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The Impact of Viral Testing on Antibiotic Stewardship in Urgent Care

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This JUCM Webinar is Sponsored by

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- Six Sigma Black Belt

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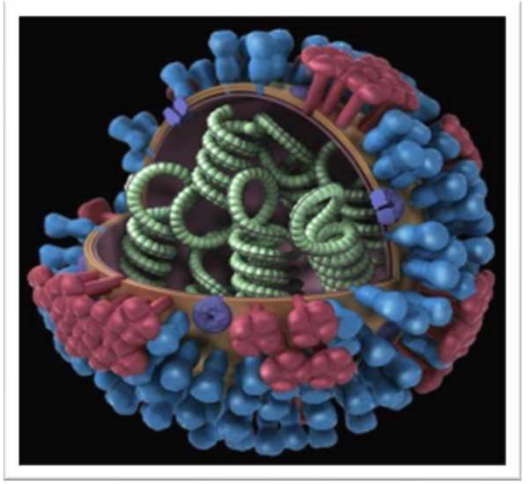
Viral Illnesses

- **Most upper respiratory illness**: viruses
- **Acute respiratory tract infection (ARTI)**

  Most common reason
  - Outpatient visits
  - Antibiotic prescription in adults
- **Multiple Random Control Trial Focused on ARTI**
  - Antibiotics: Ineffective
- **Acute Respiratory Infections**: Pediatric population
  - 232 million visits per year
- **Lower Respiratory Tract Infections**
  - 6 most common cause of death in high income countries in 2016
- **Influenza and Pneumonia**
  - 51,000 deaths in the USA



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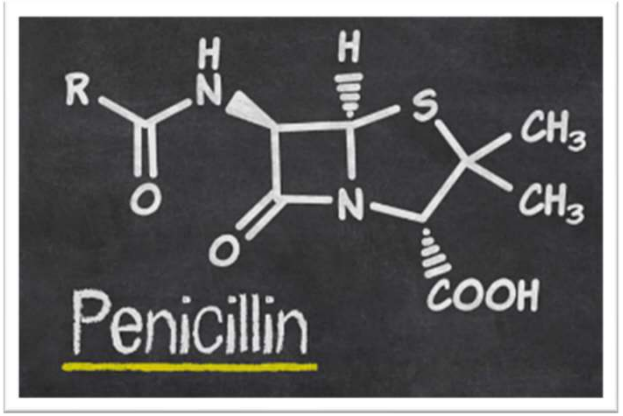
Harris AM, etal ; High Value Care Task Force of the ACP and for the CDC. Appropriate Antibiotic Use for Acute Respiratory Tract Infection in Adults. Ann Intern Med. 2016 Mar 15;164(6):425-34.

Antibiotic Stewardship

60% of US antibiotics: In outpatient setting

Antibiotic Resistance is one of the greatest public health threats

- Increased Cost
- Adverse reactions
- Toxicity
- Morbidity and Mortality



- **Antibiotic Resistance**:
  - 2 million infection
  - 23,000 deaths per year
  - $30 billion per year
- **Adverse Events:**
  - 143,000 Emergency department visit
  - 453,000 Cases of *C. difficile*; 30% were community-acquired with no recent hospitalizations
- 50% of all outpatient medications may be inappropriate based on:
  - Selection
  - Dosing
  - Duration
  - Unnecessary

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Sanchez GV, Fleming-Dutra KE, Roberts RM, Hicks LA. Core Elements of Outpatient Antibiotic Stewardship. MMWR Recomm Rep. 2016 Nov 11;65(6):1-12

CDC Tier

- Patient visits for outpatient and primary medicine
  184,030 patient visits
  30% of all antibiotics are unneeded

- **Tier 1: Antibiotics**: *Almost always indicated*
  - Bacterial infection: miscellaneous
  - Pneumonia
  - Urinary tract infections

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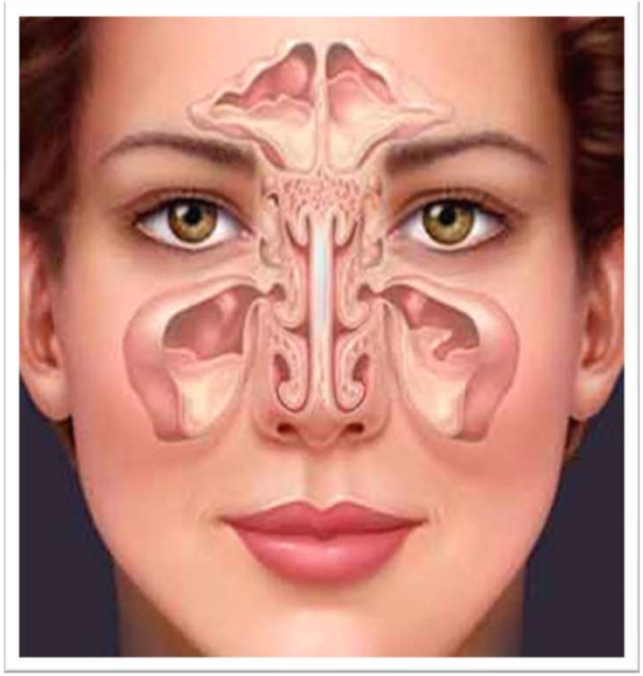
Reference: Fleming-Dutra KE, etal Prevalence of Inappropriate Antibiotic Prescriptions Among US Ambulatory Care Visits, 2010-2011. JAMA. 2016 May 3;315(17):1864-73.

CDC Tier

- **Tier 2: Antibiotic: *May be indicated***
  - Acne
  - Gastrointestinal Infections
  - Pharyngitis
  - Sinusitis
  - Skin and Soft Tissue Infections
  - Suppurative Acute Otitis Media



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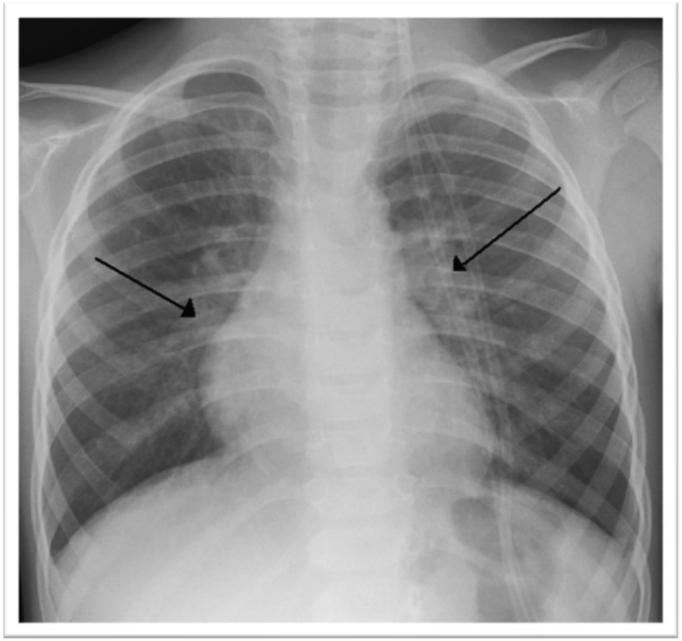
Reference: Fleming-Dutra KE, etal Prevalence of Inappropriate Antibiotic Prescriptions Among US Ambulatory Care Visits, 2010-2011. JAMA. 2016 May 3;315(17):1864-73.

CDC Tier

- **Tier 3: Antibiotics: *Not indicated***
  - Asthma
  - Allergies
  - Bronchitis
  - Bronchiolitis
  - Influenza
  - Viral pneumonia
  - Non-Suppurative Otitis Media
  - Viral Upper Respiratory Infection
  - Non-Bacterial:
    - Gastrointestinal
    - Respiratory
    - Skin
    - Genitourinary conditions



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Reference: Fleming-Dutra KE, etal Prevalence of Inappropriate Antibiotic Prescriptions Among US Ambulatory Care Visits, 2010-2011. JAMA. 2016 May 3;315(17):1864-73.

Past State

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Past State

- Published: 2014
- Study Design: Meta-analysis
- 1588 patients in 4 studies
- Population: Pediatrics
- Viral testing PCR
- Test: Time 24 hours
- Results: No statistically significant decrease in antibiotic use
- Next Steps: Adequately powered trials with antibiotic use as an outcome

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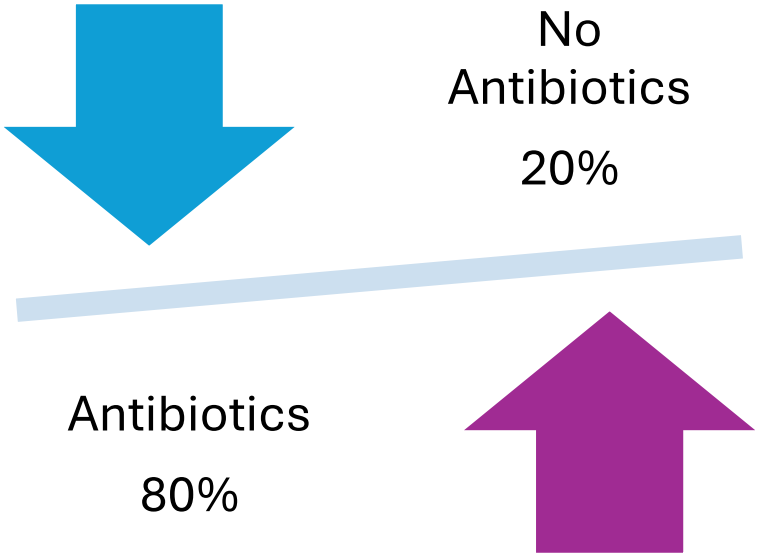
Reference: Doan Q, etal Rapid viral diagnosis for acute febrile respiratory illness in children in the Emergency Department. Cochrane Database Syst Rev. 2014 Sep 15;2014(9):CD006452.

Past State

- Published: 2019 Finland
- Study Design: Randomized controlled clinical trial
- 998 adult patient
- Area: Emergency department
- Population:
  - 80% received antibiotics
  - 17.5% viral testing positive rate
- Symptoms: Respiratory symptoms
  - Fever
  - Chest pain
  - Poor general condition
- Viral test: Multiplex PCR 16 viral panel
- Testing: Time 24 hours
- Results: No decrease in antibiotic use



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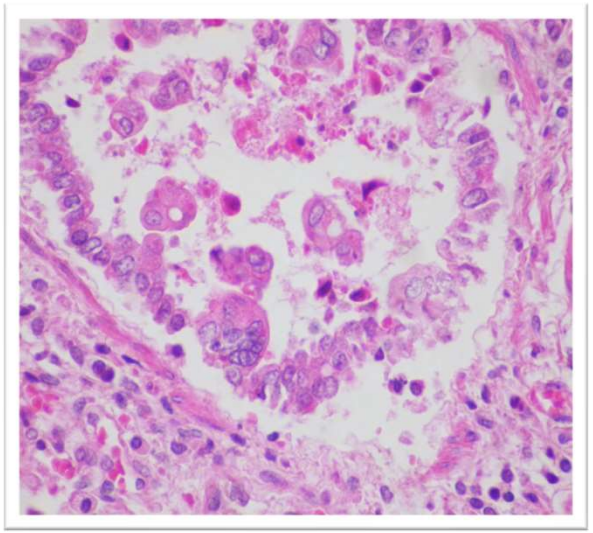
Reference: Saarela E, etal Impact of multiplex respiratory virus testing on antimicrobial consumption in adults in acute care: a randomized clinical trial. Clin Microbiol Infect. 2020 Apr;26(4):506-511.

Past State

- Published: 2023 Finland
- Study Design: Meta-analysis
- 754 abstract in 10 studies
- Population: All ages both inpatient and outpatient
- Viral testing
- Test: Influenza and RSV 48.2% to 48.7
- Timing 1-10 hours
- Results: No decrease in antibiotic use



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Reference: Kuitunen I, The Effect of Rapid Point-of-Care Respiratory Pathogen Testing on Antibiotic Prescriptions in Acute Infections-A Systematic Review and Meta-analysis of Randomized Controlled Trials. Open Forum Infect Dis. 2023 Aug 18;10(9):ofad443

Past State

- 1985 -2022 years reviewed Ovid Medline
- Study Design: Systematic Review and Meta-analysis
- 7157 patients 11 RCT studies
- Population: All ages
- Area: Emergency Department
- Rapid POC viral testing
- Timing >8 hours
- Results:
  - No decrease in antibiotic use or length of stay
  - Decreased in cxr and lab work

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Reference: Schober T, Wong K, DeLisle G, et al. Clinical Outcomes of Rapid Respiratory Virus Testing in Emergency Departments: A Systematic Review and Meta-Analysis. *JAMA Intern Med.* 2024;184(5):528–536. doi:10.1001/jamainternmed.2024.0037

Current State

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Current State

- Published 2018 Brisbane
- **Study Design:** Retrospective Cohort study
- 109 admitted patients
- Most Common diagnosis:
  - 2017 Influenza A
  - 2018 RSV
- All ages
- RSV, Influenza A and B
- Timing 1-10 hours
- **Results:**
  - Decrease antibiotic use for pediatric population
  - No change in adults
  - No change in time to discharge

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Reference: O'Callaghan K, Etal. Rapid testing for respiratory viruses: Impact on antibiotic use and time to patient discharge. Infect Dis Health. 2019 Aug;24(3):147-151.

Current State

- Published: 2002 Salt Lake City, Utah
- Area: Admitted to the hospital over two years
- 338 Patients
- Population: 1month to 17 years old
- Symptoms: fever and /or respiratory symptoms
- Viral testing: RSV, Influenza, adenovirus, and parainfluenza
- Most Common Diagnosis: Bronchiolitis, Pneumonia and Fever
- Most Common: + DFA (RSV) and received antibiotics diagnosis: AOM and Pna
- Testing time: Year 1= 8.5 hours, Year 2= 4.5 hours
- **Results:**
  - DFA testing decreased inappropriate antibiotic use from 52%-37%

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Reference: Byington CL, etal The effect of rapid respiratory viral diagnostic testing on antibiotic use in a children's hospital. Arch Pediatr Adolesc Med. 2002 Dec;156(12):1230-4.

Current State

- Published: 2021 Korea
- 915 admitted patients
- Population: Pediatrics ages
- Test: 20 pathogen panel: Covid, Metapneumon, rhino, entrero Influenza, para influenza, rsv, and adeno
- Panel included: Pertussis: 0, Chlamydophila pneumonia: 6 and Mycoplasma pneumona: 15
- Timing 1 hours
- **Results:**
  - Decrease antibiotic use from 51.7% to 39.4%
  - No decrease in oral antibiotics

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Reference: Kim YK, Etal Rapid Molecular Tests for Detecting Respiratory Pathogens Reduced the Use of Antibiotics in Children. Antibiotics (Basel). 2021 Mar 10;10(3):283.

Current state

- Published 2017 Nashville Tennessee
- Area: Discharged from hospital or Emergency Department
- 4107 Patients
- Population: 1month to 17 years old
- Symptoms: fever and /or respiratory symptoms
- Viral testing: POCT timing 3 hours
- Mostly Tier 3 Diagnoses
- Most common Viral illness: rhino/entro/rsv/parainfluenza
- **Results:**
  - ED: 25% decrease in antibiotics
  - Hospital Admissions: 43% decrease in antibiotics
- Next Steps: More studies are needed to assess viral testing and ABS

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Reference: Rankin DA, Etal Provider-ordered viral testing and antibiotic administration practices among children with acute respiratory infections across healthcare settings in Nashville, Tennessee. Antimicrob Steward Healthc Epidemiol. 2024 Mar 6;4(1):e29.

Future State

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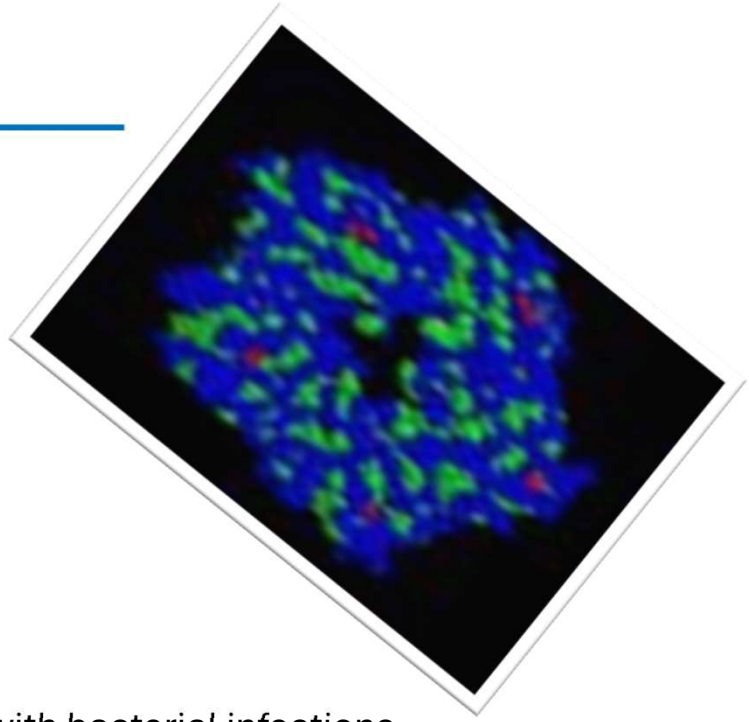
Future: C-reactive Protein



- Published 2022
- Study Design: Meta-anaylsis
- Location: Europe, Russia and Asia
- Patient area: Primary care
- 10,218 patients in 13 trails
- All Ages
- Test POC CRP
- C-Reactive Protein Acute phase reactant associated at higher levels with bacterial infections
- Peak at 48 hours increases by 6 hours still elevated at 72 hours
- **Results:**
  - Decrease in antibiotics from 516 to 397 prescriptions in intervention groups

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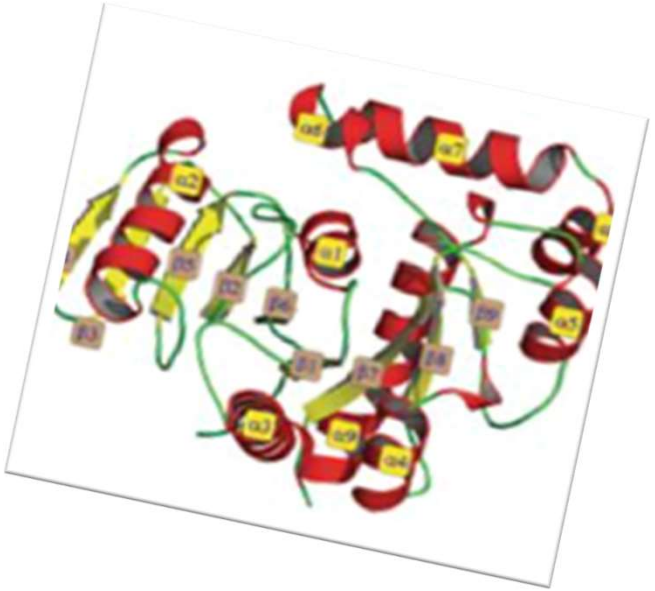
Reference: Smedemark SA, Etal Biomarkers as point-of-care tests to guide prescription of antibiotics in people with acute respiratory infections in primary care. Cochrane Database Syst Rev. 2022 Oct 17;10(10):CD010130.

Future: Myxovirus Resistance Protein A

- Published Year: 2022 Finland
- Myxovirus Resistance protein A-derivative of Interferon a/b associated with viral illness
- Study Design: Prospective, non RCT, feasibility study
- Patient area: Admitted
- Ages: 1 month to 16 years; 265 patients
- Test: Myxovirus resistance protein A
- Viral infections: Rhino/RSV/HumanMV/Adeno
- POCT: Finger stick
- Timing: 10-12 minutes
- **Results**: Moderate accuracy in detecting virus
  - sensitivity (74.4%) and specificity (80.0%)
- **Next Step**: High prevalence of co-infection a biomarker for bacterial infections is also needed



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Reference: Piri R, Myxovirus Resistance Protein A as a Marker of Viral Cause of Illness in Children Hospitalized with an Acute Infection. Microbiol Spectr. 2022 Feb 23;10(1):e0203121.

Future: Myxovirus resistance protein A (MxA) and C-Reactive Protein (CRP)

- Publication: 2017 Boston
- Study Design: Prospective Cross-sectional
- Patient Area: Emergency Departments
- Ages: All ages 205 patients
- Symptoms: Fever and URI symptoms
- Test POCT blood test
- Detected Bacterial 91.7% (80 % Sensitivity and 93%specificity)
  - Throat/NP/PCT >0.25/WBC>15,000 or bandemia
- Detected viral 84% (87 % Sensitivity and 83%specificity)
  - Influenza/Adeno/RSV/HumanMV/Parainf/EBV

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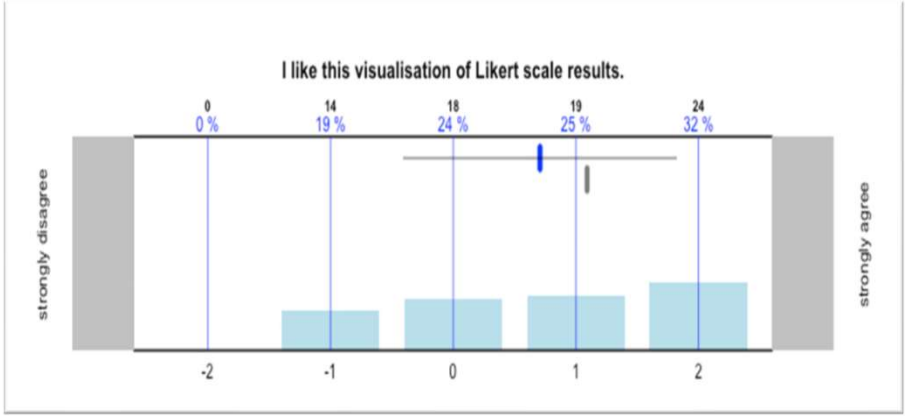
Reference: Self WH, Diagnostic Accuracy of FebriDx: A Rapid Test to Detect Immune Responses to Viral and Bacterial Upper Respiratory Infections. J Clin Med. 2017 Oct 7;6(10):94.

Future: Mixed Testing

- Published Year: 2023 Jan-June
- Study Design: Prospective, non RCT, feasibility study
- Location: UK
- Patient area: Primary care
- Ages: >1year 162 patients average age is 57
- Patients with Lower Respiratory Tract Infections
  - Symptoms: cough <21 days, infective in origin
  - Other symptoms SOB, sputum chest pain
  - Exclude if antibiotic in last month
  - Median symptoms duration 7 days
  - “Deemed likely to receive antibiotics.” using a Likert scale
- 28 days follow up
- Test: Myxovirus resistance protein A and CRP
- POCT: Finger stick
- Timing: 10-12 mins



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Reference: Wilcox CR, Et.al Use of the FebriDx® host-response point-of-care test may reduce antibiotic use for respiratory tract infections in primary care: a mixed-methods feasibility study. J Antimicrob Chemother. 2024 Jun 3;79(6):1441-1449

Myxovirus resistance protein A and CRP Test

- Results:
- 157 patients
  - 66% - CRP - MxA
  - 18% +CRP - MxA,
  - 3% -CRP + MxA,
  - 12% +CRP +MxA

- Antibiotic Use:
  - Pretesting 86% of provider plan for antibiotics
  - Post testing 45% of providers used antibiotics
  - Decrease in 41%

- **Next Steps:** Need for Randomized Control Trail

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Future: Procalcitonin

- Year: 2023
- AACC Guidance Document
- Patient area: all
- Ages: all
- Test: Procalcitonin (Acute phase reactant normally undetectable)
  - Bacterial infection: cause cytokine mediated: IL 1b, TNF A and IL 6
  - Viral illness: cause counterregulatory cytokine: IL g
  - Increases within 2 hours
  - peaks at 12 hours
  - Still elevated at 72 hours
- POCT: Finger stick
- Timing: 1-2 hours
- Decrease the need for antibiotics in pneumonia and critical ill
- All other limited

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Reference: A Chambliss, AACC Guidance Document on the Clinical Use of Procalcitonin, *The Journal of Applied Laboratory Medicine*, Volume 8, Issue 3, May 2023, Pages 598–634,

Future: Mixed Testing

- Year: 2014 2020
- Study Design: Meta-anaylsis
- 18 studies
- Patient area: all
- Ages: all
- Test: RVP and Procalcitonin
- POCT: Finger stick and swab
- Timing: 10-12 mins
- RVP no statistical improvement in antibiotic stewardship but combined with PCT can reduce antibiotic use duration

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Reference: Covert K, Bashore E, Edds M, Lewis PO. Utility of the respiratory viral panel as an antimicrobial stewardship tool. J Clin Pharm Ther. 2021 Apr;46(2):277-285

Q&A

Please submit your question on the webinar platform

Identifying Children Likely to Benefit From Antibiotics for Acute Sinusitis, an article that Patrick referenced in the Q&A session, is available here:
https://jamanetwork.com/journals/jama/fullarticle/2807568

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