

Helping to Prevent the Preventable in Healthcare Systems – Pertussis Disease

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Today's Presenter



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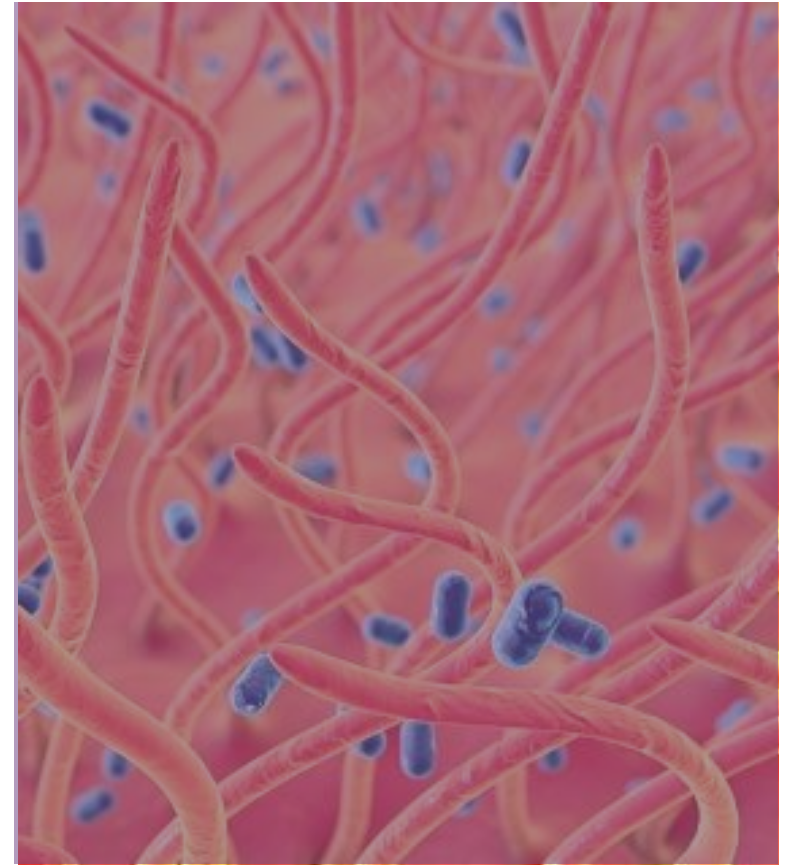


Helping to Prevent the Preventable in Healthcare Systems—Pertussis Disease

AMGA Webinar, Dr. Lawrence Shulman

Outline

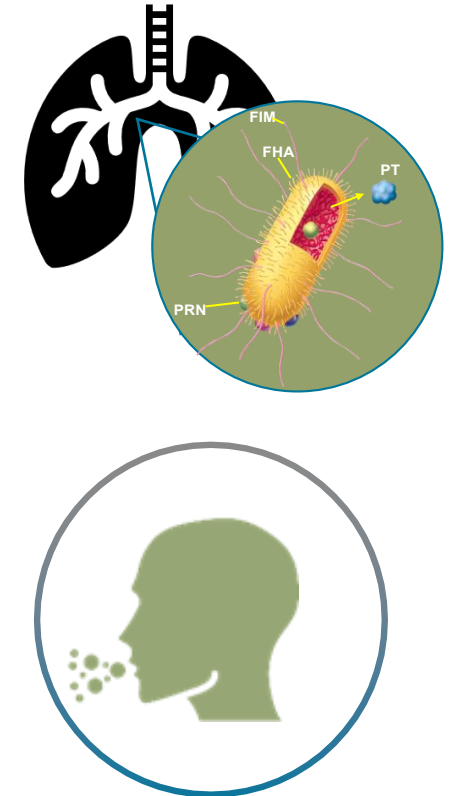
- Pertussis Disease Overview
- Economic Impact of Pertussis Transmission in Health Systems
- Improving Tdap Immunization Rates in Health Systems
- Key Takeaways



Pertussis Disease Overview

Pertussis: Highly Communicable Disease

- Acute respiratory infection caused by the *Bordetella pertussis* bacterium¹
- Highly contagious and spread directly from person to person through contact with airborne droplets¹
 - High reproductive number (R_0) of 15-17²
 - **Compare with COVID-19 R_0 of 2-7³**
- Incidence occurs in all ages, however it is reported as highest in infants⁴
- In 2012 epidemic year⁵ more than 10,000 cases were reported in persons 20 years of age and older⁶



Severe Pertussis Infections Can Cause Complications in Adolescents and Adults

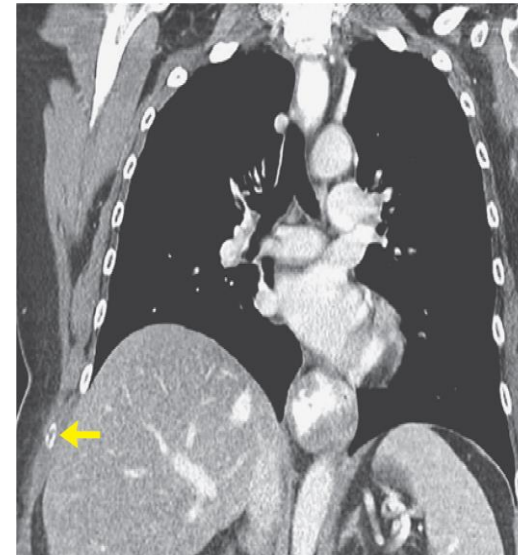
COMPLICATIONS¹

- Sinusitis
- Otitis media
- Pneumonia
- Weight loss
- Fainting
- Rib fracture

In a study that examined the effect of age on the clinical presentation of pertussis, complications were more frequent in adults compared to adolescents¹

Adults 28% vs Adolescents 16%

RIB FRACTURE FOLLOWING PERSISTENT COUGH AND CULTURE-CONFIRMED *B. PERTUSSIS* DISEASE IN A FEMALE PATIENT²



Images from *The New England Journal of Medicine*. Copyright © 2018 Massachusetts Medical Society. Reprinted with permission from Massachusetts Medical Society.²

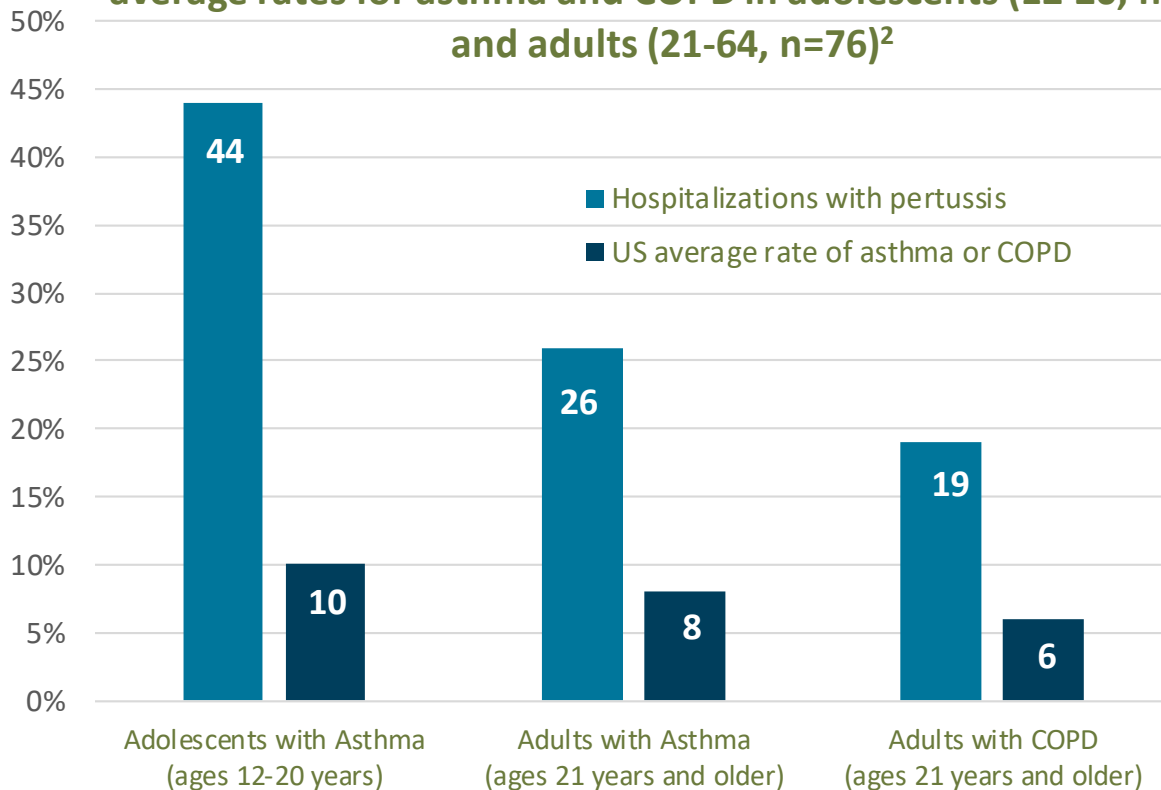
Rib fracture occurs in rare cases.¹

Pertussis can be a Burden to Adolescents and Adults with Chronic Respiratory Comorbidities

ENHANCED PERTUSSIS SURVEILLANCE IN 7 US STATES^{1,2}

Among 15,942 pertussis cases reported, 515 patients were hospitalized²

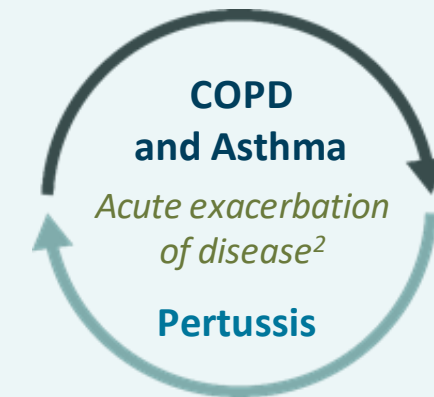
Percentage of hospitalized pertussis patients compared to US average rates for asthma and COPD in adolescents (12-20, n=23) and adults (21-64, n=76)²



COPD = chronic obstructive pulmonary disease

References: 1. Skoff TH, et al. *Emerging Infectious Diseases*. 2015;21(9):1568-1573. 2. Mbayei SA, et al. *Clin Infect Dis*. 2019; 69(2):218-226. 3. Jenkins VA, et al. *Human Vaccines & Immunotherapeutics* 2020. DOI:10.1080/21645515.2020.1738168

- Adolescents and adults with asthma are at an increased risk of pertussis and pertussis-related hospitalizations compared to individuals without asthma^{2,3}



- Adults with COPD are potentially at increased risk of pertussis diagnosis or pertussis-related hospitalizations compared to adults without COPD^{2,3}

Pertussis: Underdiagnosed and Not Tested For

- Studies of prolonged cough illnesses in adults reveal that 13% to 20% are a result of *B pertussis* infection¹
- Serologic studies suggest that the rate of B pertussis infection is 2.0% per year¹
- Can be overlooked, especially among adults²
- Perception that pertussis is a childhood disease leads to frequent misdiagnoses of older age groups²
- Diagnosed by culture or polymerase chain reaction (PCR)³
- PCR has optimal sensitivity during the first 3 weeks of cough⁴

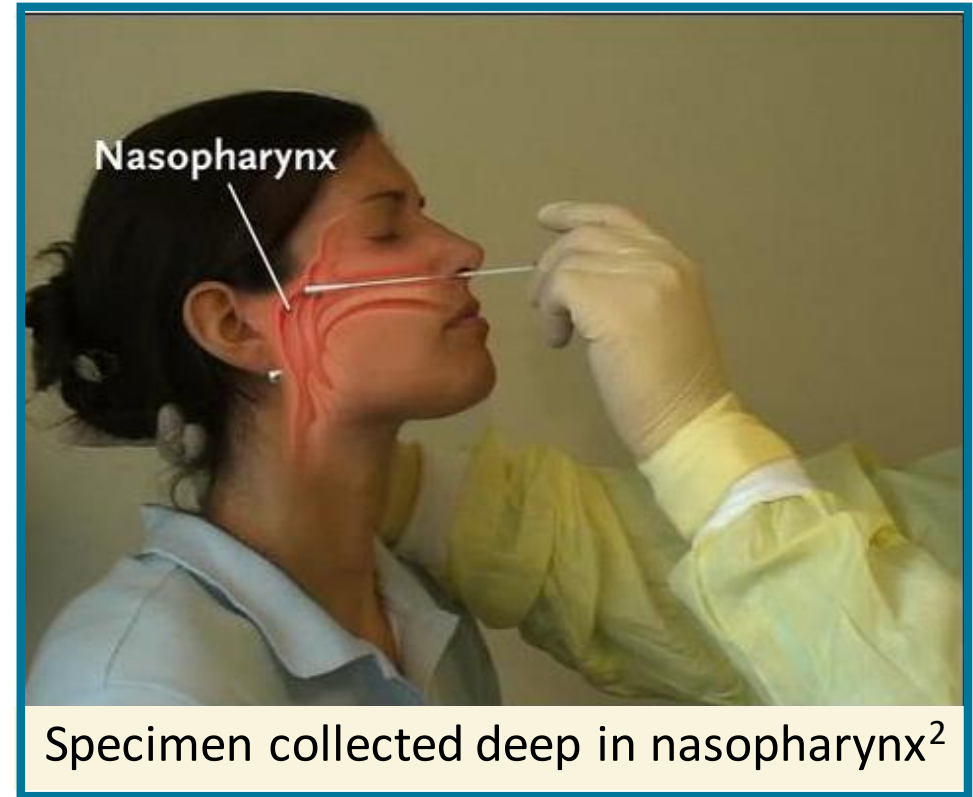


Image from *The New England Journal of Medicine*. NEJM Procedure: Collection of Nasopharyngeal Specimens with the Swab Technique

Adult Immunization Rates Suboptimal in Comparison to Adolescents

ADOLESCENTS (AGES 13-17)

National Immunization Survey-Teen (2019)¹

Estimated Tdap vaccination coverage of US adolescents (n=18,788) in 2019:

90.2%

- *More-established vaccination schedule*
- *School requirements in all 50 states²*

ACIP recommendation for persons aged 13–17 years: These persons should receive a single dose of Tdap, preferably at a preventive care visit at age 11–12 years. To ensure continued protection against tetanus and diphtheria, 1 booster dose of either Td or Tdap should be administered every 10 years throughout life.⁴

Tdap=tetanus, diphtheria, and acellular pertussis vaccine

ADULTS (AGES 19+)

National Health Interview Survey (2018)³

Estimated vaccination coverage of US adults (n=15,118) who in the past 10 years received Tdap:

31.2%

- *Suboptimal coverage in adults*
- *Opportunity for vaccination*

ACIP recommendation for persons aged ≥19 years: Regardless of the interval since their last tetanus or diphtheria toxoid-containing vaccine, persons aged ≥19 years who have never received a dose of Tdap should receive 1 dose of Tdap. To ensure continued protection against tetanus and diphtheria, booster doses of either Td or Tdap should be administered every 10 years throughout life.⁴

References: 1. Elam-Evans LD, et al. *MMWR*. 2020;69:1109-1116. 2. Immunization Action Coalition <https://www.immunize.org/laws/tdap.asp>. Accessed April 19, 2021. 3. Lu P, Hung M, Srivastav A, et al. Surveillance of Vaccination Coverage Among Adult Populations — United States, 2018. *MMWR Surveill Summ* 2021;70(No. SS-3):1–26. 4. Havers FP, Moro PL, Hunter P, Hariri S, Bernstein H. Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccines: Updated Recommendations of the Advisory Committee on Immunization Practices — United States, 2019. *MMWR Morb Mortal Wkly Rep* 2020;69:77–83.

HCPs are at Increased Risk and are a Source of Pertussis Transmission

- HCP with unrecognized pertussis infection are a source of transmission to susceptible patients¹
 - Pertussis has a prolonged incubation period and a long duration of nonspecific respiratory symptoms, which may delay diagnosis¹
 - **1.7-fold greater risk for acquiring pertussis compared to the general population²**



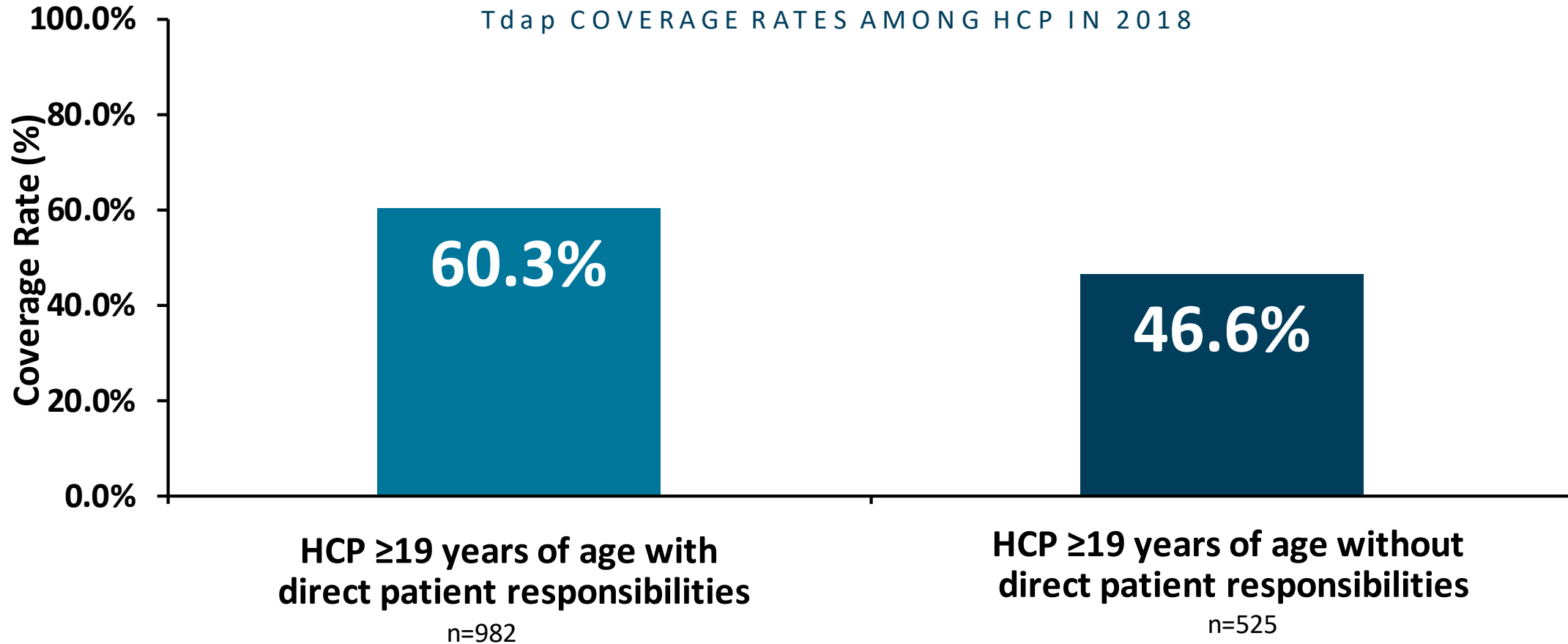
One method of preventing workplace pertussis transmission is through Tdap immunization³



Tdap Immunization Rates Among HCPs Remain Low, Despite an ACIP Recommendation in Place Since 2006¹

THE NATIONAL HEALTH INTERVIEW SURVEY

Tdap COVERAGE RATES AMONG HCP IN 2018



HCP=Health Care Provider

Reference: 1. Lu P, Hung M, Srivastav A, et al. Surveillance of Vaccination Coverage Among Adult Populations — United States, 2018. MMWR Surveill Summ 2021;70(No. SS-3):1–26.

Occupational Exposure to Pertussis Occurs Across Health Care Settings

A CROSS-SECTIONAL STUDY FROM 2002 THROUGH 2011 FOUND THAT **219** PERTUSSIS CASES IN ONE PEDIATRIC CARE NETWORK LED TO **1193** CONFIRMED HCP EXPOSURES¹



71.1%

exposures occurred while the HCP was providing care for an index case* who presented with respiratory symptoms¹



77.5%

of exposures occurred in the Emergency Department (ED) and in ambulatory sites¹

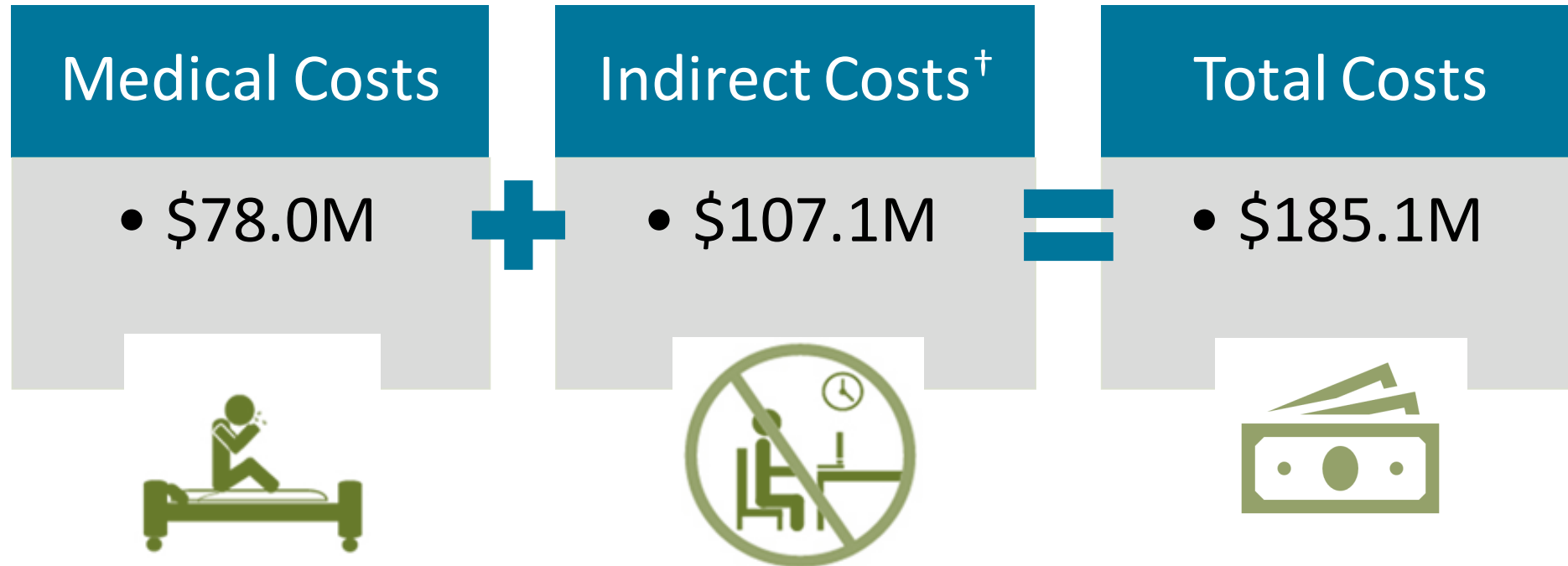
*An index case was defined as any patient who had a laboratory-confirmed diagnosis of pertussis that also resulted in an HCW exposure



Economic Impact of Pertussis Transmission in Health Systems

Annual Cost of Pertussis Disease Among Adults in the United States Is Significant

Analysis of the estimated annual human and economic burden of pertussis in the United States, 2013, among adults 50 to 64 years of age^{1,*}

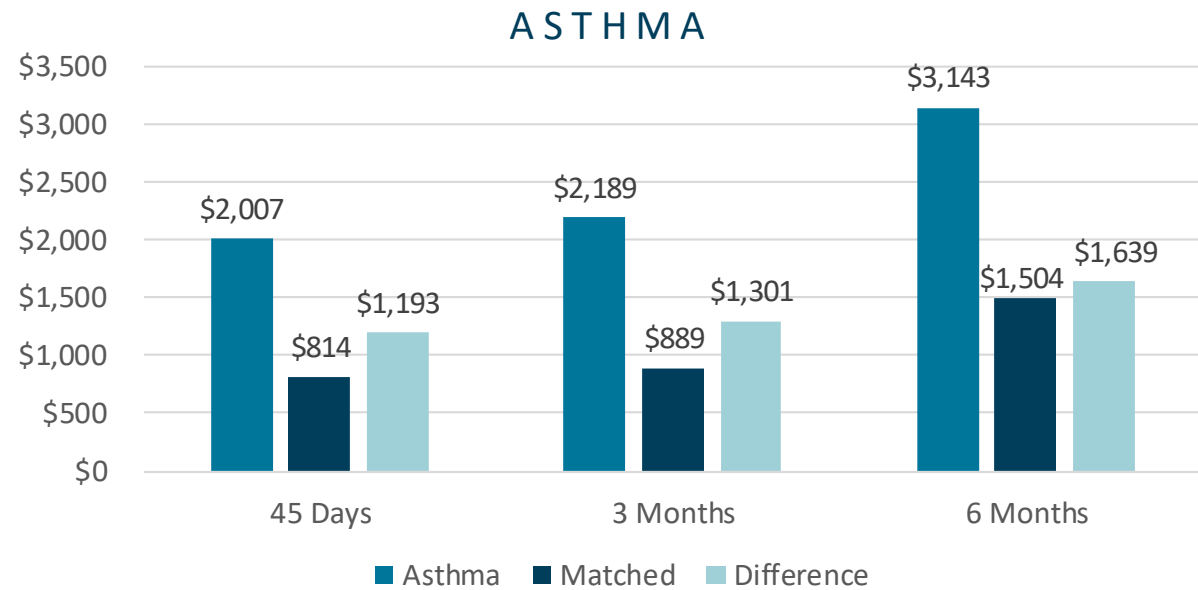
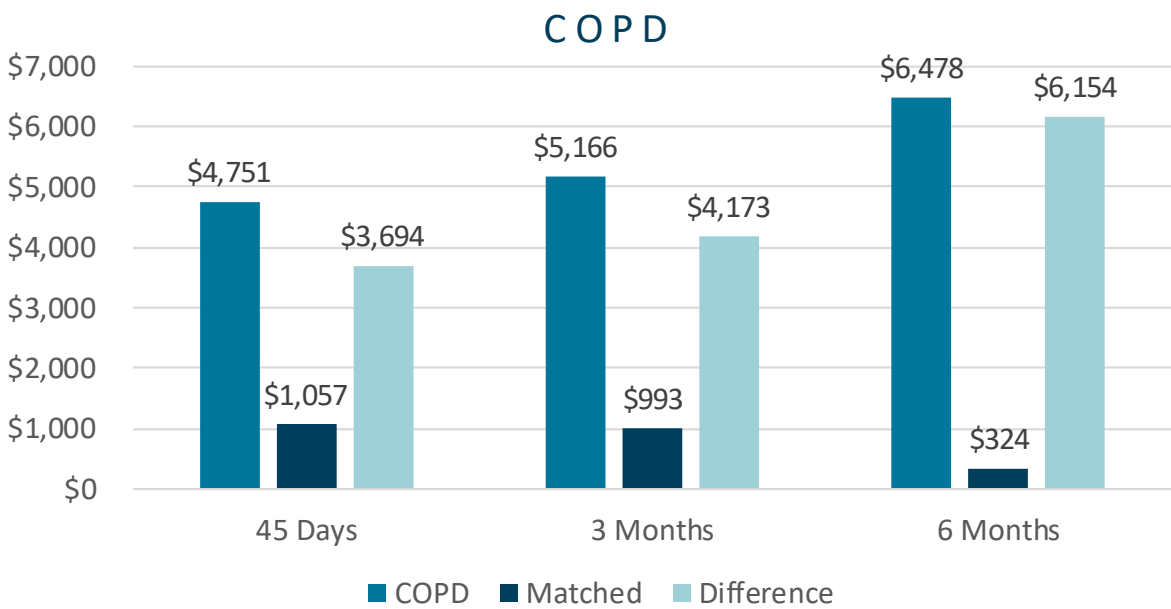


*Based on an estimated 180,568 annual pertussis disease cases among adults aged 50 to 64 years of age.

[†]Indirect (non-medical) costs were estimated by combining work-loss data with economic productivity data, including wages, fringe benefits/supplements, and household productivity.

Pertussis Disease in Adults with Chronic Respiratory Conditions Can be Even More Costly

Compared with matched patients, patients with pertussis and pre-existing COPD or asthma age^a accrued **greater all-cause^b adjusted costs** across study period¹



COPD = chronic obstructive pulmonary disease

P < 0.0001 for all differences

^a Patients aged ≥11 years with diagnosed pertussis and pre-existing COPD (n = 343) or asthma (n = 1041) were matched 1:1 to patients with diagnosed pertussis but without COPD or asthma.

^b All-cause health care costs included all medical and pharmacy costs, regardless of the corresponding diagnoses or prescriptions.

Pertussis Outbreaks in Health Care Facilities Incur Significant Costs

Examples of Outbreaks	Total Cost
2011: 15 cases of pertussis occurred among 10 health care professionals and 5 infants in an Arizona hospital ¹	\$97,745 ¹
2004: 2 nosocomial outbreaks at a tertiary care hospital (A) and a pediatric hospital (B) ² <ul style="list-style-type: none">Hospital A reported that a 38-year-old emergency room physician was diagnosed with pertussis, and identified 738 persons (hospital staff, patients, and visitors) as potentially being exposed to the physicianHospital B reported that a 38-year-old respiratory therapist was presumed to have pertussis and identified 417 employees as potentially exposed	(A): \$263,357 ² (B): \$121,130 ²
2003: 17 cases of pertussis occurred among HCP exposed to 1 infant for 1 day in a tertiary health care facility for pediatric and adult patients ³	\$74,870 ³

Types of Direct and Indirect Costs to a Hospital as a Result of a Pertussis Outbreak

Type of Cost and Activity	Resource Used	Unit Cost
<u>Direct costs</u>		
Molecular laboratory tests	PCR test	\$286
Culture laboratory tests	Culture tests ^a	\$17
Treatment and prophylaxis	Azithromycin courses	\$35
Additional activities ^b <ul style="list-style-type: none"> • Identification of cases and contacts • Pertussis related counseling • Conducting of laboratory tests • Management of a telephone hotline for community inquires 	Labor hours	\$11-\$124
Information dissemination	Letters	\$0.6-\$4
<u>Indirect costs</u>		
HCWs' furlough ^c	Administrative-leave hours	\$20

a Culture tests of nasopharyngeal secretions.

b Additional activities included, but were not limited to, identification of cases and contacts, pertussis-related counseling, conducting of laboratory tests, and management of a telephone hotline for community inquires.

c A total of 17 health care workers (HCWs) were placed on administrative leave; an average hourly earnings estimate of \$20/h was used.

Healthcare Worker Vaccination Program Implementation Results in Savings

IN A 10-YEAR PERIOD, THE VALUE OF COSTS^a ASSOCIATED WITH¹:

Containment Activities:

~\$388,000

Vaccination Program:

~\$69,000



- Introduction of a healthcare worker^b vaccination program could result in a net savings as high as **\$535,000** and a benefit-cost ratio of **2.38** for a hospital with 1,000 HCWs¹
- For every dollar spent on the vaccination program, the hospital would save \$2.38 on control measures¹

^a Costs were determined by interviewing infection-control and hospital personnel, reviewing billing records, and surveying symptomatic HCW. Benefits and costs of a vaccination program for HCWs was calculated using a probabilistic model to estimate the number of pertussis exposures that would require control measures annually

^b A stable cohort of 1000 HCWs is followed for 10 years, both with and without a pertussis vaccination program

Limitation: model may not have accounted for cost of booster doses, program acceptance, hospital organizational culture.



Improving Tdap Immunization Rates in Health Systems

Healthy People 2030 Goals

HEALTHY PEOPLE 2030 SETS DATA-DRIVEN NATIONAL OBJECTIVES TO IMPROVE HEALTH AND WELL-BEING OVER THE NEXT DECADE¹



Reduce cases of pertussis among infants (IID-05: baseline only)²



Increase the proportion of adults age 19 years or older who get recommended vaccines (IID-D03: in development status)²



Increase the proportion of pregnant women who receive 1 dose of the tetanus-diphtheria-acellular pertussis (Tdap) vaccine during pregnancy (IID-D01: in development status)²



Image from *Office of Disease Prevention and Health Promotion*

Recommended Strategies to Increase Vaccine Coverage

FOR EMPLOYEES

- ✓ Consider the level of vaccination coverage among HCP to be **one measure of patient safety and quality**¹
- ✓ Implement **employee health clinics** for Tdap immunization¹
- ✓ **Measure employee immunization rates** and compare data to a desired target¹
- ✓ Provide vaccinations to employees at **minimal or no cost**¹
- ✓ Create a **task force** to communicate with individual staff members to champion Tdap immunization²

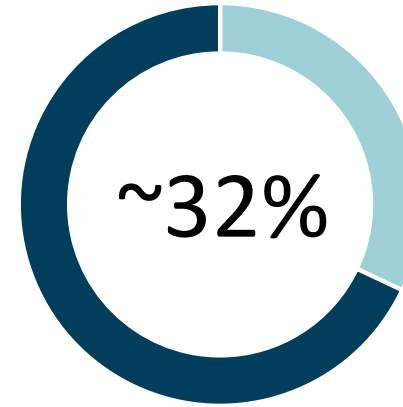
FOR PATIENTS

- ✓ Utilize **education materials** such as posters, pamphlets, brochures⁴
- ✓ Vaccination opportunities at the time of **physical examinations or sick visits for minor illness or injury**⁴
- ✓ If vaccination is deferred because of more serious illness, vaccinate **as soon as the acute illness has improved**⁴
- ✓ Use **reminder-recall systems, standing orders and immunization information systems**³
- ✓ Recommend **simultaneous vaccination** if timing aligns (eg, offer other vaccines at the time of influenza vaccination)⁴

Help Increase Tdap Vaccination Rates in Adults by Utilizing Emergency Care Settings



- Emergency care plays a significant role in healthcare delivery and is utilized as an **access point for primary care**¹
- In a CDC study, **~80% of ER** visits by adults were due to lack of access to other providers²



As per NHIS 2017 data, Tdap vaccination coverage among adults is **~32%**³



ER visits can be utilized as opportunities for Tdap immunization in eligible patients

Multiple Approaches to Reduce Costs while Implementing Vaccination Strategies



Avoiding errors in coding and billing¹

- Remember to bill for both the vaccine and vaccine administration
- Review vaccine manufacturer billing and coding guides
- Consider 2021 E&M Codes for information on billing for vaccine counseling



Routinely updating drop-down menus and other electronic health record tools¹

- Preventing errors improves patient care and reduces claims rejections



Many vaccine manufacturers offer **vaccine return programs** to decrease the risk of losing money from expired vaccines¹



Improving efficiency of vaccination implementation and vaccine delivery can reduce the fixed costs per vaccine administered¹



Quality measures can be tied to insurance payment¹

HEDIS Quality Measures Related to Tdap Immunization



Endorsed by NCQA in 2019

Adult Immunization Status: the percentage of members **19 years of age and older who are up to date on recommended routine vaccines** for influenza, Td or Tdap, zoster, and pneumococcal¹



Endorsed by NCQA in 2019

Pregnancy Immunization Status: The percentage of deliveries in the measurement period in which women received influenza and **tetanus, diphtheria toxoids and acellular pertussis (Tdap) vaccinations**¹

HEDIS=Healthcare Effectiveness Data and Information Set; NCQA=National Committee for Quality Assurance

Td=tetanus and diphtheria toxoids adsorbed

Tdap=tetanus, diphtheria, and acellular pertussis

Reference: 1. NCQA. HEDIS® Adult and Prenatal Immunization Measures. February 2019. <https://www.ncqa.org/wp-content/uploads/2019/02/NCQA-AIS-PRS-Webinar-Slides-Feb-2019.pdf>
Accessed April 19, 2021.

Strategies for Improving Tdap Vaccination Rates in Health Care Settings are Shown to Increase Coverage

MANDATED MEASURES¹

Mandatory Tdap Employee Vaccination Program: 2009-2011; n=15,267

- **High-risk areas:** inpatient and outpatient areas of women's health, pediatrics, emergency department
- All clinical campuses and buildings

Vaccination coverage increased from:

9% to **90%**

Geisinger Health System (Danville, PA)

QUALITY IMPROVEMENT INITIATIVE²

Improvement Effort Included: 2014-2017; n=1,090

- Changes to Occupational Health Program processes
- Education campaign
- Improved access to vaccine
- Personal engagement of HCP by task force members

Vaccination coverage increased from:

58% to **90%**

St. Jude Children's Research Hospital (Memphis, TN)

Key Takeaways



- Pertussis is a highly infectious respiratory disease that continues to cause significant morbidity in adults and adolescents^{1,2}
 - HCPs are at a 1.7-fold greater risk for acquiring pertussis than the general population³
- Vaccination coverage among adults and healthcare providers in the United States is still relatively low and needs improvement⁴
 - Many cases often go underdiagnosed or underreported¹
- Pertussis outbreaks in healthcare facilities can incur significant costs⁵
- Many strategies to help increase vaccination rates for both healthcare providers and patients can be implemented in your healthcare facility

Selected Strategies From the 4 Pillars™ Practice Transformation Program to Improve Vaccination Uptake¹

1 Provide convenience and easy access

- **Use every patient visit type** as an opportunity to vaccinate
- **Offer other vaccines** at the time of influenza vaccination if timing aligns
- **Extend the influenza vaccination season**
 - Vaccinate as soon as supplies arrive and continue to vaccinate as long as influenza is circulating

2 Communicate with patients

- Inform about VPDs **at start of every visit**
- Train staff to **discuss vaccines during routine processes**
- Promote vaccination among staff to **set a good example**

3 Enhance systems to facilitate vaccination

- Review accurate EMR **vaccination record keeping**
- Assess immunizations **as part of vital signs**
- **Develop systematic processes** for vaccinating every person with a vaccination need (eg, standing orders)

4 Get motivated

- Create a chart to **track progress**
- Provide **ongoing feedback** to staff on vaccination progress
- **Reward** successful results

EMR=electronic medical record; VPDs=vaccine-preventable diseases

Reference: 1. 4 Pillars™ Practice Transformation Program. Self-Guided Version. <http://www.4pillarstransformation.pitt.edu/self-guided-version/select-and-implement-your-evidence-based-strategies>. Accessed April 19, 2021.

Effectiveness of the 4 Pillars™ Practice Transformation Program in Increasing Uptake of Adult Vaccines¹

Posthoc analysis* of a trial to compare the effect of the 4 Pillars program on vaccination rates in patients aged 18–64 years with common high-risk medical conditions[†] (June 2013-January 2015; n=4737)



Tdap

11.4%

PPSV

12.2%

Influenza

4.8%

Uptake increased significantly ($P<0.001$) for Tdap, PPSV, and influenza vaccination

The overall uptake of recommended vaccines for those with high-risk conditions remained below national goals

*Posthoc analysis of data from a randomized controlled cluster trial

[†]High-risk medical conditions included diabetes (n=1999), chronic lung disease (n=1682), chronic heart disease (n=658) or another high-risk condition (n=764)

PPSV=pneumococcal polysaccharide vaccine; Tdap=tetanus, diphtheria, and acellular pertussis vaccine.

Limitation: Population limited to greater Pittsburgh region. Analysis compared intervention effect on adults with common high-risk conditions rather than demonstrate effectiveness against no program

Reference: 1. Nowalk MP, et al. *Am J Manag Care*. 2017;23(11):651-655.

THANK YOU!

For supporting resources, please visit [Vaccine Shoppe US Site](#)

BACK UP