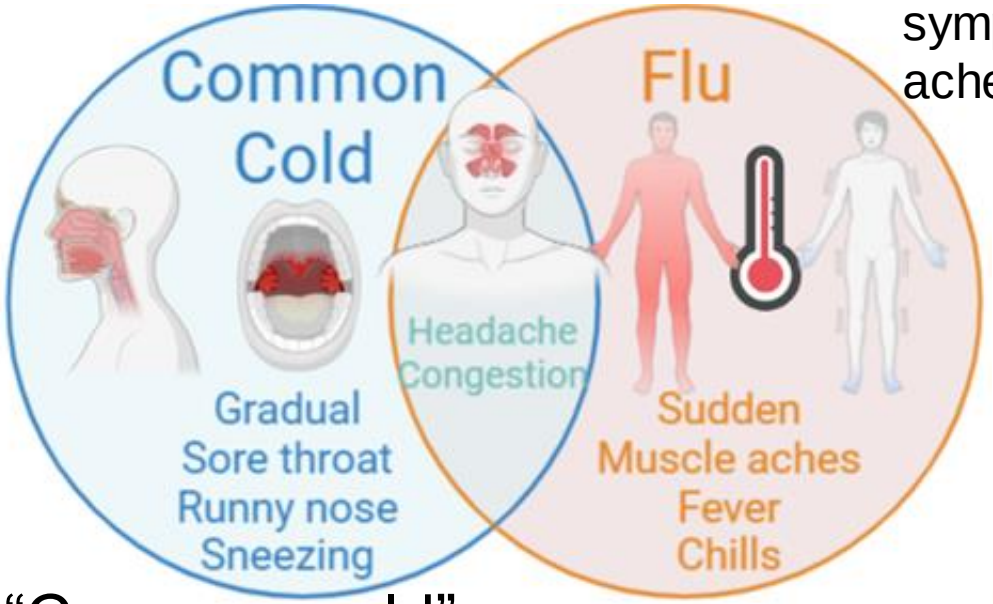
Objectives

- Evaluate the epidemiology and background of upper and lower respiratory infections
- Develop facility-specific treatment guidelines for bronchitis, sinusitis, otitis media and community acquired pneumonia
- Describe effective communication strategies to reduce antimicrobial use for viral upper respiratory infections
- Compare statewide vaccine preventable disease trends
- Discuss vaccine recommendations in the elderly and long-term care populations
- Identify ways to incorporate vaccines into your stewardship and infection prevention and control programs

Terminology

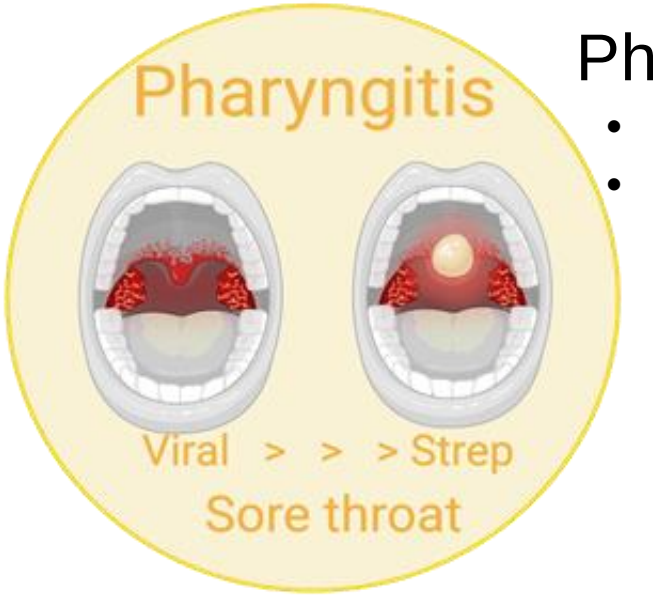
Influenza

- i.e., flu
- Mostly systemic symptoms (muscle aches, fevers, chills)



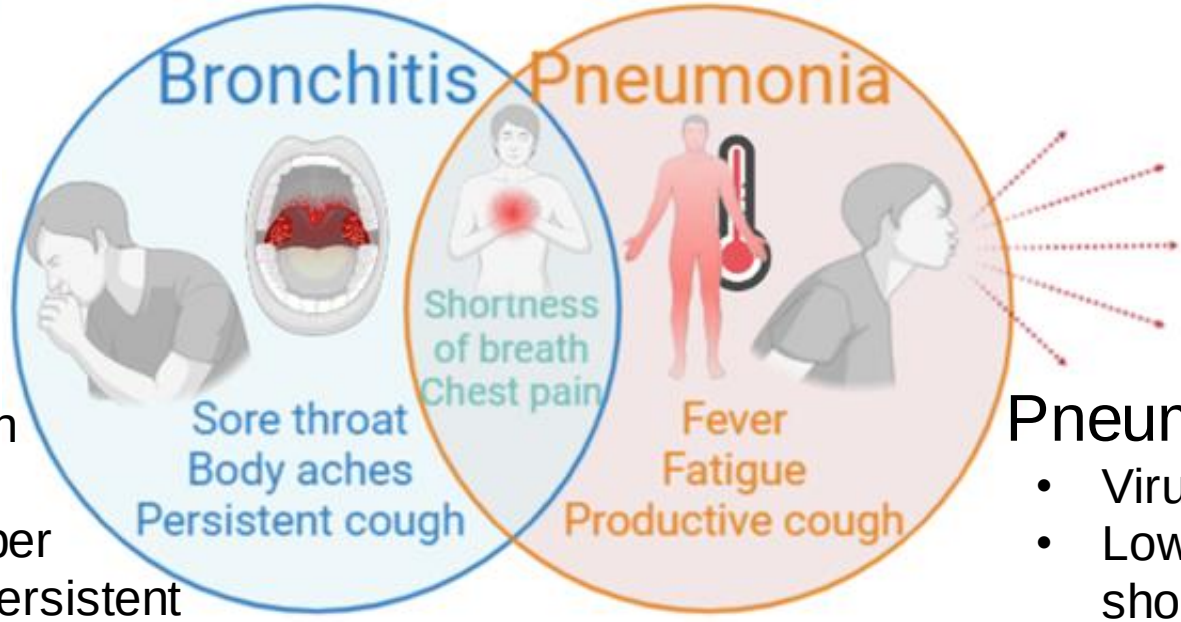
“Common cold”

- i.e., viral upper respiratory infection (URI)
- Mostly sinus/ throat symptoms



Pharyngitis

- i.e., sore throat
- Pharyngeal inflammation, generally not systemic symptoms



Bronchitis

- e.g., cough
- Viruses
- Mostly upper
- airways, persistent
- cough, tracheal irritation

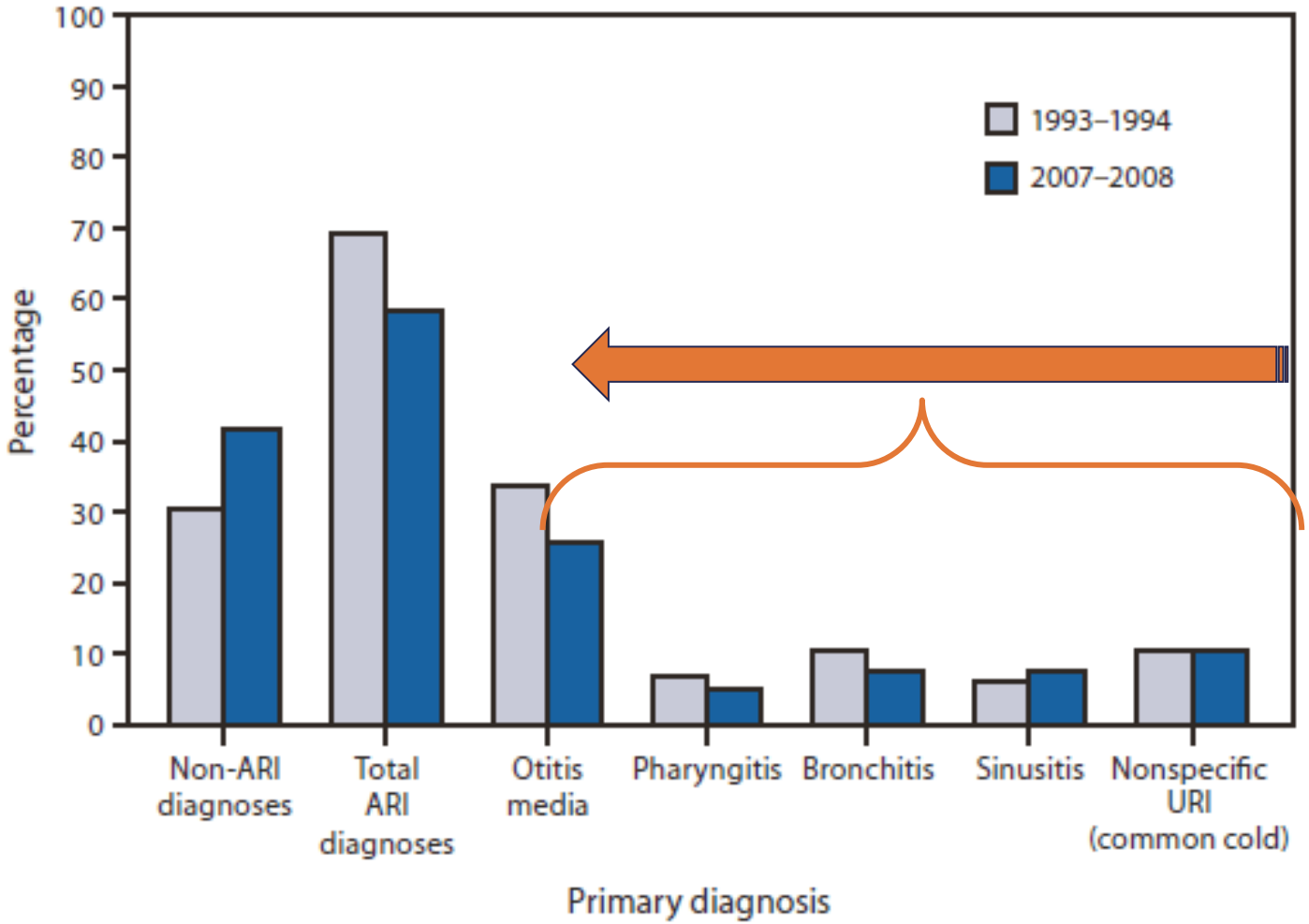
Pneumonia

- Viruses + Bacteria
- Lower airways, shortness of breath, systemic symptoms

Epidemiology

- 50-60% of all antibiotic prescriptions written are for acute upper respiratory infections (ARIs)
- Prescribing is highest for children and adults >65

Average annual percentage of physician office visits by persons aged ≤14 years where an antibiotic was prescribed, by primary diagnosis - National Ambulatory Medical Care Survey, United States, 1993-1994 and 2007-2008

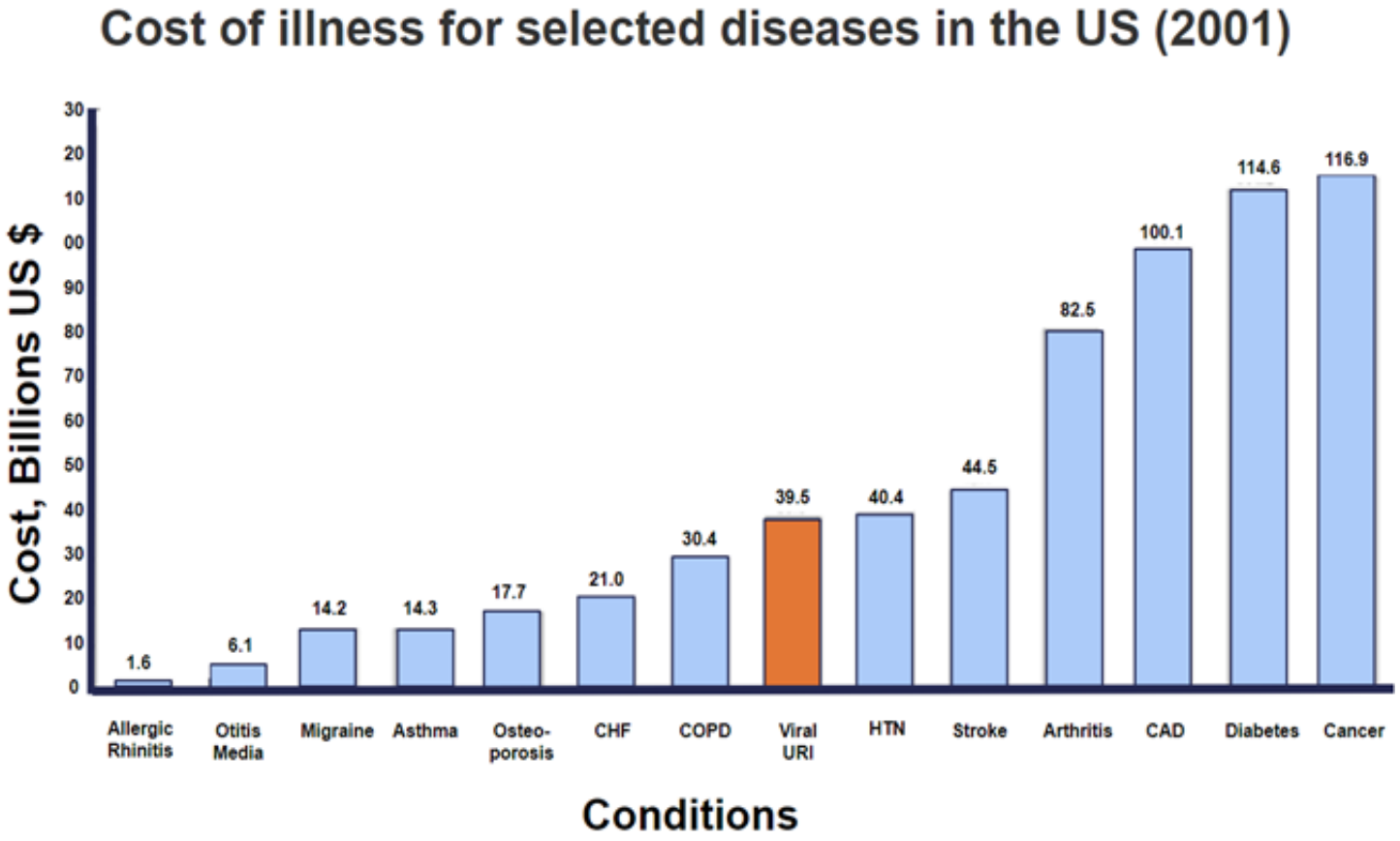


Source: Hicks L, et al. MMWR 2011; 60(34):1153-56. Shapiro D., et al. J Antimicrob Chemo 2014;69:234-40.

Epidemiology

Economic burden of the common cold is greater hypertension, heart failure, chronic obstructive pulmonary disease

- $40 billion annually (2001 USD)
- $2 billion worth of OTC cough and cold meds (1997 USD)



Source: Fendrick A., et al. Arch Intern Med. 2003;163 (4):487-94. Turner R., Ann Allergy Asthma & Imm 1997;78(6): 531-40.

Epidemiology

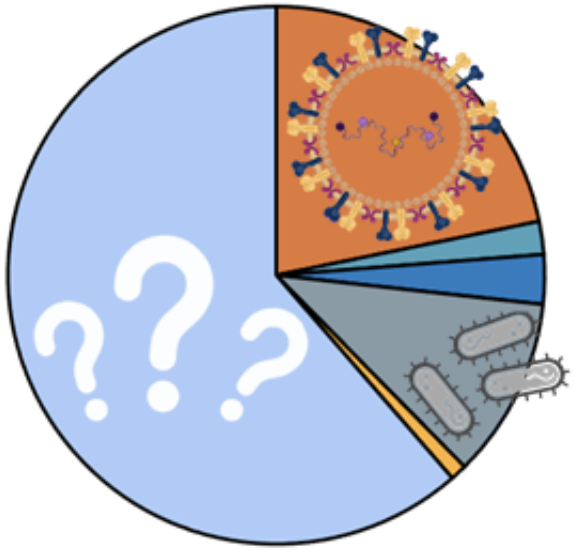
500 million episodes of common colds annually associated with:

- 22.0% office visits (95% CI 20.2%-23.8%)
- 1.2% ED visits (95% CI 0.7% - 1.6%)
- 8.2% Antibiotic Rx (95% CI 7.4%-9.0%)

Virus	Estimated annual proportion of cases
Rhinovirus	30-50%
Coronavirus	10-15%
Influenza viruses	5-15%
Respiratory syncytial virus	5%
Parainfluenza virus	5%
Adenovirus	<5%
Enterovirus	<5%
Metapneumovirus	Unknown
Unknown	20-30%

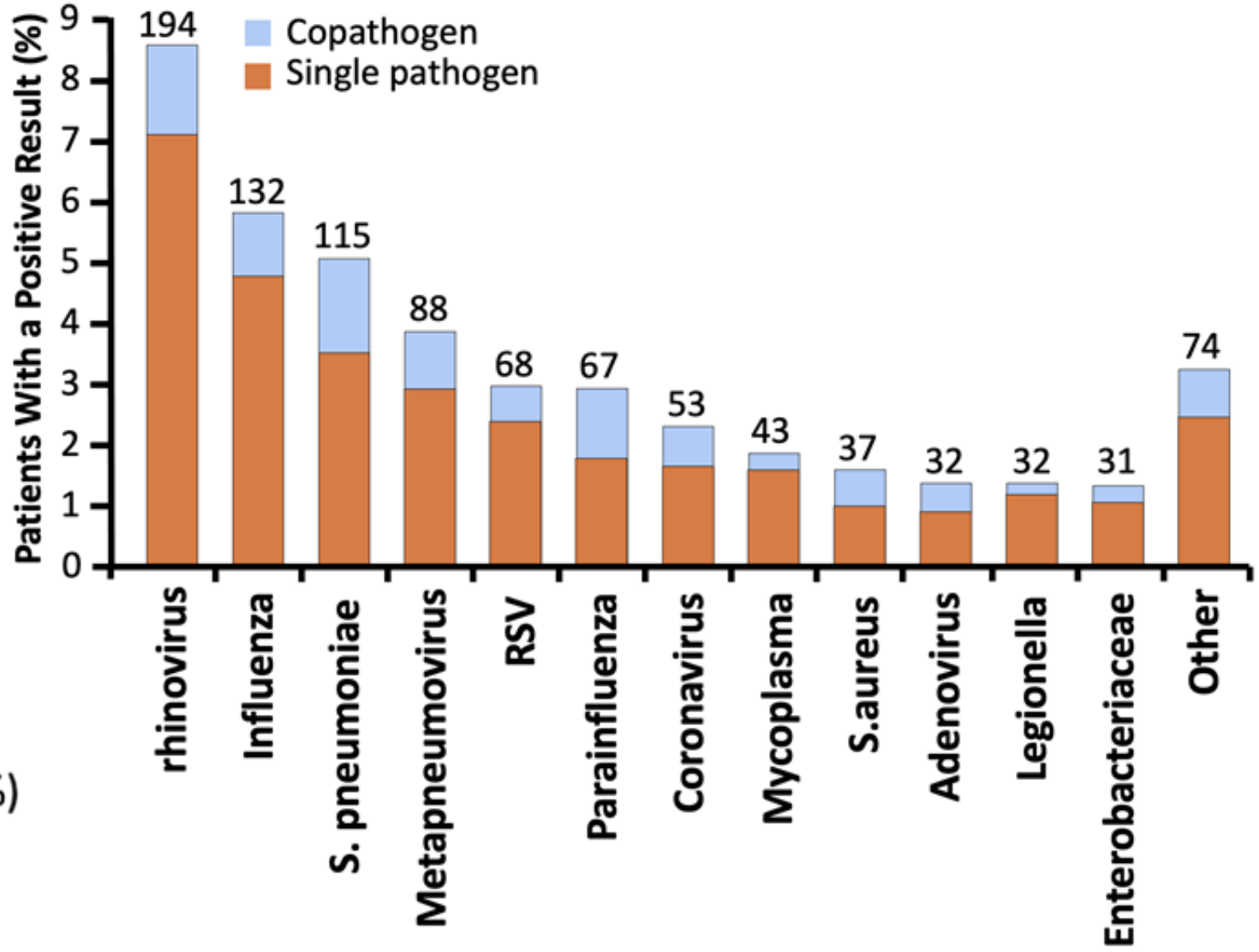
Source: Fendrick A., et al. Arch Intern Med. 2003;163 (4):487-94. Heikkinen G et al. Lancet 2003;361(9351): 51-59.

Epidemiology



- Viral pathogen only (22%)
- Viral–viral detection (2%)
- Bacterial–viral codetection (3%)
- Bacterial pathogen only (11%)
- Fungal or mycobacterial detection (1%)
- No pathogen detected (62%)

Leading causes of Community Acquired Pneumonia Requiring Hospitalization



Source: Jain S., et al. NEJM 2015;373:415.

Guidelines

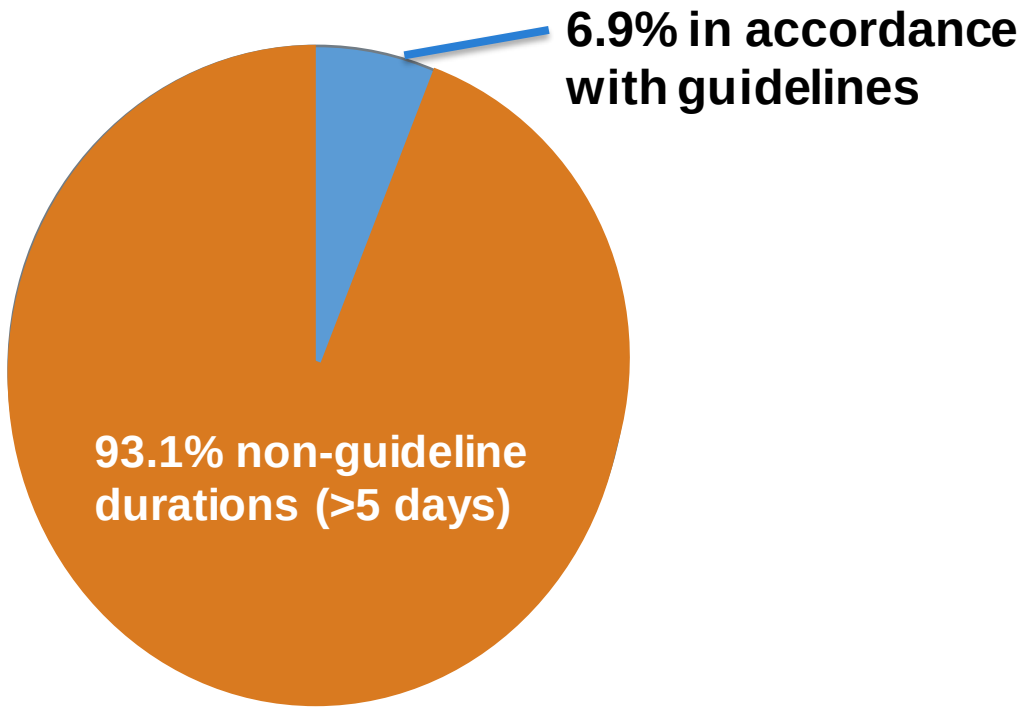
Example Guidelines					
Condition	**Common Pathogens**	**Treatment**			**Duration**
Community Acquired Pneumonia	*S. pneumonia* *H. influenzae* *M. catarrhalis*	No comorbidities	Amox/clav 875 mg PO BID OR Doxycycline	**Penicillin allergic** Cefuroxime mg 500 BID	5 days
	S. pneumonia *H. influenzae* *M. catarrhalis* *S. aureus* *M. pneumoniae* *C. pneumoniae* *Legionella spp* Gram negative rods	Comorbidities (heart, lung, liver, renal disease, diabetes, alcoholism, malignancy, asplenia)	Amox/clav 875 mg BID AND Doxycycline 100 mg BID or Azithro 500 mg x1 -> 250 mg q24	**Penicillin allergic** Cefuroxime mg 500 BID AND doxy or azithro **Penicillin and cephalosporin allergic** Levofloxacin 750 mg q24	

Source: Metlay J., et al. Am J Resp and Crit Care. 2019; 200(7): e45-67

Clinical Practice Guidelines

Community Acquired Pneumonia Durations (Adults)		
Outcome Mild, Mod and Severe CAP	**3 days**	**8 days**
Clinical cure at 10 days	93%	88%
Clinical cure at 28 days	90%	88%
Adverse events	11%	21%

Retrospective review of inpatient CAP treatment duration

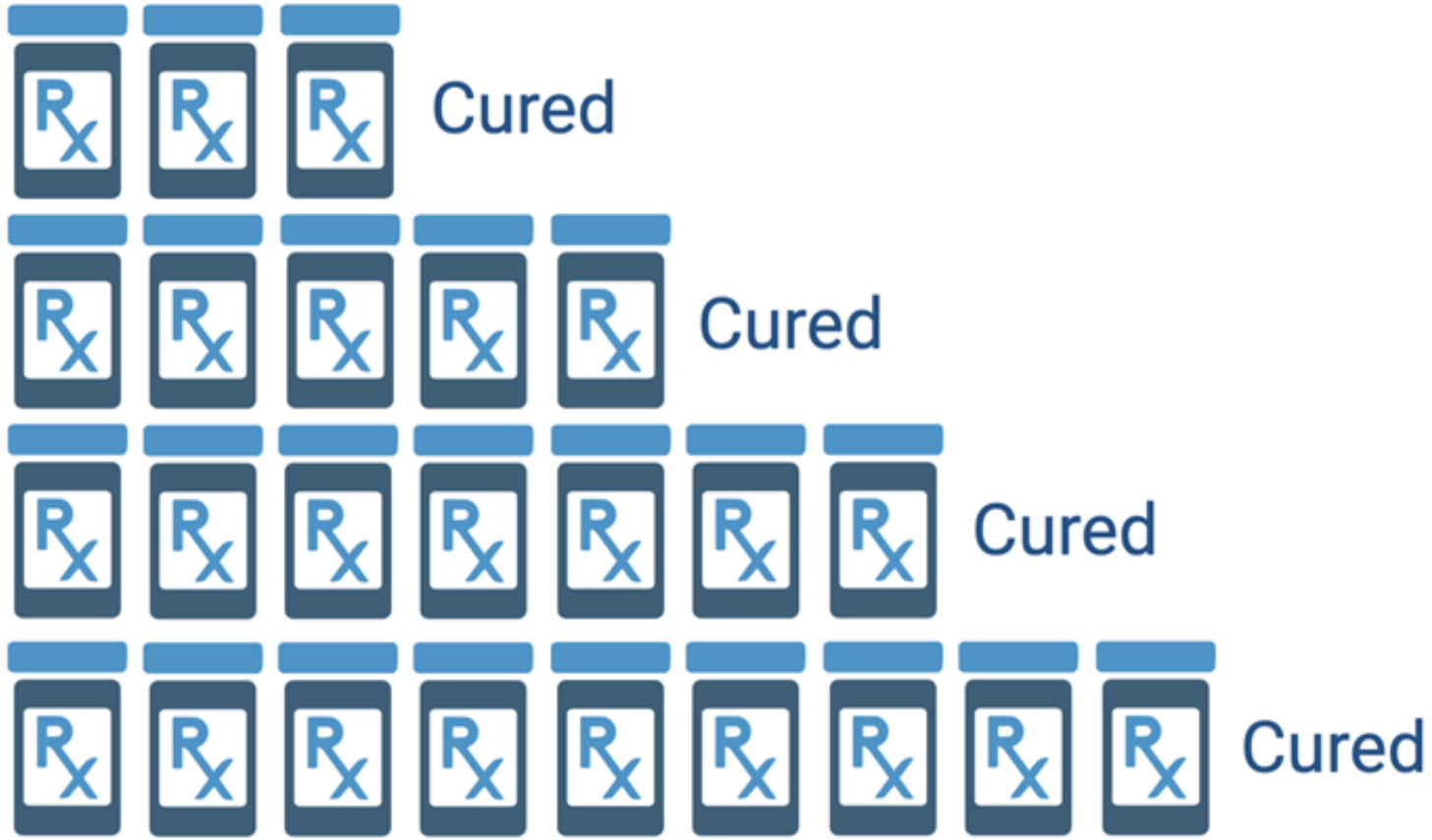


Sources: Stevens D, et al CID; 2014; 59:e10. Moussaoui R, et al BMJ 2006;332:1355. Jenkins T., et al Infect Control Hosp Epidemiol 2014;35(10).

Shorter is Better: Pneumonia

Adults + Pediatrics

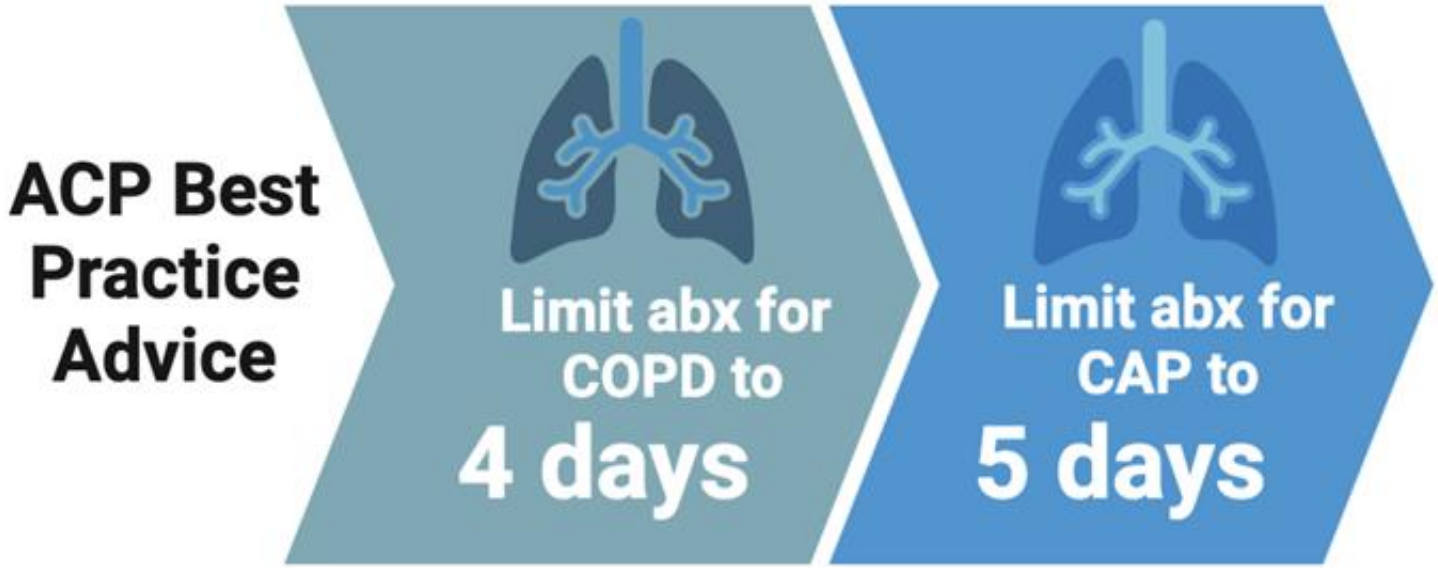
- 14 randomized controlled trials of >8,000 patients
- Three or 5 days antibiotics non-inferior to 5 to 14 days for treatment of pneumonia



Source: Wunderink R et al. NEJM; 2014; 370: 543-51
Wald-Dickler N & Spellberg B. CID 2019;69:1476
el Moussaoui R, et al. BMJ 2006;332:1355
Dinh A, et al. CID 2018;66:1981

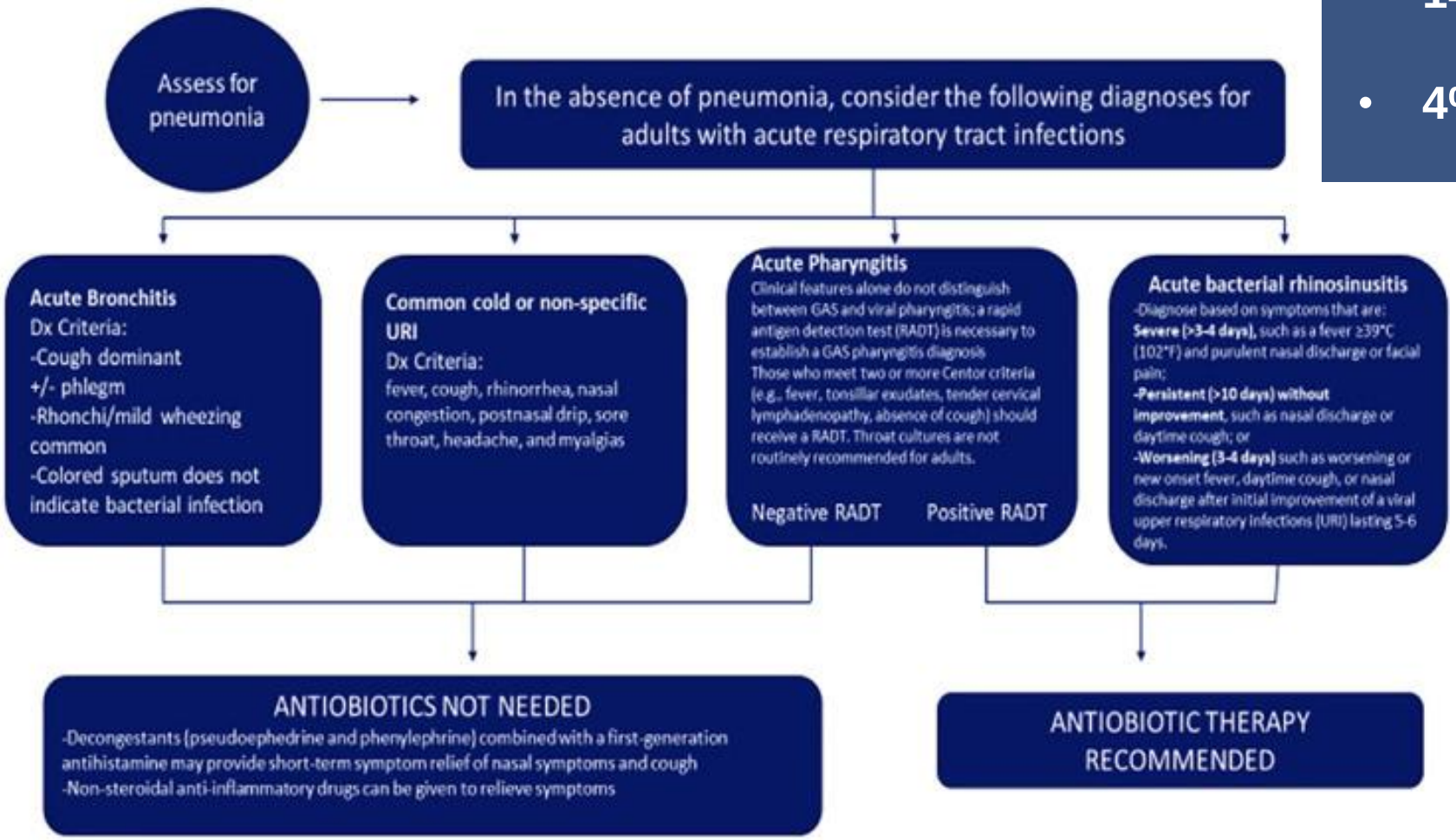
Clinical Guideline

Appropriate Use of Short-Course Antibiotics in Common Infections: Best Practice Advice From the American College of Physicians



Source: Lee R., et al. Annals of Int Med. 2021; 174(6): 822-27.

Clinical Practice Guidelines



Antibiotic Use

- **10% decreased abx URI** (33.3% to 22.9%)
- **14% decrease nasopharyngitis** (14.3% to 0%)
- **4% acute bronchitis** (40% to 36.1%)

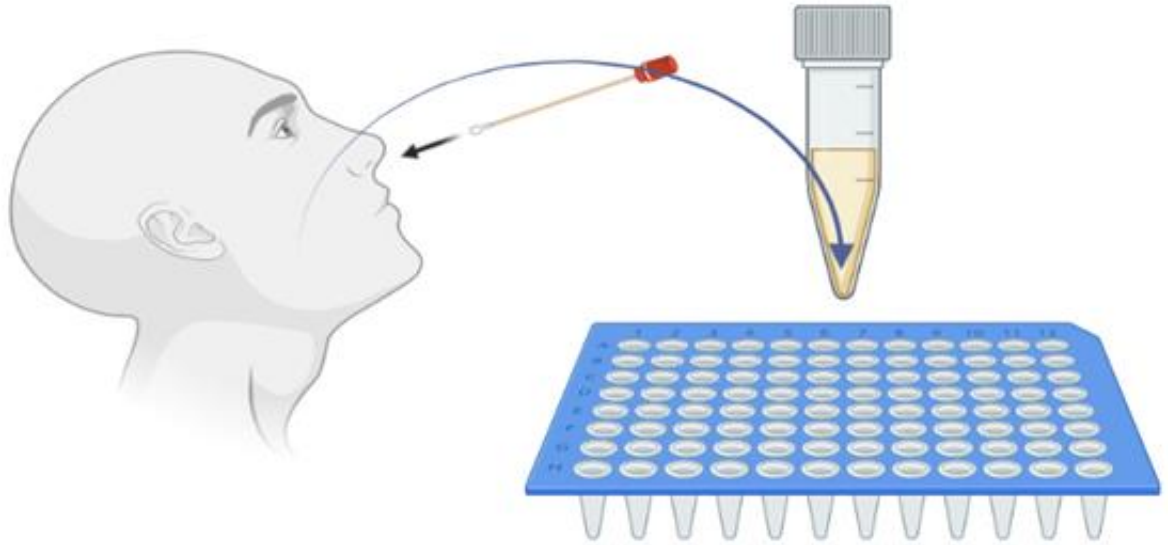
- URI management protocol
- Educational emails detailing project
- Laminated protocols distributed during educational meetings

Source: Aplin-Snider C., et al. J Prim Care Comm Health 2020;11:2150132720966811.

Diagnostics

- Rapid diagnostics have the potential to
  - Reduce unnecessary antibiotics
  - Improve antiviral prescribing
  - Limit additional imaging
  - Shorten hospital or ED lengths of stay
  - Optimize infection-control practices

- May be associated with
  - Higher costs
  - Over-diagnosis



Source: Hansen K., et al. CID 2020; 2744-51.

Respiratory Diagnostic Stewardship

Question 1: To Test or Not to Test

- Severity of illness
- Duration of symptoms
- Availability of other studies
- Turnaround time of results
- Test results change management

- American Society for Clinical Pathology recommends **against** broad respiratory viral PCR panels and instead use specific rapid molecular tests that impact management (e.g. flu, RSV)

Question 2: If I Test, Which is Best

- CDC and IDSA both favor molecular (PCR) testing for flu instead of antigen testing
- Multiplex viral and bacteria PCRs for immunocompromised and critically ill
  - Consider prolonged shedding
  - Specimen source (e.g., lower respiratory tract RSV vs nasal swab)

Method	Test Time
Rapid molecular (flu RNA or NAAT)	15-30 min
RT-PCR (singleplex and multiplex)	1-8 hours
Rapid influenza (antigen)	<15 min
Immunofluorescence direct (DFA) or indirect fluorescent antibody (IFA)	1-4 hours

Source: Hansen K., et al. CID 2020; 2744-51. Am Soc Clin Path Choosing Wisely, choosingwisely.org/societies/american-society-for-clinical-pathology/

Respiratory Diagnostic Stewardship

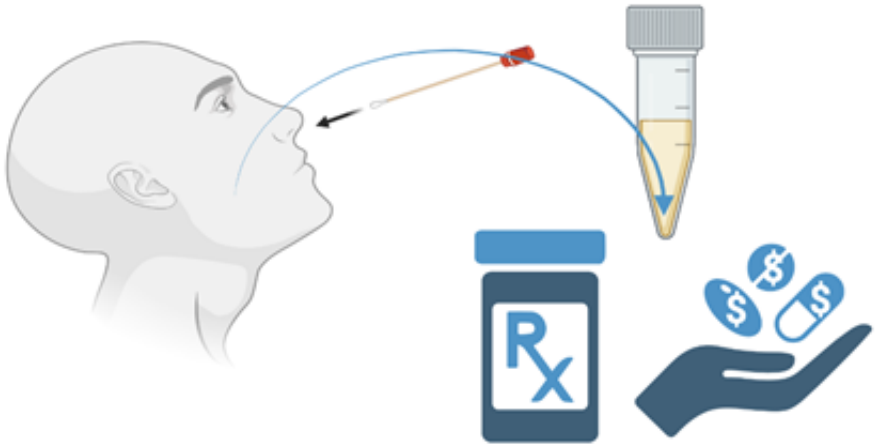
Question 3: What is the Significance of Bacterial DNA

- Potential detection of dead, colonization or metabolically impaired organisms of unclear clinical significance
- Semi-quantitative PCRs may be helpful
- Concern that over-detection may paradoxically increase abx

Antibiotic Use

Cochrane review - 3 trials of rapid viral diagnostics

- **Little or no effect on antibiotic prescribing** (RR 0.86, 95% CI 0.61 - 1.22)
- **No difference on repeat visit** (RR 0.86, 95% CI 0.59 - 1.25)

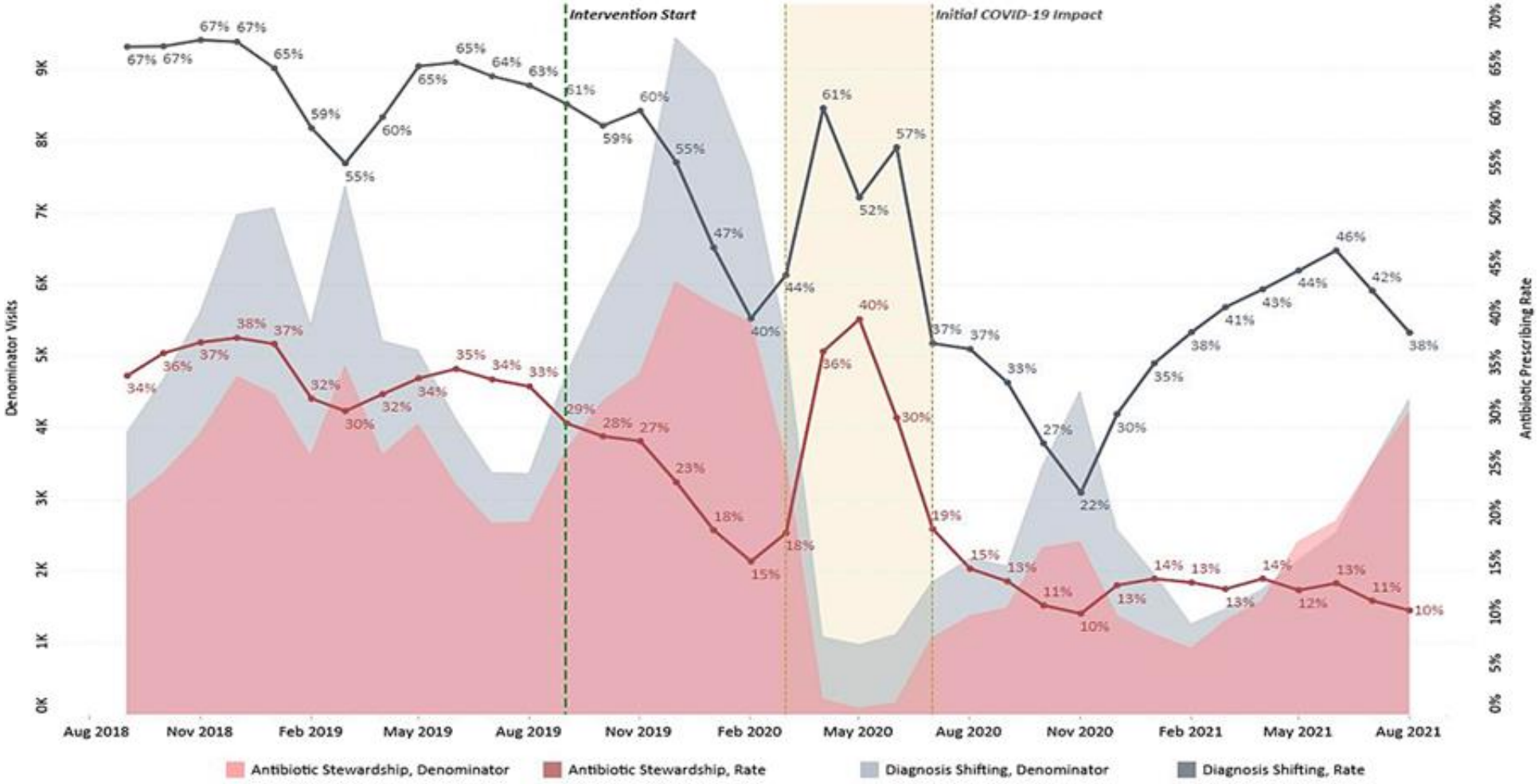


Source: Hansen K., et al. CID 2020; 2744-51. Tonkin-Crine S., et al. Cochrane Syst Rev 2017;9(9):cd012252.

Audit and Feedback: Harness Local Champions

Antibiotic Use

- **22% reduction antibiotics** (34% 2019 to 12% 2021)
- **6% increase in patient satisfaction** (83%->89%)



- 17 urgent care clinics
- Clinician and patient education
- Reports with individual, regional Rx
- Shared leadership through regional and quality committee meetings
- Regional medical directors reviewed report with individual prescribers annually, discussed barriers and opportunities

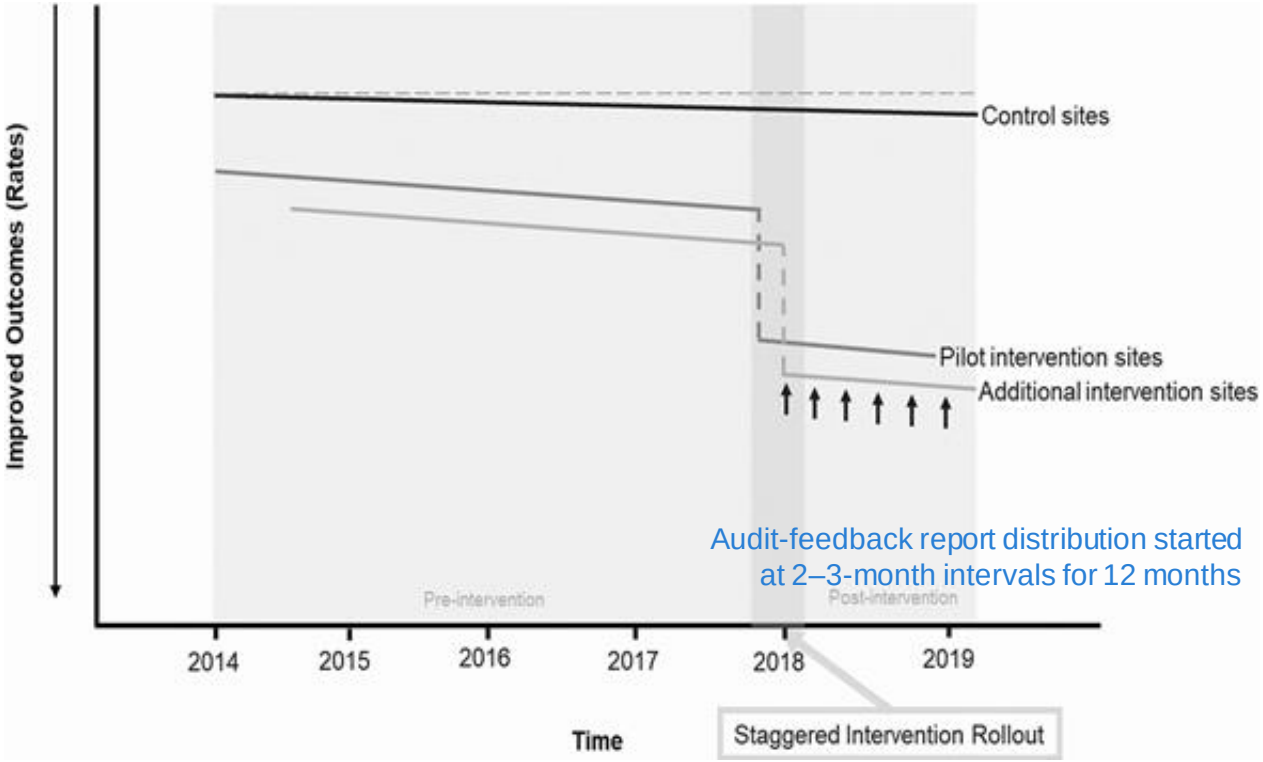
Source: Patel D., et al. ICHE 2022; 1-10

Audit and Feedback: Harness Peers

- ED + outpatient (VA)
- Site champions recruited to promote and participate
  - Peer-to-peer communication and strategies with vignettes, reinforcement techniques
  - Reports every 2-3 months “throughout ARI season”
  - In-person or emailed aggregate antibiotic, abx by total ARI diagnosed, proportions of acute sinusitis, cases treated appropriately and ARI mgmt compared to top 20% in their groups

Antibiotic Use

- **- 22% abx for bronchitis** (+ 5.9% for control, p>0.001)
- **-7.7% abx for sinusitis** (-1.7% control, p=0.02)
- **1.7-fold increase in appropriate antibiotics** (53.8%->69.1%, OR 1.67, 95% CI 1.31-2.14)



Source: Madaras-Kelly CID 2021; 73(5):e1126-e1134

Audit and Feedback

- Auditing easier with mandatory antibiotic indications in the EMR
- Auditing targets
  - Conditions (e.g., CAP, viral URI)
  - Antibiotics
  - Guideline adherence
  - Duration of therapy
  - Pharmacist-led audit and feedback (inpatient)
  - Frequency

Sample Report LTCF providers: asap.nebraskamed.com/wp-content/uploads/sites/3/2018/08/Annual-ASP-Activity-Report-for-LTCF-Prescribers-081418.docx

Sample Annual Antimicrobial Stewardship Program Report

Highlights of Antimicrobial Stewardship Program (ASP) Initiatives in 20xx

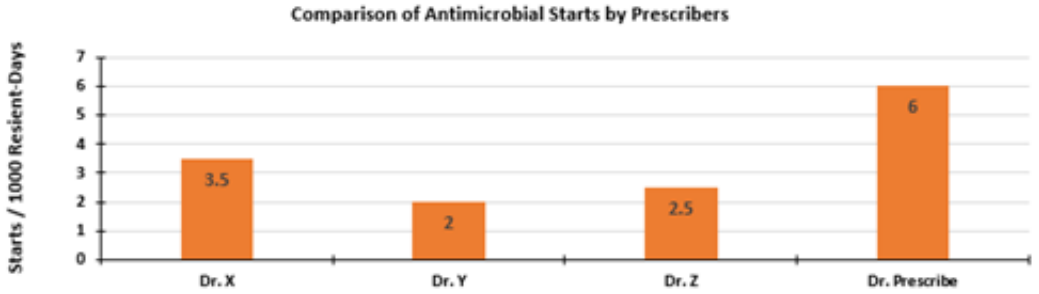
- Implemented use of SBAR tool for suspected UTI *(completed)*
- Revised contract with laboratory to include production of facility-specific antibiogram *(completed)*
- Revised contract with consultant pharmacy to review all antimicrobial use *(completed)*
- Provided mandatory antimicrobial stewardship education to all facility staff *(completed)*
- Successfully surveyed by CMS on IPCP and ASP without receiving an F-tag *(completed)*
- Implementing use of SBAR tool for suspected respiratory tract infections *(ongoing)*
- Collaborating with Nebraska ASAP to further augment ASP *(ongoing)*

Antimicrobial Stewardship Program-Related Outcomes in 20xx

A. *Process Measures: Compliance to Antimicrobial Prescribing Documentations*
   I. Total Number of Antimicrobial Prescribed: 250
   II. Missing ≥1 required elements: 50 (20%)
      a. Dose: 5 (2%)
      b. Duration: 20 (8%)
      c. Indication: 40 (16%)

B. *Antimicrobial Use Measures*
   I. Antimicrobial starts/1000 resident-day is 5% lower compared to 20ww
   II. Antimicrobial days of therapy/1000 resident-day is by 7% lower compared to 20ww
   III. Antimicrobial appropriateness decreased by 10% compared to 20ww

	Antibiotic Starts / 1000 Resident-Day		Days of Therapy / 1000 Resident-Day	
	20xx	20ww	20xx	20ww
All antimicrobials	14.17	14.88	121.68	130.20
Most frequently prescribed antimicrobials				
Levofloxacin	1.96	1.98	32.54	31.00
Ciprofloxacin	1.59	1.57	12.88	12.90
Cephalexin	1.38	1.40	13.62	11.05



Nudging

Commitment Posters

- Accountability when faced with pressure during visit
- 20% reduction in inappropriate abx (5 clinics, 2 RCTs)

English customizable poster: khconline.org/files/POSTER-UseAntibioticsWisely11x17.pdf
Spanish poster: khconline.org/files/POSTER-UseAntibioticsWisely24x36_SPANISH.pdf

Source: Meeker D et al. JAMA 2014;174(3):425-31;
Kufel W., Open Forum Infect Dis 2018;5(suppl 1:S527)

Communication Training

Nurse-clinician communications

- Nurses are the frontline clinicians assessing and caring for residents and are the principal communicators among prescribers, residents and their family members

- Online education: free, 30 min, interactive modules
  - Differentiating UTI from asymptomatic bacteriuria
  - Recognition and evaluation of URIs bronchitis, pneumonia
  - Proper application transmission-based precautions
  - Proper collection for sampling cultures

Source: Wilson B., et al. Am J Inf Control; 2017;45(5): 466-70

Communication Training

Post-education participation

- Greater awareness of their role as abx stewards in the nursing home
- Increased agreement their own knowledge of resident's baseline status, assessment and communication with providers and families influenced whether a resident received abx

Source: Wilson B., et al. Am J Inf Control; 2017;45(5): 466-70

Communication Training

Negative treatment recommendations that "rule out" the need for antibiotics

- "this infection is viral, so antibiotics won't help"
- May increase questions of the treatment plan
- Shift to provider-patient negotiation
- Extends visit length
- Forces providers to re-explain why abx aren't needed

Positive treatment recommendations for symptom relief

- "drink hot tea with a teaspoon of honey to help with the sore throat"
- "use an extra pillow at night to reduce the drainage and resulting cough"

When **combined**, negative treatment recommendations when followed by a positive one resulted in:

- Lowest association with unwarranted prescribing
- Strongest association with satisfaction with the quality of care

Source: Mangione-Smith et al. Ann Fam Med. 2015;13(3).
Mangione-Smith R., et al. Patient Educ and Counseling. 2022; 105(7): 2611-16.

Communication Training

Type of Communication

Communication training (10 peds clinics, 2 years)

- **85% reduction antibiotics Rx when negative followed positive recs** (RR 0.15 CI 0.06-0.4, p<0.01)
- 52% reduction of abx if positive only (RR 0.48, 95% CI 0.24-0.95, p=0.04)
- No difference if negative only (RR 0.18, 95% CI 0.02 - 1.43, p=0.11)

Sustained Effects

Communication training (228 adult + peds clinics, 1 year, randomized with c-reactive protein)

- **Decreased compared to no-intervention but abx Rx with c-reactive protein at 1 year**
- **29% decreased abx Rx, maintained at 1 year** (RR 0.71, 95% CI 0.45-0.99)

Sources: Mangione-Smith et al. Ann Fam Med. 2015;13(3). Little P., et al. Ann Fam Med 2019;17(2):125-32.

Reporting Nudges

Leverage the laboratory to improve antibiotic use

Result text interpretation

- “commensal respiratory flora”
- “normal upper respiratory flora”

How to translate into a **NUDGE**?
Work with micro lab on selective reporting protocol using accepted American Society of Microbiology guidelines.

Take it a step further, if already reporting interpretation, does more specificity help?

- **“commensal flora only” nudged to**
- **“commensal flora only, no S. aureus/MRSA or P. aeruginosa”**

Reporting Nudges

"commensal flora only, no *S. aureus*/MRSA or *P. aeruginosa*"

Musgrove et al, 2018

- **Greater reduction de-escalation or discontinuation** (39% vs 73%, p>0.001)
- **5.5-fold increased odds de-escalation** (aOR 5.5, 95% CI 2.8 to 10.7)
- **Anti-MRSA & anti-pseudomonal antibiotics decreased 7-day median to 5 day**
- **No difference in all-cause mortality** (30% vs 18%, p=0.52), *C. diff*, or ICU LOS
- **Reduced AKI** (31%-> 14%, p=0.03)

McBride et al 2015

2-year inpatient period

- **Total abx decreased** 2.31-> 1.87 (p=0.009)
- **Broad-spectrum abx decreased** 1.94-> 1.44 (p=0.004)
- **Anti-MRSA agents decreased** 0.71-> 0.49 (p=0.008)
- **Anti-pseudomonal decreased** 1.24-> 0.94 (p=0.02)
- **IV antibiotic decreased** 1.51-> 1.16 (p=0.009)

Highlights importance of clear, persuasive communication of diagnostic testing in improving abx prescribing behaviors

Sources: Musgrove M., t al OFID 2018;5(7).
Mcbride J., et al. ORID 2015;2(1).

Delayed Prescribing

- Patient-led (immediate Rx at time of visit with instructions not to till until specified day or symptom)
- Post-visit (instructed will receive abx at specified day if symptoms unimproved)

Adult - ARIs

Immediate abx vs delayed vs no abx (23 clinics tracked 1 year)

- **Patient-led 58% reduced abx use**
- **Delayed Rx associated with 68% reduced abx use**
- **No difference in patient satisfaction**
- **No difference in duration of symptoms**
- **No difference in severity of symptoms**

Sources: Paza Abad M., et al. JAMA Int Med. 2016;176(1):21-9. Cates C., BMJ 1999;318(7185):715-16.

Delayed Prescribing

Meta-analysis of RCTs - delayed prescribing for reducing ARI antibiotics

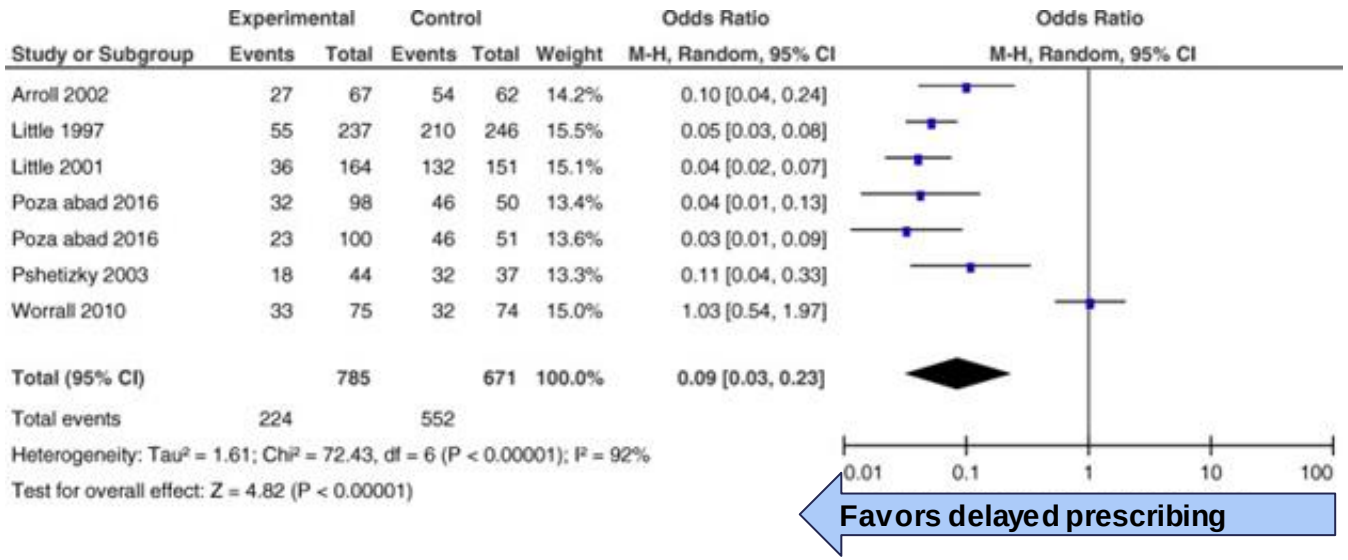
Antibiotic Use

- **Greater odds of not requiring antibiotics for ARIs** (OR=0.09, CI 0.03 to 0.23)
- Subgroup analysis - **no difference when Rx were given at index visit or at a later time**

Secondary Outcomes

No difference in satisfaction (5 studies: 1 UK trial did have statistically significant lower satisfaction, 1 New Zealand trial had higher satisfaction)

No difference in re-consultation (2 studies: non-statistically significant repeat visits in delayed groups)

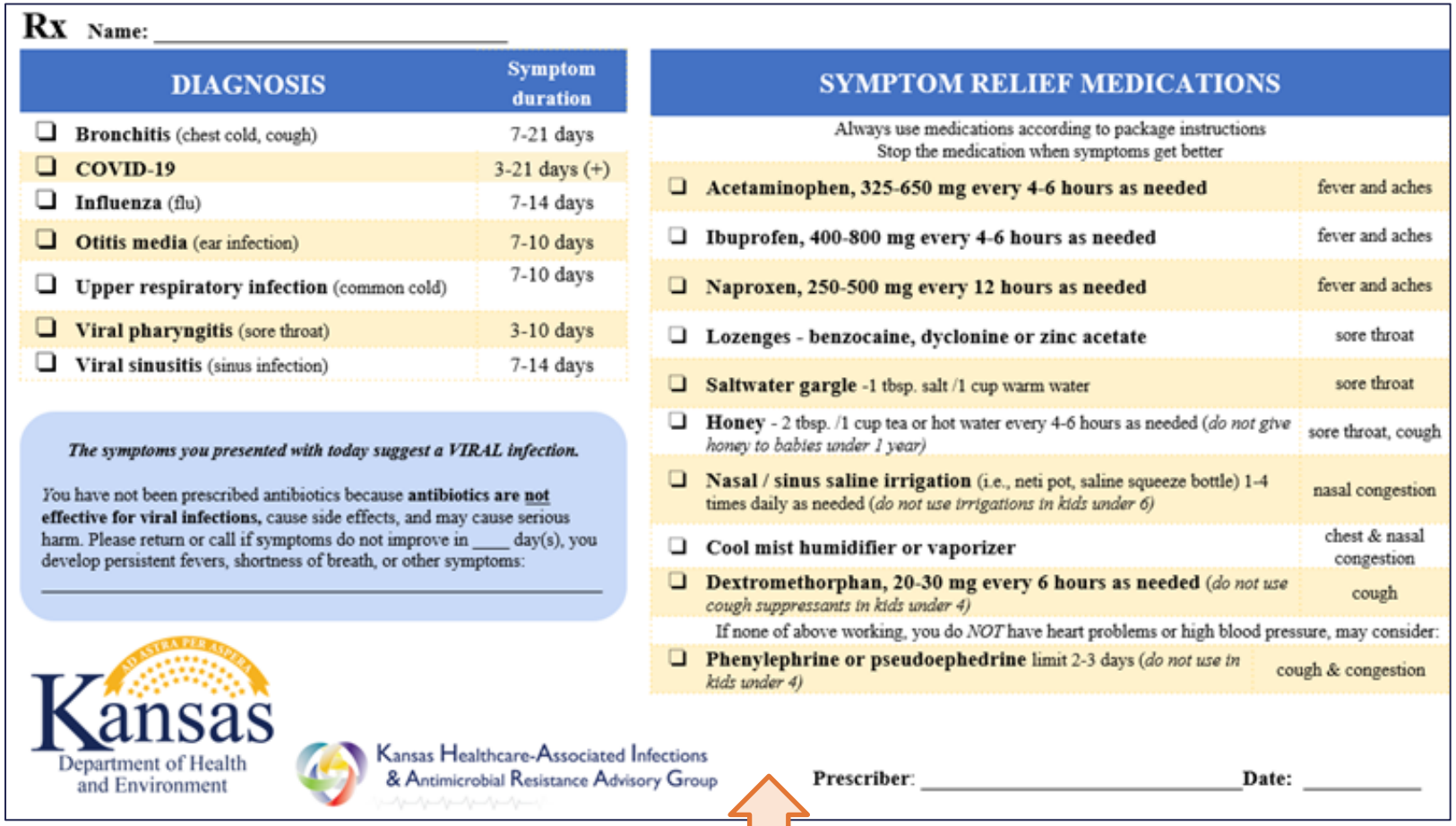


Sources: Mortazhejri S., et al. Syst Rev 2020; 9(1):106.

Delayed Prescribing Support: ARI Script Pads

- Providers reported biggest barrier was lack of tools to aid in promoting conversations with patients and education about ARIs
- 2/3 patients preferred to receive **verbal + printed** information about symptomatic URI management

Print onto 5.5” x 8.5” notepads (50-100 pages per pad)



Rx Name: _____

DIAGNOSIS	Symptom duration
❑ **Bronchitis** (chest cold, cough)	7-21 days
❑ **COVID-19**	3-21 days (+)
❑ **Influenza** (flu)	7-14 days
❑ **Otitis media** (ear infection)	7-10 days
❑ **Upper respiratory infection** (common cold)	7-10 days
❑ **Viral pharyngitis** (sore throat)	3-10 days
❑ **Viral sinusitis** (sinus infection)	7-14 days

The symptoms you presented with today suggest a VIRAL infection.

You have not been prescribed antibiotics because **antibiotics are not effective for viral infections,** cause side effects, and may cause serious harm. Please return or call if symptoms do not improve in ____ day(s), you develop persistent fevers, shortness of breath, or other symptoms:

_____

SYMPTOM RELIEF MEDICATIONS	
Always use medications according to package instructions Stop the medication when symptoms get better	
❑ **Acetaminophen, 325-650 mg every 4-6 hours as needed**	fever and aches
❑ **Ibuprofen, 400-800 mg every 4-6 hours as needed**	fever and aches
❑ **Naproxen, 250-500 mg every 12 hours as needed**	fever and aches
❑ **Lozenges - benzocaine, dyclonine or zinc acetate**	sore throat
❑ **Saltwater gargle** -1 tbsp. salt /1 cup warm water	sore throat
❑ **Honey** - 2 tbsp. /1 cup tea or hot water every 4-6 hours as needed (*do not give honey to babies under 1 year*)	sore throat, cough
❑ **Nasal / sinus saline irrigation** (i.e., neti pot, saline squeeze bottle) 1-4 times daily as needed (*do not use irrigations in kids under 6*)	nasal congestion
❑ **Cool mist humidifier or vaporizer**	chest & nasal congestion
❑ **Dextromethorphan, 20-30 mg every 6 hours as needed** (*do not use cough suppressants in kids under 4*)	cough
If none of above working, you do *NOT* have heart problems or high blood pressure, may consider:	
❑ **Phenylephrine or pseudoephedrine** limit 2-3 days (*do not use in kids under 4*)	cough & congestion

Kansas Department of Health and Environment

Kansas Healthcare-Associated Infections & Antimicrobial Resistance Advisory Group

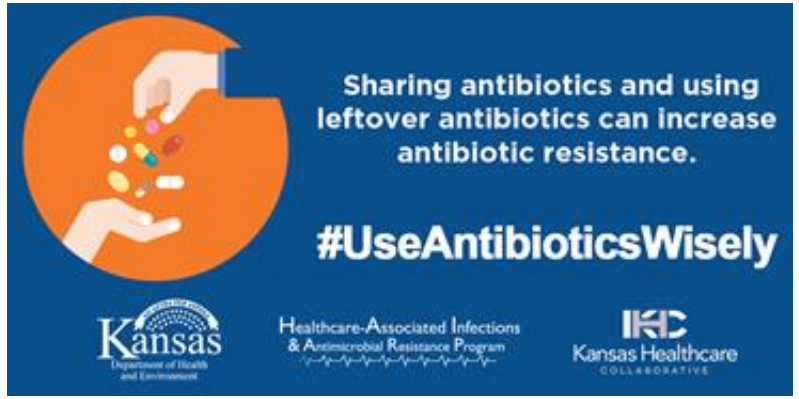
Prescriber: _____ **Date**: _____

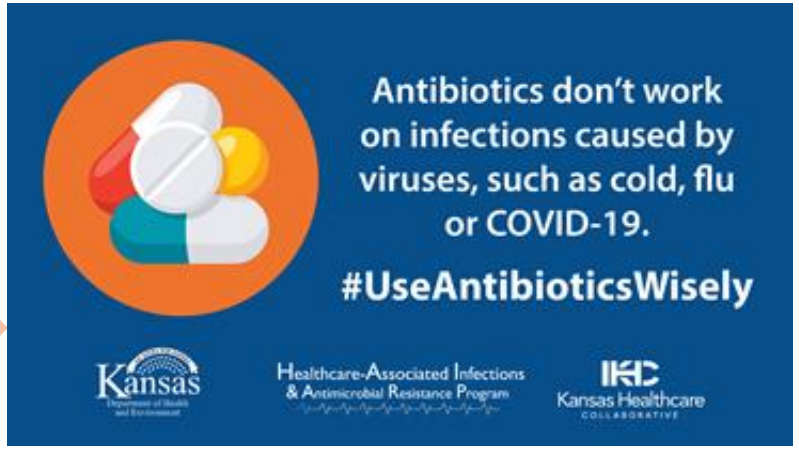
Emailing symptomatic script pads with printing instructions (soon to be added to KDHE HAI/AR website)

Source: Lee C., et al. BMC Fam Pract 2020;21(42).

Patient and Public Education

- Easy to understand
- Focus on modifiable risk factors
- Design according to needs
  - Key driver for ARI visits: concern that illness lasted longer than expected
- Pharmacologic and nonpharmacologic treatments
- Passive education (e.g., providing materials but not reviewing) has little to no impact compared to active strategies





Download Social Media Toolkit:
khconline.org/files/USAAW-2020-images.zip

Sources: Francis N., et al. Patient Educ & Counseling 2008;73(2):286-93.

Peer Comparison

Choosing Metrics

- Antibiotic Use: ARI + Abx
- Antibiotics: NDC codes
- Identify ICD-10 codes: 24
- Time period: 2019-2022
- Rate: ARI+Abx / Total ARI claims
- Provider: NPI by address
- Provider: AU rates to quartiles

ICD-10 Code	Diagnosis
H65	Non-suppurative otitis media
J00	Acute nasopharyngitis, unspecified
J040	Acute laryngitis
J042	Acute laryngotracheitis
J043	Supraglottis
J050	Acute obstructive laryngitis (croup)
J06	Acute laryngopharyngitis
J09-J11	Influenza A
J12	Viral pneumonia
J203-209	Acute bronchitis due to coxsackie, parainfluenza, RSV, rhinovirus, echovirus, NOS
J21	Acute bronchiolitis
J22	Acute respiratory infection NOS
J30	Vasomotor and allergic rhinitis
J31	Chronic rhinitis
J40	Bronchitis NOS
J45	Asthma

Reporting

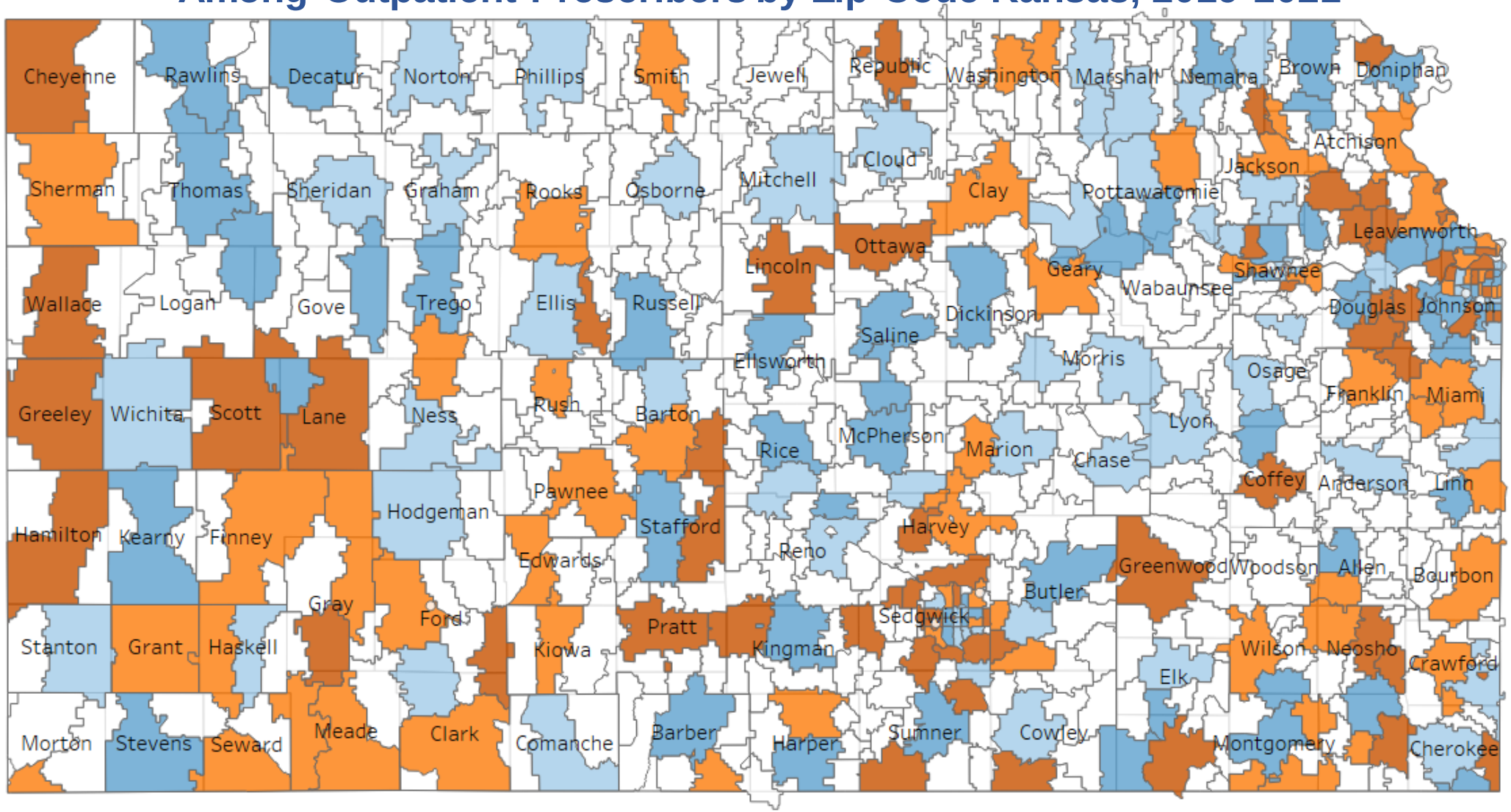
ARI-AU Heatmap

- County/zip code-level rates mapped to identify areas for improvement
- Previous (2017-18) ARI-AU showed no relation b/w rural and urban counties

Peer Comparison

- Providers ARI-AU rate as percentage, split in quartiles
- Provider specialty vs entirety
- Vetted letters with KS physicians for message framing

Percent of Potentially Inappropriate Prescribing of Antibiotics for Acute Respiratory Illnesses (ARI) Among Outpatient Prescribers by Zip Code Kansas, 2019-2021



Zip codes with no data | First Quartile: 0% - 12.0% | Second Quartile: 12.1% - 18.1% | Third Quartile: 18.2% - 25.5% | Fourth Quartile: 25.6% - 100%

Vaccine Impact on Antibiotic Use

Flu vaccination each season prevented:

- 3.8% total abx for acute respiratory illness (ARI) (95% CI 3.6 – 4.1%)
- 4.2 million antibiotic courses
- 5.6% total outpatient ARI visits

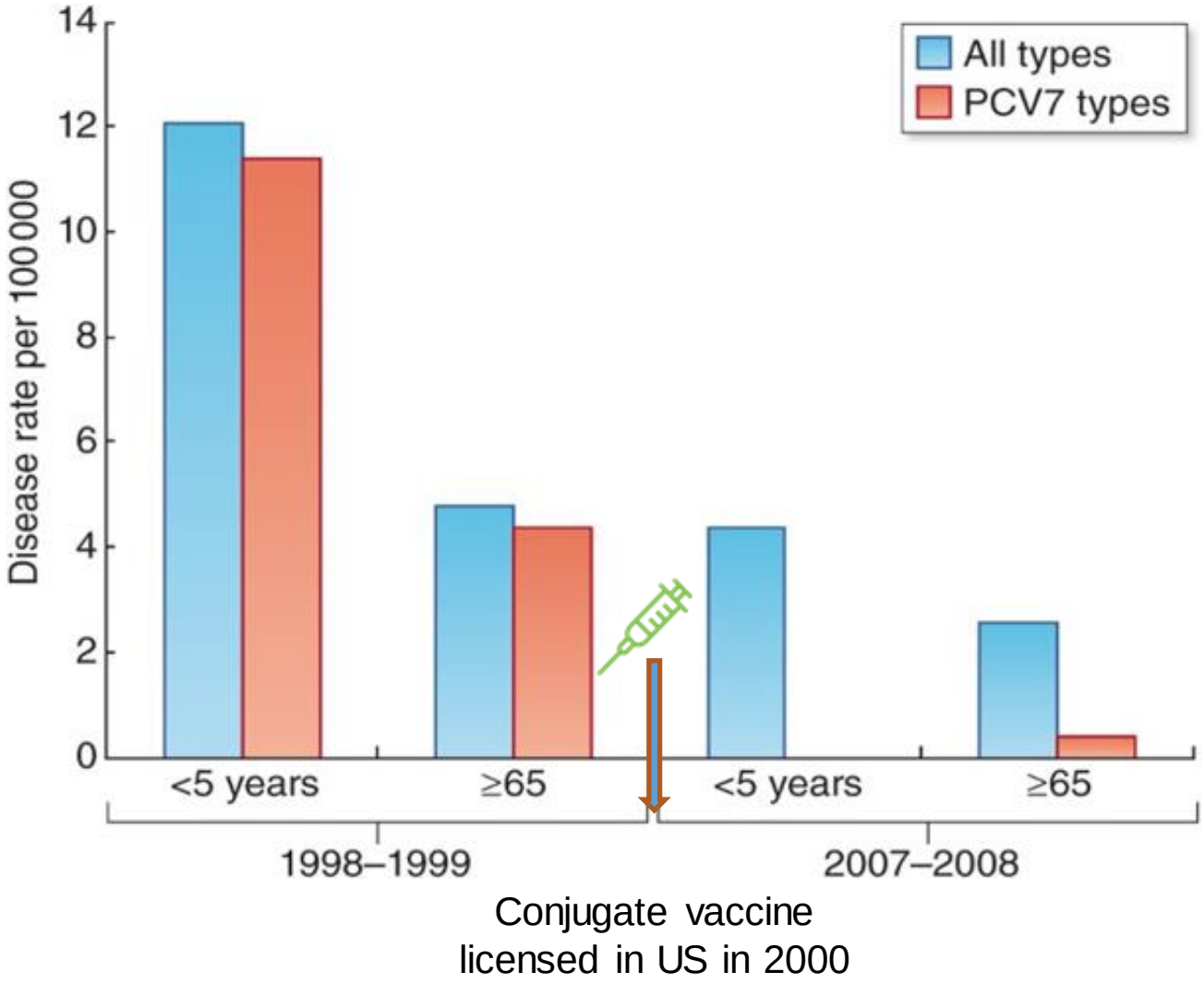
Systematic review + Meta analysis of randomized control trials (RCTs) flu vaccine vs placebo, vaccination:

↓ 28% in duration antibiotics for febrile-illness

↓ 31% in antibiotics for kids

Sources: Smith E., et al. Clin Infect Dis. 2020; 71(11):e726-34; Buckley B, et al. Clin Microbiol Infect 2019;25:1213-25.00

Vaccine Impact on Antibiotic Resistance



Pneumococcal vaccination

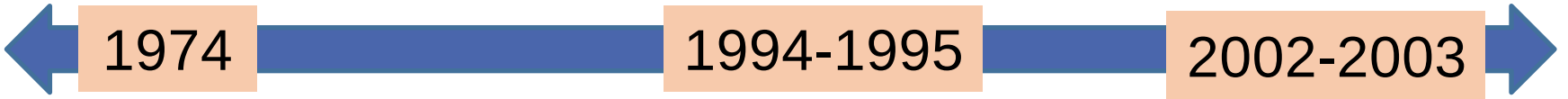
Penicillin-resistant strains of *S. pneumoniae* (PCV7 types, seen in the orange color in the graph on the left) have virtually disappeared thanks to use of the pneumococcal vaccine.

So, ten years after conjugate vaccination introduced those serotypes (and resistance) have been almost eliminated!

Source: Jansen K et al. Nat Med. 2018;24(1):10-19.

Vaccine Impact on Antibiotic Resistance

H. influenzae b (HIB) vaccination



Ampicillin-resistance first found in HIB

Ampicillin-resistance peaked 32-34%

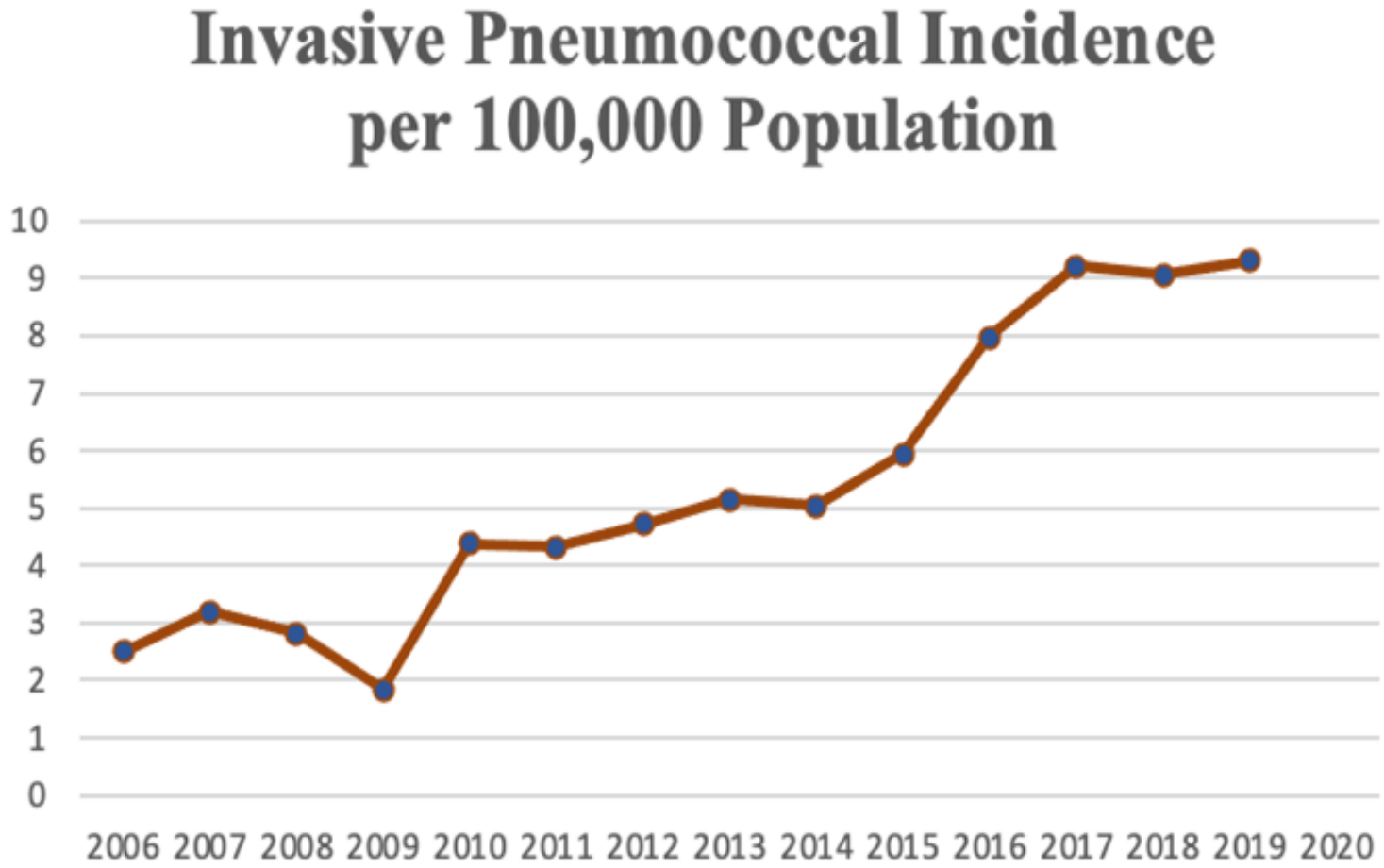
Ampicillin-resistance reduced 26%

Bactrim-resistance in HIB 18.3%

Bactrim-resistance reduced 14.6%

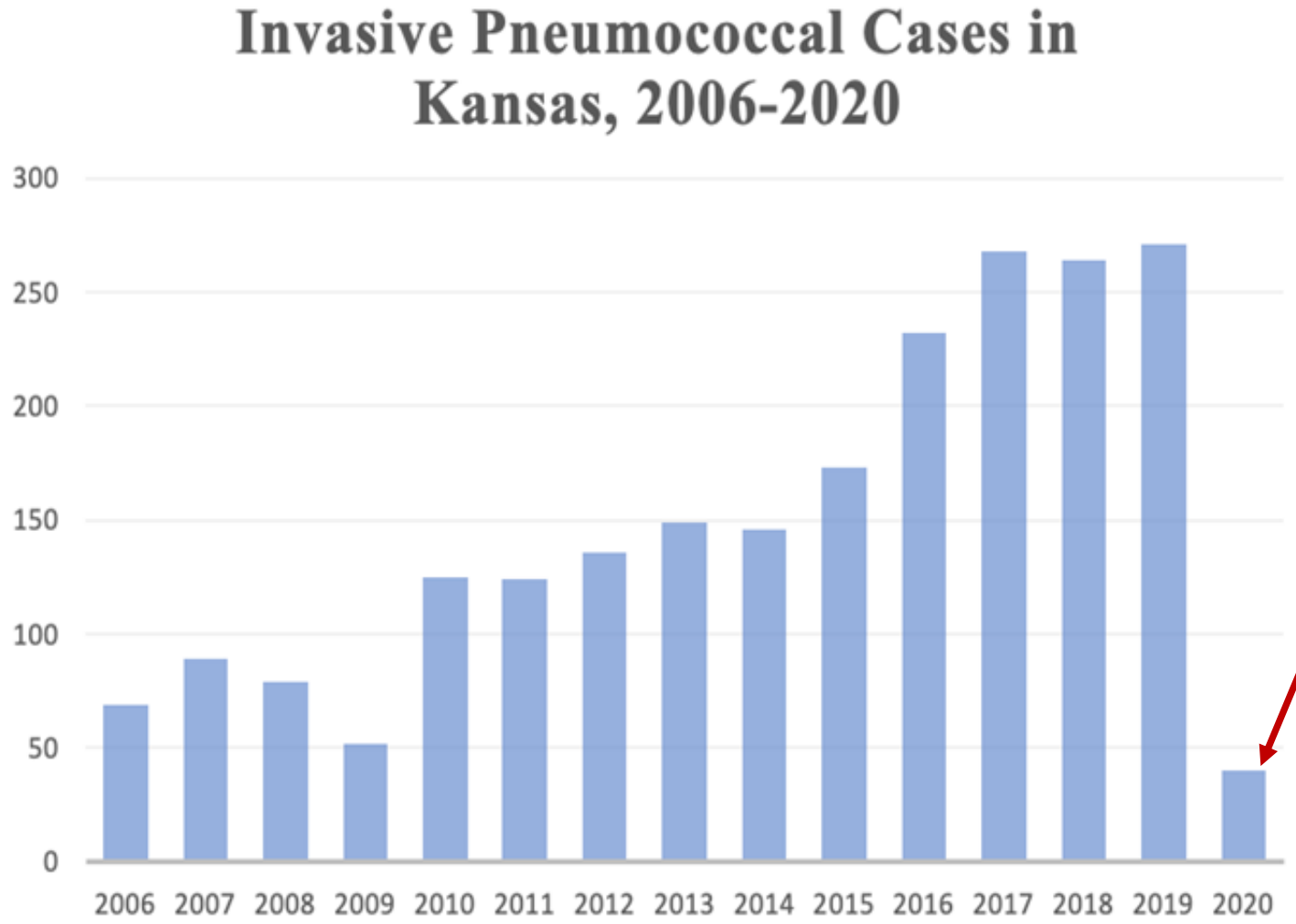
Sources: Buchy P, et al. Int J Infect Dis 2020;90:188-196; Jansen K et al. Nat Med. 2018;24(1):10-19; Wasserman M., et al Emerg Infect Dis 2021;27(6):1627-36

Kansas Invasive Pneumococcal Epidemiology



Source: kdhe.ks.gov/Archive.aspx

Kansas Invasive Pneumococcal Epidemiology



Data is preliminary due to finalizing data during COVID-19 pandemic.

Source: kdhe.ks.gov/Archive.aspx

Pneumococcal Vaccines

Capsular conjugated (PCV) vs unconjugated polysaccharide (PPSV)

- Conjugated = linked to protein carrier, more immunogenic, invokes memory B cells
- Unconjugated = contains sugar antigens
- Antigen spectrum/quantity provides coverage for different serotypes (>90 serotypes)

Available pneumococcal vaccines:

- PCV13 (Prevnar 13; Pfizer)
- PPSV23 (Pneumovax 23; Merck)
- **FDA approved 2021:** PCV15 (Vaxneuvance; Merck)
- **FDA approved 2021:** PCV20 (Prevnar 20; Pfizer)

Source: cdc.gov/vaccines/acip/meetings/downloads/slides-2022-10-19-20/03-pneumococcal-kobayashi-508.pdf

Pneumococcal Serotypes

	Serotypes												
	1, 3-5, 6B, 7F, 9V, 14, 18C, 19A, 19F, 23F	6A	22F	33F	8	10A	11A	12F	15B	2	9N	17F	20
PCV13	X	X											
PCV15	X	X	X	X									
PCV20	X	X	X	X	X	X	X	X	X				
PPSV23	X		X	X	X	X	X	X	X	X	X	X	X

~30% of invasive pneumococcal disease caused by non-PCV13 serotypes

8-12% of invasive pneumococcal disease remaining 4 serotypes

Source: cdc.gov/vaccines/acip/meetings/downloads/slides-2022-10-19-20/03-pneumococcal-kobayashi-508.pdf

Pneumococcal Serotypes

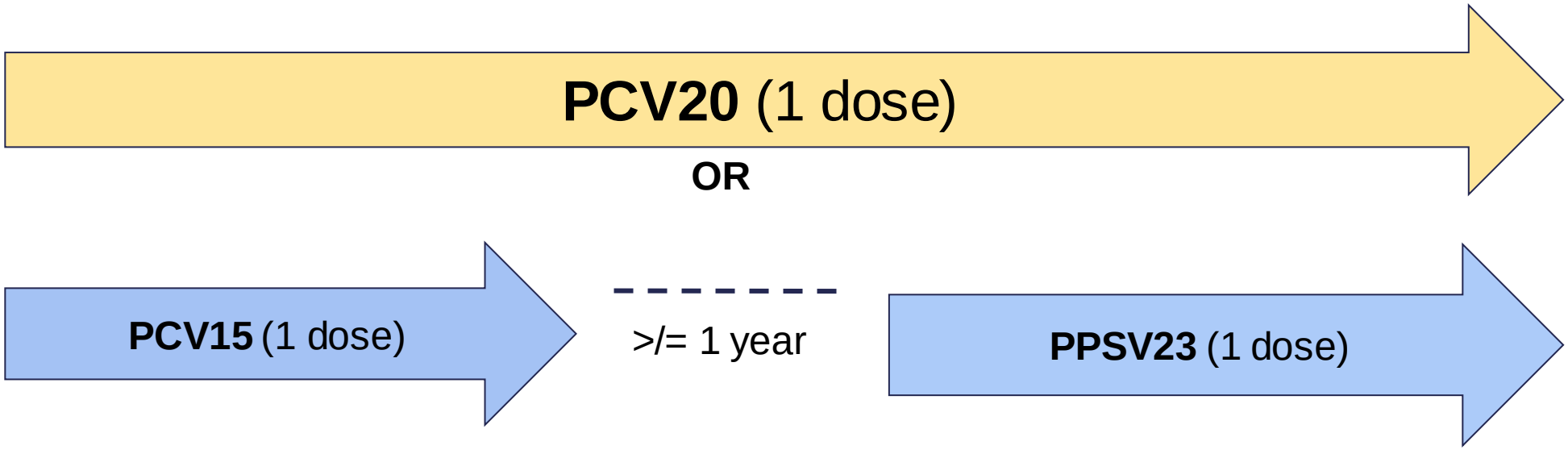
	Serotypes												
	1, 3-5, 6B, 7F, 9V, 14, 18C, 19A, 19F, 23F	6A	22F	33F	8	10A	11A	12F	15B	2	9N	17F	20
PCV13	X	X											
PCV15	X	X	X	X									
PCV20	X	X	X	X	X	X	X	X	X				
PPSV23	X		X	X	X	X	X	X	X	X	X	X	X

Antibiotic-resistant serotypes

Source: cdc.gov/vaccines/acip/meetings/downloads/slides-2022-10-19-20/03-pneumococcal-kobayashi-508.pdf

2022 ACIP Recommendations

- Age >/= 65 yo *OR*
- Age 19 – 64 yo with underlying medical condition or other risk factor for pneumococcal disease:



Source: cdc.gov/vaccines/acip/meetings/downloads/slides-2022-10-19-20/03-pneumococcal-kobayashi-508.pdf

2022 ACIP Recommendations

- Recommended interval of **at least 1 year** between PCV15 and PPSV23
  - Minimum of 8 weeks in vulnerable groups

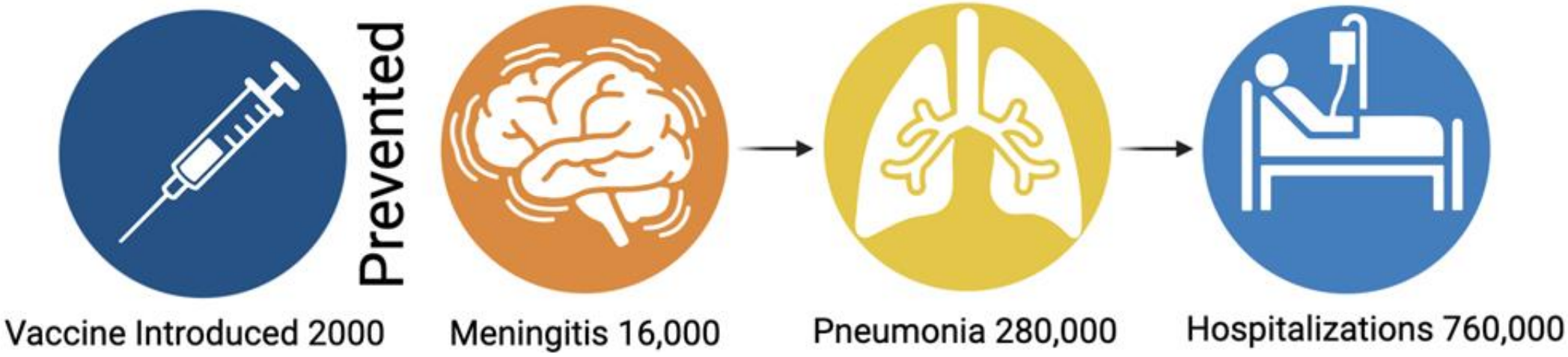
- In those patients who have received a pneumococcal vaccine(s) as an adult in the past:

Previous PPSV23 only	Previous PCV13 only	Previous PCV13 + PPSV23 (completed series)
Administer PCV15 or PCV20 >/=1 year after last PPSV23 dose	Complete series with PPSV23 (may substitute with x1 dose of PCV20)	No additional vaccinations recommended at this time

Pneumococcal Infections and Deaths Prevented

Prevented since vaccine introduced

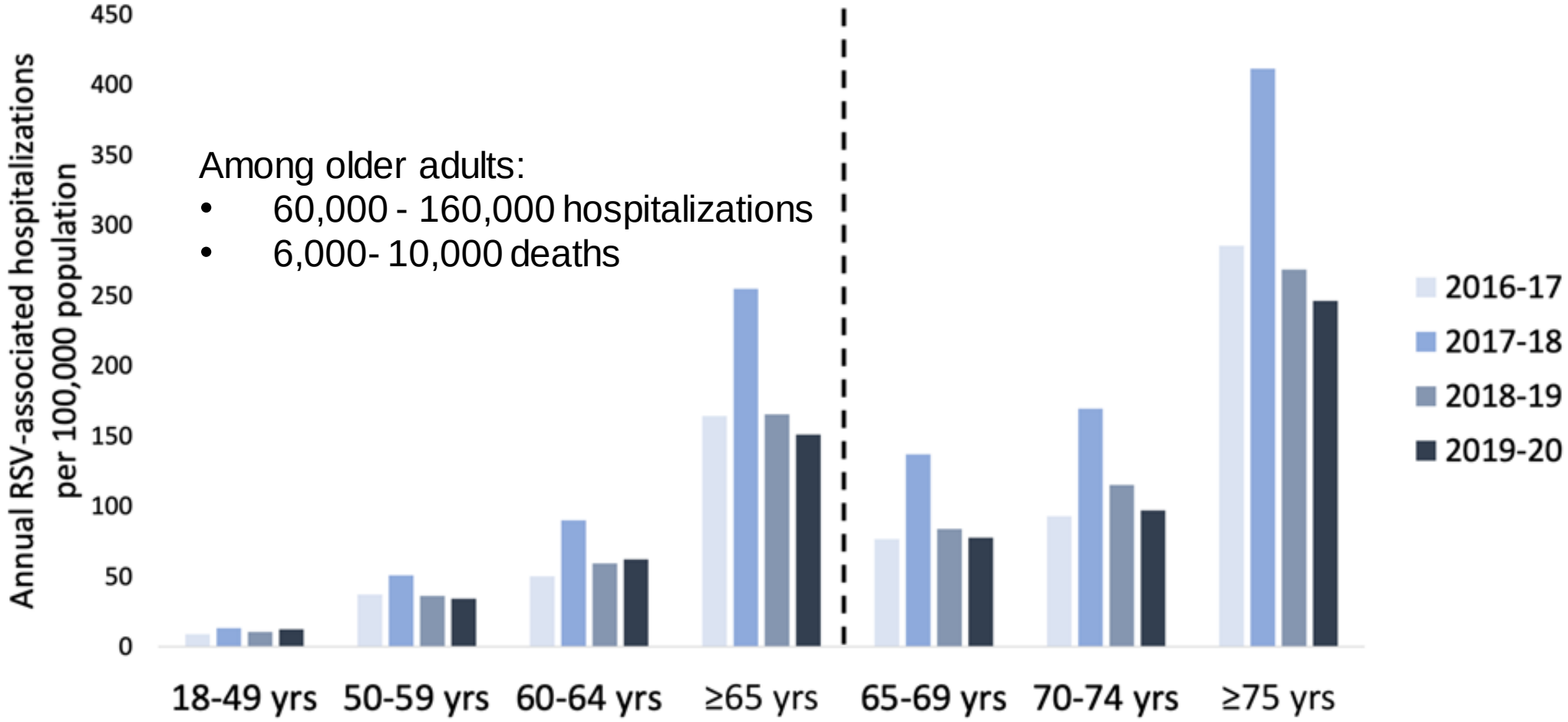
- 282,000 invasive pneumococcal disease cases
- 16,000 cases meningitis
- 172,000 cases bacteremias
- **97 million visits** for otitis media (antibiotics avoided)
- 706,000 hospitalizations
- 2,780 deaths prevented



Sources: prevnar20.pfizerpro.com/about-prevnar20 and Wasserman M., et al. Emerg Infect Dis. 2021;27(6):1627-36.

RSV Infections and Deaths

RSV-Net estimated annual hospitalizations per 100,000 adults (2016-17, 2019-20)



Source: CDC RSV-NET cdc.gov/rsv/research/rsv-net/index.html

Respiratory Syncytial Virus Vaccines

GlaxoSmithKline: Arexvy

- Recombinant pre-fusion RSV antigen
- 5/31/23 FDA approved >60

Pfizer: Abrysvo

- RSV pre-fusion bivalent (RSV A and B)
- 5/31/23 FDA approved >60

Vaccine Type	Vaccine Efficacy (season-1, LRTD 2+ sx)	Vaccine Efficacy Comorbidities
ABRYSVO Pfizer n=17,215	Overall: **67%** (29-86%) 60-69: **58%** (-7 to 85%) 70-79: **78%** (-19 to 98%) >80: **80%** (--104 to 100%)	"High-risk": **63%** (-8 to 89%) 1+ cardiopulm: **33%** (-213 to 88%)
AREXVY GSK n=12,466	Overall: **83%** (58-94%) 60-69: **81%** (44-95%) 70-79: **84%** (47-97%) >80: **34%** (-478 to 94%)	"High-risk": **83%** (41-87%) 1+ co-morb: **95%** (66-100%)

Source: Walsh E., et al. NEJM 2023; 388(16):1465-77.
Papi A., et al. NEJM 2023; 388(7):595-608.

Respiratory Syncytial Virus Vaccines

Vaccine Type	Vaccine Efficacy (ED and hospitalization)	Vaccine-Efficacy (outpatient visit)
ABRYSVO Pfizer n=17,215	Overall: **85%** (to month 7) 75% (8-14 mos)	Overall: **65%** (to month 7 55% (8-14 mos)
AREXVY GSK n=12,466	Overall: **88%** (to month 7) 53% (8-14 mos)	Overall: **79%** (to month 7) 28% (8 -14 mos)

Source: ACIP June 21, 2023 RSV Vaccine Meeting
youtube.com/watch?v=DunxtgBmRxI
Walsh E., et al. NEJM 2023; 388(16):1465-77.
Papi A., et al. NEJM 2023; 388(7):595-608.

Respiratory Syncytial Virus Vaccines

Vaccine Type	Side effects
ABRYSVO Pfizer n=17,215	Site pain: **79%** Fatigue: **46%** Site red: **31%** Headache **0.5%**
AREXVY GSK n=12,466	Fever: **2%** Site pain: **61%** Fatigue: **34%** Site red: **8%** Headache **27%** Myalgias: **39%**

youtube.com/watch?app=desktop&v=ir6D7SN-mRs

Source: Walsh E., et al. NEJM 2023; 388(16):1465-77.
Papi A., et al. NEJM 2023; 388(7):595-608.

Pertussis

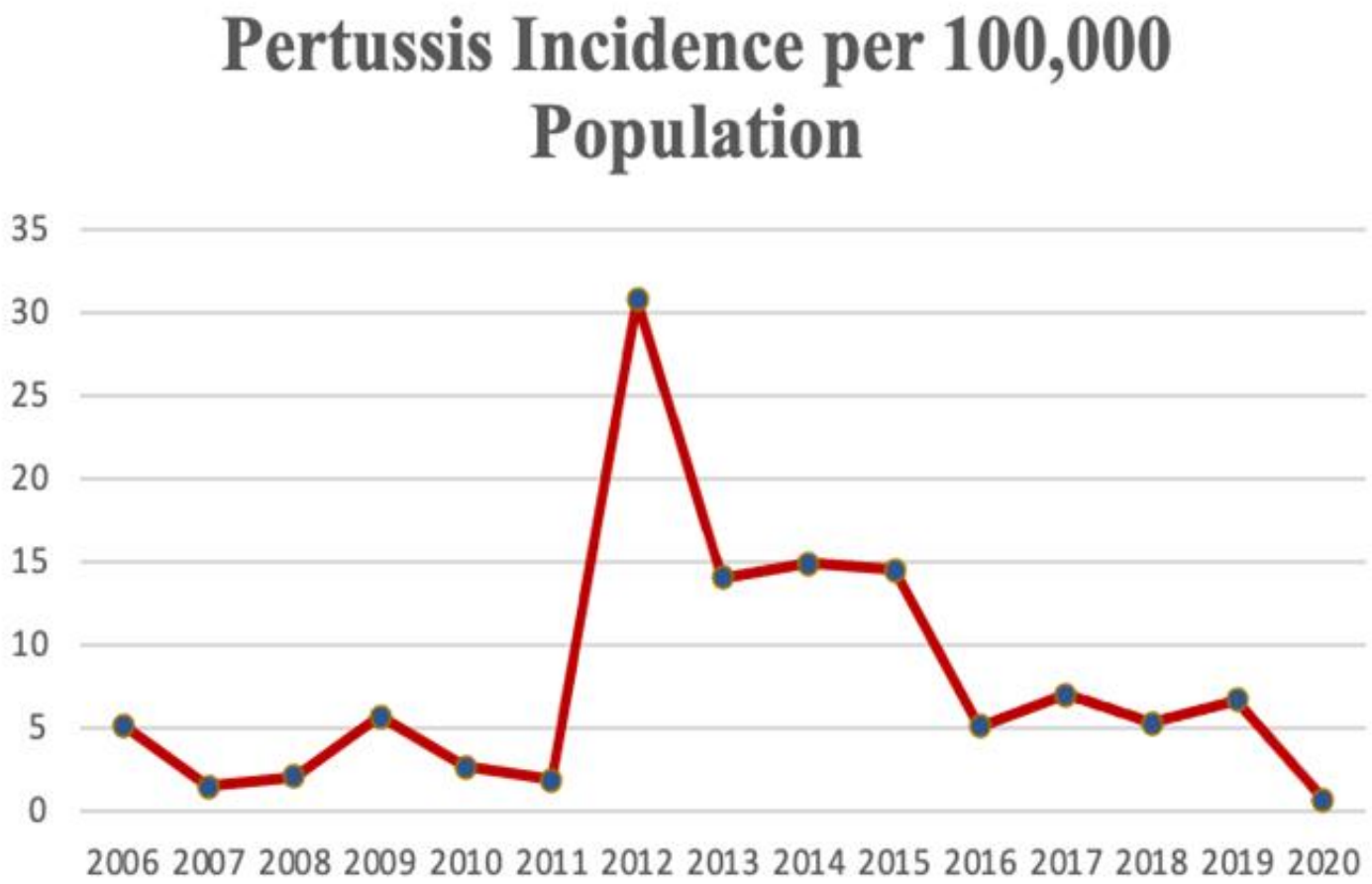


Image source CDC

Child with broken blood vessels in eyes and bruising on face due to pertussis coughing

Source: kdhe.ks.gov/Archive.aspx

TDaP Vaccine

Tetanus toxoid
Reduced diphtheria toxoid
acellular pertussis

- Adults not previously having received Tdap:
- Tdap x1 → Td booster q10 y
  - Alt: pertussis immunity wanes at 5-10 years, so with increasing rates in our state, consider Tdap q10y

- Tdap each pregnancy (3rd tri)
- Household contacts, grandparents, care providers

Regardless of interval from last Tdap

How can we improve immunization rates?

Strategies to improve patient and worker vaccinations

Facility-Based

- Standing orders (e.g., on admit or discharge) rather than requiring physician's signature
- High-risk patients by diagnoses and age (identified by EHR or physician, nurse, pharmacist or IPC)
- Leadership support (visibly vaccinate institutional leaders)

Provider-Based

- Practice-based tracking systems ID high-risk adults and remind during visit
- Preventative checklists
- Meta-analysis of 41 studies: reminders improved vaccination rates 80%

Quality of Care Metric

- IDSA issued Executive Summary on Immunization Coverage, citing need to care and other organization promote immunization as indicator of healthcare quality in managed s

Occupational Health Partnership

- Offer flexible worksite vaccine delivery (e.g., multiple locations and times, via mobile carts)
- Offer free access w/o out of pocket expense to HCWs
- Monitor and report rates (ID areas/sectors with low coverage for targeted intervention)

Sources: Szilagyi P., JAMA 2000; 284(14):1820; IDSA Executive Summary. CID. 2007;44(12):1529-31

Thank You!

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