Infectious Disease
- Antimicrobial stewardship
- Hepatitis C
- Adult immunizations

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Infectious Disease: Antimicrobial Stewardship

ANTIBIOTIC STEWARDSHIP BEYOND THE ACUTE CARE SETTING
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Objectives

- Evaluate the need for antibiotic stewardship beyond the acute care hospital setting
- Outline core elements of antimicrobial stewardship in community and long term care facilities
- Describe methods of monitoring, tracking, reporting and implementing change in facility practices

Background

- 60% of U.S. antibiotic expenditures for humans are related to care received in outpatient settings
- Complications from antibiotics range from rashes and diarrhea to severe allergic reactions
  - Drug events lead to 143,000 ER visits annually
- Antibiotic treatment is the most important risk factor for C diff infection

- 60% of U.S. antibiotic expenditures for humans are related to care received in outpatient settings
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What is Antimicrobial Stewardship?

• Using the right antibiotic at the right time at the right dose for the right duration

• Primary goal
  Optimize clinical outcomes while minimizing unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms, and the emergence of resistance

Antibiotics are Misused in a Variety of Ways

- Given when they are not needed
- Continued when they are no longer necessary
- Given at the wrong dose
- Broad spectrum agents are used to treat very susceptible bacteria
- The wrong antibiotic is given to treat an infection

Significance and Relevance

• Antibiotics are among the most commonly prescribed drugs used in human medicine
  • 50% are not needed or not optimally prescribed
  • At least 30% of outpatient antibiotic prescriptions in the United States are unnecessary

• Annual impact of antibiotic resistant infections
  • 2 million illnesses
  • 23,000 deaths
  • 8 million additional hospital days
  • $20-35 billion excess direct healthcare costs
  • Up to $35 billion societal costs


IDSA and the SHEA guidelines for developing an institutional program to enhance antimicrobial stewardship.

PCAST Report to the President on Combating Antibiotic Resistance.
Antibiotic misuse adversely impacts patients--resistance

Getting an antibiotic increases a patient’s chance of becoming colonized or infected with a resistant organism.

Annual prevalence of imipenem resistance in *P. aeruginosa* vs. carbapenem use rate

Antibiotic resistance increases mortality
Mortality associated with carbapenem resistant (CR) vs susceptible (CS) Klebsiella pneumoniae (KP)

Overall Mortality
Attributable Mortality

OR 3.71 (1.97-7.01)
OR 4.5 (2.16-9.35)

Improving antibiotic use reduces resistance

P. aeruginosa susceptibilities before and after implementation of antibiotic restrictions
(CID 1997;25:230)

Percent susceptible

Before
After

P<0.01 for all increases
Antibiotic exposure is the single most important risk factor for the development of *Clostridium difficile* associated disease (CDAD).

- Up to 85% of patients with CDAD have antibiotic exposure in the 28 days before infection.

Emergence of the NAP-1/B1 or “epidemic” strain of *C. difficile* have intensified the risks associated with antibiotic exposure.

Epidemic strain of *C. difficile* is associated with increased risk of morbidity and mortality.

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**Estimated burden of healthcare-associated CDI**

- **Hospital-acquired, hospital-onset:** 165,000 cases, $1.3 billion in excess costs, and 9,000 deaths annually.
- **Hospital-acquired, post-discharge (up to 4 weeks):** 50,000 cases, $0.3 billion in excess costs, and 3,000 deaths annually.
- **Nursing home-onset:** 263,000 cases, $2.3 billion in excess costs, and 16,500 deaths annually.

Antibiotic misuse adversely impacts patients—adverse events

- Fluoroquinolones are associated with
  - CDAD
  - Tendinopathy/rupture
Centers for Disease Control and Prevention (CDC): Perspective on Antimicrobial Stewardship

Benefits of Antibiotic Stewardship:
• Helps streamline therapy and improve patient outcomes
• Helps set duration of therapy
• Improves handoff communication
• Reduces the emergence of multidrug resistant pathogens and C. difficile colitis
• Reduces adverse drug reactions

Antibiotic resistance is a major public health problem. We now have organisms resistant to all readily available antibiotics. Some would argue that we are in the post-antibiotic era. Antibiotics are a shared resource.

Principles of Antimicrobial Stewardship:
• Obtain Quality Cultures
• Before antibiotics initiated (if possible)
• Utilize Respiratory Therapy to obtain sputum samples
• Avoid surface cultures
• Establish source control if applicable
• Indications are written with all antibiotic orders
• Streamline to narrow spectrum antibiotics following culture results
• Set antibiotic durations of therapy at time of prescribing or immediately following clinical response

For more information refer to the stewardship website on OASIS (Medical access) or contact the Infectious Disease Pharmacist

Quality Measures Identified:
• Multidisciplinary process to review antimicrobial utilization and local susceptibility patterns
• Systems to prompt appropriate use of antimicrobial agents
• Antibiotic orders include indication for use
• Discontinue/review of need/selection of antibiotics at 72
• IV to PO program

CDC report: Antibiotic Resistance Threats in the United States

September 2013

Assessment of domestic antibiotic resistance threats

C. difficile
Carbapenem-resistant Enterobacteriaceae (CRE)
Drug-resistant Neisseria gonorrhoeae
MDR Acinetobacter
DR Campylobacter
ESBL
VRE
MRSA
VISA
Erythromycin-resistant Streptococcus Group A
Clindamycin-resistant Streptococcus Group B

Medicine: Antimicrobial Stewardship

Timeline of Recent Events

CDC Federal Engagement in Antimicrobial Resistance.

September 2013
• CDC report: Antibiotic Resistance Threats in the United States

September 2014
• National Strategy to Combat Antibiotic-Resistant Bacteria (CARB)
• Executive Order 13676: Combating Antibiotic-Resistant Bacteria

March 2015
• National Action Plan for Combating Antibiotic-Resistant Bacteria

June 2015
• White House hosts the Forum on Antimicrobial Resistance

November 2015
• CARB First 180 Days Report
• The Joint Commission (TJC) Proposed Standards for Antimicrobial Stewardship
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National Targets by 2020

<table>
<thead>
<tr>
<th>Target</th>
<th>CDC Recognized Urgent Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%</td>
<td>Incidence of overall C. diff infection</td>
</tr>
<tr>
<td>60%</td>
<td>Hospital acquired CRE infections</td>
</tr>
<tr>
<td>&lt;2%</td>
<td>Prevalence of ceftriaxone-resistant Neisseria gonorrhoeae</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Target</th>
<th>CDC Recognized Serious Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>35%</td>
<td>Hospital acquired MDR Pseudomonas species infections</td>
</tr>
<tr>
<td>≥50%</td>
<td>Overall MRSA BSI</td>
</tr>
<tr>
<td>25%</td>
<td>Number of MDR TB infections</td>
</tr>
<tr>
<td>≥25%</td>
<td>Rate of antibiotic-resistant invasive pneumococcal disease &lt;5 yo</td>
</tr>
<tr>
<td>≥25%</td>
<td>Rate of antibiotic-resistant invasive pneumococcal disease &gt;65 yo</td>
</tr>
</tbody>
</table>

By 2020 significant outcomes of Goal 1

- Improve antibiotic stewardship across all healthcare settings
- Reduce inappropriate antibiotic use by 50% in outpatient settings
- Establish state antibiotic resistance prevention programs in all 50 states to monitor regionally important MDR organisms and provide feedback and technical assistance
- Eliminate medically-important antibiotics for growth promotion in food producing animals
- Requirement of veterinary oversight for use of medically-important antibiotics in the feed or water for food-producing animals

Goal 1: Objectives & Milestones

- Strengthen antibiotic stewardship in outpatient and long-term care settings by developing, expanding, and monitoring progress
  - Within 1 Year
    - Propose regulations to implement antibiotic stewardship programs in ambulatory surgery centers, dialysis clinics, and other inpatient facilities
    - National Healthcare Safety Network (NHSN) will begin tracking the number of facilities with stewardship policies and programs
Goal 1: Objectives & Milestones

- Improve antibiotic stewardship across all healthcare settings

Within 3 Years

- Centers for Medicare & Medicaid Services (CMS) will issue new Conditions of Participation (COP) Interpretive Guidelines to advance compliance with recommendations in CDC's Core Elements
- All long-term acute care hospitals, post-acute care facilities, ambulatory surgery centers and dialysis centers governed by CMS COP will be required to implement antibiotic stewardship programs
- Training webinars for CMS surveyors will be updated to include information on antibiotic utilization in nursing homes
- CDC and others will issue guidance on AS and best practices for ambulatory surgery centers, dialysis centers, nursing homes, long term care facilities, doctor’s offices, and other outpatient settings, pharmacies, Emergency departments and correctional facilities.


- Issued final rule Sept 28, 2016
- To improve the care and safety of 1.5 million residents in >15,000 long term care facilities that participate in CMS programs
- Targets:
  - Reduce unnecessary hospital readmissions and infections
  - Improve quality of care and strengthen safety measures
  - Update facility’s infection prevention and control program, including requiring an infection prevention and control officer and an antibiotic stewardship program that includes antibiotic use protocols and a system to monitor antibiotic use


Goal 1: Objectives & Milestones

- Improve antibiotic stewardship across all healthcare settings

Within 5 Years

- Department of defense will support stewardship programs and interventions critical for maintaining quality health care throughout the military healthcare system
- CDC will work with select hospital systems to expand antibiotic use reporting and stewardship implementation, and will partner with nursing organizations to develop and implement stewardship programs and interventions in a set of nursing homes
- All states will establish or enhance antibiotic stewardship activities in healthcare delivery settings

Goal 2: Objectives & Milestones

- Enhance reporting infrastructure and provide incentives for reporting
  - Within 1 Year
  - CDC will develop an implementation plan for regional laboratories that considers all aspects of operation, including specimen transport, testing, reporting and data-sharing
  - Within 3 years
  - CDC will charge at least 5 public labs with rapid detection of outbreaks caused by MDR pathogens

- Provide incentives for timely reporting of antibiotic-resistance and antibiotic use in all healthcare settings
  - Within 1 Year
  - It has been proposed for NHSN data reporting to add to an institution's meaningful use

Goals continued

- **Goal 3**: Advance development and use of rapid and innovative diagnostic tests
  - To distinguish between bacterial and viral infections
  - Determine antibiotic-resistance profiles

- **Goal 4**: Accelerate research to develop new antibiotics, other therapeutics, vaccines, and diagnostics

- **Goal 5**: Improve international collaboration and capacities for prevention, surveillance and antibiotic research and development

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More patients get infections when facilities do not work together.

- **Common Approach**
  - 2,000 patients will get CRE
  - CRE will impact 12% of patients.

- **Independent Efforts**
  - 1,500 patients will get CRE
  - CRE will impact 8% of patients.

- **Coordinated Approach**
  - 400 patients will get CRE
  - CRE will impact 2% of patients.

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Antibiotic Usage in Nursing Homes

- Total antibiotic usage 11.1% (Usage/100 residents)
- 70% of NH residents will receive a course of antibiotics in any given year
  - Many are treated multiple times
- Most common indications:
  - UTI 32%
  - Respiratory 24%
- Appropriateness for AU for UTI is 15-45%
- AU for respiratory tract predominantly for upper
- 23% of all usage is for prophylaxis

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Infectious Disease: Antimicrobial Stewardship

Antibiotic Usage in Nursing Homes

- 40-75% of AU is inappropriate
  - Drug selection not correct
- For 38% of antibiotics administered, key prescribing information is not documented — no duration, stop date or rationale
  - 66% of antibiotic prescriptions are started via telephone orders

The Major Culprits Contributing to Overuse

- 1) Urine
  - Up to 50% of elderly women in NH’s have asymptomatic bacteriuria and pyuria
- 2) Respiratory Tract Infections
  - Most are URI’s; Ambiguous CXR reports
- 3) Cellulitis
  - Frequently venous stasis, lipodermatosclerosis
- 4) Unnecessary transitions of care antibiotics
  - No stop date, not needed
Family Pressure
Residents are sicker, frail, complex and have many comorbidities
Pressure to not send patients back to hospital
Common misperception that UTI’s are a common cause of functional decline in the elderly
Residents with confusion and dementia are more likely to be continuously bacteriuric without an established UTI
Antibiotic Stewardship Goals

1. Ensure that only those patients who truly have bacterial infections receive antibiotics
2. Preserve the life expectancy of antibiotics
3. Reduce antibiotic-related harms (CRE, C diff)
4. Reduce unnecessary spending

- Respiratory Panel
  - Also avail.
    - Meningitis/Encephalitis Panel
    - GI Panel
    - Bld Cx Panel

1 Test. 20 Respiratory Pathogens. All in about an hour.

1 Test. 16 Targets. All in about an hour.

Procalcitonin

- Most specific readily available biomarker for bacterial infections
- Interpret in clinical context
- Serial measurements more useful
- Not a substitute for good clinical judgment
- Best clinical scenarios for use: Sepsis, and Pneumonia
Obstacles to Appropriate Antibiotic Prescribing in Nursing Homes

- Timeliness of test results
- No IT department
  - Lack of EHR’s
- Outside Pharmacies
- High staff turnover
- Lack of leadership oversight or commitment

Education Based Resources

- CDC Core Elements
- Agency for Healthcare Quality and Research (AHRQ) Nursing Home Antimicrobial Stewardship Guide

Core elements of Performance in Nursing Homes

LEADERSHIP COMMITMENT
ACCOUNTABILITY
DRUG EXPERTISE
ACTION
TRACKING
REPORTING
EDUCATION
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Core Elements

**LEADERSHIP COMMITMENT**
- Formal, written statement in support of improving antibiotic use
- Include stewardship-related duties in position descriptions for the medical director, clinical nurse leads, and consultant pharmacist
- Communicate expectations about antibiotic use, monitor and enforce AS policies
- Create a culture which promotes stewardship

**ACCOUNTABILITY**
- Empower director to set standards for antibiotic prescribing
- Empower the director of nursing to set the practice standards for assessing, monitoring, and communicating changes in a resident’s condition by frontline nursing staff
- Engage consultant pharmacist in supporting and reporting antibiotic use data

Core Elements

**ACCOUNTABILITY**
- Infection preventionist review antibiotic resistance patterns, collect and analyze infection surveillance data which can be used for stewardship purposes
- Laboratory support for MDR organism alerts, education on technology and creation of annual antibiogram

**DRUG EXPERTISE**
- Incorporate consultant pharmacist trained in ID or antibiotic stewardship
- Collaborate with antibiotic stewardship program leads at the hospitals within your referral network
- Develop relationships with ID consultants interested in supporting your facilities’ stewardship efforts

Core Elements

**ACTION**
- Policies
  - Documentation of dose (route), duration (start/end date, planned days of therapy), indication (including rational, treatment site) for every antibiotic
  - Develop treatment recommendations based on guidelines and local susceptibility
  - Establish best practices for use of microbiology testing
  - Review antibiotic agents available on site
- Broad interventions
  - Develop and implement algorithms for assessment of residents suspected of having an infection
  - Develop an antibiogram
  - Antibiotic time out: clinicians to review antibiotics at 48-72 hours
  - Reduce prolonged antibiotic treatment courses for common infections

CDC Core Elements of Antibiotic Stewardship for Nursing Homes
The Joint Commission. Proposed Standard for Antimicrobial Stewardship in AHC, CAH, HAP, NCC, and OBS.
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Core Elements

**Diagnosis and infection specific interventions**
- Reduce antibiotic use in asymptomatic bacteriuria
- Reduce antibiotic prophylaxis for prevention of UTI
- Optimize management of nursing home-associated pneumonia
- Optimize use of superficial cultures for management of chronic wounds

**Process Measures**
- Completeness of clinical assessment documentation at the time of antibiotic prescription
- Completeness of antibiotic prescribing documentation
- Antibiotic selection is consistent with recommended agents for specific indications

**Measures of Antibiotic Use**
- Point prevalence of antibiotic use
- Track new antibiotic starts
- Antibiotic days of therapy (DOT/1000 resident-days)

**Antibiotic Outcome Measures**
- By counts of antibiotic(s) administered to patients per day = Days of therapy (DOT) / per 1000 patient days

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Core Elements

**ACTION**

**TRACING**
“If You Do Not Measure, You Cannot Change”

“You Cannot Improve What You Cannot Measure”

- Identify areas for targeted intervention
- Assess response to an intervention
- Provide information/feedback to prescribers
- Justify importance of stewardship to administrators and funders
- Future requirement to receive healthcare dollars

Antimicrobial Usage Data: Why Measure?

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Why Is Measurement Important?

- Every ASP must measure antibiotic use
- Dates of therapy (DOT’s) are preferred, but Defined Daily Dose (DDD’s) remain an alternative for sites that cannot obtain patient-level antibiotic use data
- ASP’s should consider measurement of appropriate antibiotic use, particularly when assessing results of a targeted intervention, and share that data with clinicians to help inform their practice
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DOT Example
- Each antibiotic prescribed on a given day counts as one day of therapy.
- Days present is the number of days that a patient received care in a specific patient-care location for any portion of time during a calendar day.
- If the total days of therapy was 8, and patient days present for the facility was 50, the usage rate would be calculated as:

\[
\text{Days of Therapy (DOT)} \times \frac{1000}{\text{Days Present}}
\]

\[
8 \times 1000 = 160 \text{ DOT per 1000 days present}
\]

Days of therapy (DOT) /per 1000 patient days

CDC Core Elements of Hospital Antibiotic Stewardship Programs
AHRQ Toolkits

- Establish an Antibiotic Stewardship Program and choose one or more interventions
  - May be tailored to your specific institution
  - Monitor and Sustain Antibiotic Stewardship
    - Monthly Summary Reports
- Determine whether it is necessary to treat a potential infection with antibiotics
- Help Prescribing Clinicians choose the right antibiotic
- Educate and engage residents and family members

Examples of Basic Measures to Take

- Monthly antibiotic usage
  - Review of quinolone use
  - Duration of therapy
  - Documented reasons for antibiotic initiation
- Antibiotics for patients admitted from hospitals
- Monitoring of urinalyses ordered and reasons
- Isolation reviews
- Education
  - Staff
  - Residents and Families

AHRQ Toolkit

- Toolkit 2: Monitor and Sustain Stewardship
  - Agenda examples
  - Tools for tracking and feedback
A decrease in systemic antibiotic use by 30.1% \( (P < .001) \) leads to 25% fewer positive C. difficile cases.

Leadership Commitment: Dedicating necessary human, financial and information technology resources

Accountability: Appointing a single leader responsible for program outcomes. Experience with successful programs show that a physician leader is effective

Drug Expertise: Appointing a single pharmacist leader responsible for working to improve antibiotic use.

Action: Implementing at least one recommended action, such as systematic evaluation of ongoing treatment need after a set period of initial treatment (i.e., "antibiotic time out" after 48 hours)

Tracking: Monitoring antibiotic prescribing and resistance patterns

Reporting: Regular reporting information on antibiotic use and resistance to doctors, nurses and relevant staff

Education: Educating clinicians about resistance and optimal prescribing

Core Elements for ABS

ASP in Skilled Nursing Facility

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Prescriber Feedback Tools

Core Elements of Outpatient Antibiotic Stewardship
CDC’s Core Elements of Outpatient Antibiotic Stewardship

- Commitment: Demonstrate dedication to and accountability for optimizing antibiotic prescribing and patient safety.
- Action for policy and practice: Implement at least one policy or practice to improve antibiotic prescribing, assess whether it is working, and modify as needed.
- Tracking and reporting: Monitor antibiotic prescribing practices and offer regular feedback to clinicians, or have clinicians assess their own antibiotic prescribing patterns.
- Education and expertise: Provide educational resources to clinicians and patients on antibiotic prescribing, and ensure access to needed expertise on optimizing antibiotic prescribing.
Conditions for which antibiotics are overprescribed
- Bronchitis, URI's, viral pharyngitis

Conditions for which antibiotics may be indicated, but the wrong drug, dose or duration is selected
- UTI's, sinusitis

Conditions for which antibiotics are started prematurely
- Strep pharyngitis, otitis media, sinusitis

Identify barriers that lead to deviation from best practices
- Clinician knowledge gaps about best practices and clinical practice guidelines
- Clinical perception of patient expectations for antibiotics
- Perceived pressure to see patients quickly
- Clinical concerns about decreased patient satisfaction with clinical visits when antibiotics are not prescribed

Establish standards for antibiotic prescribing
- Implementation of national practice guidelines
  - AAP, IDSA, ACP
- Summary of current national clinical practice guidelines for common outpatient infections:
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Tracking and Reporting
- Peer performance comparisons
- Automatic EMR data extraction
- Prescribing habits
- Diagnosis shifting
- Clinician’s patient population

Education and Expertise
- Use effective communication strategies to educate patients about when antibiotics are and are not needed
  - Educate about potential harms of antibiotics
- Get staff involved
- Provide patient education materials
  - http://www.cdc.gov/getsmart
- Ensure timely access to persons with expertise

1. Obtain the right cultures before starting therapy
2. Follow guidelines for empirical treatment
3. Limit unnecessary combinations
4. Reassess your therapy after 24 to 72 hours (De-escalate)
5. Reduce duration of therapy
6. Use laboratory tools
7. Verify “PCN allergy”
8. Treat infections, not colonizations
9. Prevention
10. Include Skilled Nursing Facilities
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How did the current duration of therapy standards come to be?

- Anecdotal data and expert opinion
- Real variables to consider:
  - Immune status
  - Anatomical abnormalities/barriers
  - Bacterial load
  - MIC
  - Antibiotics PK/PD
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### PCN Allergy

- 30 million report to be PCN-allergic, estimated 28.5 million are not (19 out of 20).
- History of penicillin allergy translated to:
  - Received more quinolones, clindamycin, vancomycin
  - Longer hospital stay (mean 0.59 days)
  - More resistant infections during follow up:
    - 23.4% more C. difficile, 14.1% more MRSA, 30% more VRE
- Need better history of reaction
- Type I vs. non-Type I reaction
- PCN skin test patients with true Type I risk

### 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</td>
<td>Short: 3-5, Long: 7-10</td>
</tr>
<tr>
<td>Nosocomial pneumonia</td>
<td>Short: ≤8, Long: 10-15</td>
</tr>
<tr>
<td>Pyelonephritis</td>
<td>Short: 5-7, Long: 10-14</td>
</tr>
<tr>
<td>Intraabdominal infection</td>
<td>Short: 4, Long: 10</td>
</tr>
<tr>
<td>Acute exacerbation of chronic bronchitis and COPD</td>
<td>Short: ≤5, Long: ≥7</td>
</tr>
<tr>
<td>Acute bacterial sinusitis</td>
<td>Short: 5, Long: 10</td>
</tr>
<tr>
<td>Cellulitis</td>
<td>Short: 5-6, Long: 10</td>
</tr>
<tr>
<td>Chronic osteomyelitis</td>
<td>Short: 42, Long: 84</td>
</tr>
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**Treat Bacterial Infection, not Colonization**

- Many patients become colonized with potentially pathogenic bacteria but are not infected
  - Asymptomatic bacteriuria or foley catheter colonization
  - Tracheostomy colonization in chronic respiratory failure
  - Chronic wounds and decubiti
  - Lower extremity stasis ulcers
  - Chronic bronchitis
- Can be difficult to differentiate
  - Presence of WBCs not always indicative of infection
  - Fever may be due to another reason, not the positive culture

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Prevention

- Vaccinate
- Remove catheters
- Hand washing
- Proper Isolation
- Proper disinfection

Improving Antibiotic use is a public health imperative

- Antibiotics are the only drugs where use in one patient can impact the effectiveness in another
- Antibiotic are a limited resource
- If all involved do not use antibiotics prudently, we will all suffer the consequences

It is not difficult to make microbes resistant to penicillin in the laboratory by exposing them to concentrations not sufficient to kill them, and the same thing has occasionally happened in the body.
—Alexander Fleming, 1945
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“The microbes are educated to some purpose and a host of penicillin-fast organisms is bred out. In the killing of these organisms, penicillin, playing with penicillin, is morally responsible for the death of the man who finally succumbs to infection with the penicillin-resistant organism. I urge this end can be averted.

Sir Alexander Fleming, 1945

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The History of Medicine

2000 B.C.—Here, eat this root.
1000 A.D.—That root is heathen. Here, say this prayer.
1650 A.D.—That prayer is superstition. Here, drink this potion.
1950 A.D.—That potion is snake oil. Here, swallow this pill.
1945 A.D.—That pill is ineffective. Here, take this penicillin.
1955 A.D.—Oops... bugs mutated. Here, take this tetracycline.
1960–1979—39 more 'oops.' Here, take this more powerful antibiotic.
2000 A.D.—The bugs have won! Here, eat this root.
—Anonymous (WHO, 2000)
Hepatitis C update: Toward Eradication.

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Estimated 70 Million Persons Living With HCV

30 Countries Account for 80% of HCV Infections
In the US HCV is 4 Times as Prevalent as HIV and HBV

- A 2011 study estimated that as many as 5.2 million persons are living with HCV in the United States.\(^2\)\(^3\)
- Based on a 2015 literature search that takes into account populations excluded from NHANES, the number of US residents who have been infected with HCV is ~4.6 million (range 3.4 million-6.0 million).\(^4\)

Global Call for HCV Elimination

- WHO vision: “A world where viral hepatitis transmission is stopped and everyone has access to safe, affordable, and effective treatment and care.”

2030 Targets
- Diagnosed
- Treated
- Reduced mortality

Feasible by scaling up key interventions:
- Hepatitis B vaccination and treatment
- Safe injection practices and safe blood
- Harm reduction for PWID
- Safer sex (including condom promotion)
- Hepatitis C cure

Infectious Diseases: HCV Update

Primary Care Clinicians Have a Critical Role in Hepatitis C Care

- Average pt load for primary care clinician: 2000 pts
- Average primary care clinician has 20 pts with hepatitis C virus infection in his/her practice


CDC, USPSTF, and AASLD/IDSA HCV Screening Recommendations

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<thead>
<tr>
<th>Population</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>One-time screening is recommended for persons born between 1945 and 1965, without ascertainment of HCV risk[1,3]</td>
</tr>
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</table>


<table>
<thead>
<tr>
<th>Risk</th>
<th>One-time screening is recommended for persons with these risk factors[1,3]:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• History of illicit injection drug use (IDU) or intranasal illicit drug use</td>
</tr>
<tr>
<td></td>
<td>• History of long-term hemodialysis</td>
</tr>
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<td>• Children born to anti-HCV-positive mothers</td>
</tr>
<tr>
<td></td>
<td>• History of transfusion with blood or organ transplantation before July 1992</td>
</tr>
<tr>
<td></td>
<td>• Were ever in prison</td>
</tr>
<tr>
<td></td>
<td>• HIV infection</td>
</tr>
<tr>
<td></td>
<td>• Chronic liver disease/hepatitis with unknown cause, including elevated liver enzymes</td>
</tr>
</tbody>
</table>

Infectious Diseases: HCV Update

CDC, USPSTF, and AASLD/IDSA
HCV Screening Recommendations

<table>
<thead>
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<td>- HIV infection</td>
</tr>
<tr>
<td></td>
<td>- Chronic liver disease/hepatitis with unknown cause, including elevated liver enzymes</td>
</tr>
</tbody>
</table>

Annual screening is recommended for current IDUs and HIV-infected MSM[3].


Recommended Testing Sequence for Identifying Current HCV Infection

- HCV antibody test
- HCV RNA test
- Provide care or link to care

Counseling for HCV-Infected Individuals

Prevent Hepatitis C Transmission
- Avoid sharing toothbrushes, dental, sharing equipment
- Prevent blood contact, do not donate blood
- Avoid illicit drugs: avoid reusing or sharing drug paraphernalia
- Risk of sexual transmission is low, except for people with HIV, multiple partners, or STIs

Reduce Progression of Liver Disease
- Test for conditions that accelerate fibrosis, such as Hepatitis B and HIV infections
- Evaluate for advanced fibrosis
- Update vaccinations
- Avoid alcohol
Recommendations for When and in Whom to Initiate HCV Treatment

Treatment for all: Unless pts already have short life expectancy, treatment is recommended for all pts with chronic HCV infection, regardless of genotype and fibrosis level[1]

– Treatment even at lower-stage fibrosis (F0-F1) improves survival[1]


Benefits of Curing HCV Extend Beyond the Liver

Cure

Decreased transmission

Improved clinical outcomes

Hepatic

Reduction in:

- Cirrhosis
- Decompensation
- HCC
- Transplantation

Extrahepatic

Improvement in:

- All-cause mortality
- Quality of life
- Malignancy
- Diabetes, insulin resistance, renal/cardiovascular outcomes
- Neurocognition


HCV Treatment in 2018

- Many highly effective, highly tolerable options
- All-oral therapy for all
- Most pts receive:
  - 8-12 wks of treatment
  - Once-daily dosing
  - Ribavirin-free therapy, for the vast majority of patients
- Patients with previous peginterferon/ribavirin or DAA treatment have a high cure rate
Infectious Diseases: HCV Update

Current All-Oral Therapies Highly Effective, Simple, Well Tolerated

DAA Era of HCV Therapy

What is the minimum you need to know before initiating HCV therapy?

- HCV genotype (sometimes)
- HCV resistance (sometimes)
- Stage of fibrosis:
  - Cirrhosis: yes/no (How?)
  - If yes, decompensated: yes/no
- Prior HCV treatment (Response)
- Current Medications:
  - To check for DDI.
- Renal function (eGFR<30 ml/min: yes/no)
**How to Stage Liver Fibrosis**

<table>
<thead>
<tr>
<th>Clinical or Laboratory Tests</th>
<th>Imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Liver biopsy</td>
<td>• AST-to-platelet ratio index</td>
</tr>
<tr>
<td></td>
<td>• FIB-4 index</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**DDIs Between Recommended DAAs and Selected Medications**

<table>
<thead>
<tr>
<th>Concomitant Medication</th>
<th>DCV</th>
<th>LDV</th>
<th>SOF</th>
<th>EBR/OZ</th>
<th>GLE/PIB</th>
<th>SOF/VE</th>
<th>SOF/VEL/V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid-reducing agents*</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Anticonvulsants*</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Cyclosporine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Digoxin</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Ethanol precursors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Herbals, St. John’s wort, milk thistle</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Statins*</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Rifamycin antimicrobials*</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*Some DDIs not class specific; see prescribing information for specific drugs within a class.

---

**ASCEND: Nonspecialists Can Effectively Treat HCV Infection**

- Nonrandomized phase IV trial of HCV treatment outcomes by DAA prescriber type
  - Pts (N = 500) from 13 urban, FQHCs in DC, all treated with LDV/SOF per FDA prescribing info; all providers given 3-hr training in AASLD/IDSA HCV guidance

<table>
<thead>
<tr>
<th>SVR12 (%)</th>
<th>NP/PA</th>
<th>Primary MD</th>
<th>Specialist MD</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td>124/150</td>
<td>139/160</td>
<td>243/260</td>
<td>516/600</td>
</tr>
<tr>
<td>87</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>84</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>86</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Infectious Diseases: HCV Update

**HCV-TARGET: Real-World Efficacy and Safety of SOF/VEL for GT1-6 HCV**

- Pts treated per local standard of care at academic (n = 45) and community medical centers (n = 19) in North America (n = 60) and Europe (n = 4)
- N = 451 for SOF/VEL; N = 119 for SOF/VEL + RBV

<table>
<thead>
<tr>
<th>Genotype</th>
<th>SOF/VEL</th>
<th>SOF/VEL + RBV</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>92</td>
<td>92</td>
</tr>
<tr>
<td>GT1</td>
<td>96</td>
<td>95</td>
</tr>
<tr>
<td>GT2</td>
<td>98</td>
<td>99</td>
</tr>
<tr>
<td>GT3</td>
<td>95</td>
<td>98</td>
</tr>
<tr>
<td>GT4</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>GT5</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>GT6</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

**SVR12 (%)**

<table>
<thead>
<tr>
<th>Genotype</th>
<th>All</th>
<th>GT1</th>
<th>GT2</th>
<th>GT3</th>
<th>GT4</th>
<th>GT5</th>
<th>GT6</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOF/VEL</td>
<td>92</td>
<td>96</td>
<td>98</td>
<td>95</td>
<td>100</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>SOF/VEL + RBV</td>
<td>92</td>
<td>95</td>
<td>99</td>
<td>98</td>
<td>98</td>
<td>80</td>
<td>20</td>
</tr>
</tbody>
</table>


---

**When to Refer to an Experienced Hepatitis C Treater**

- No Need to Refer
- Refer According to Provider Experience
- Refer

- Hepatitis C reinfection
- Prior treatment with peginterferon/ribavirin
- No advanced fibrosis
- Renal impairment
- Active substance use
- DAA Failure
- Compensated cirrhosis
- If required by insurance
- Recurrent hepatitis C virus infection after liver transplantation
- Decompensated cirrhosis (eg, ascites, jaundice, encephalopathy, bleeding varices)

---

**Many Options in 2018: AASLD-Recommended Regimens for HCV**

- Single- or 3-tablet coformulations, all with daily dosing
- For every genotype, there is an effective treatment
- Newest treatments effective for all genotypes, with cure rates of 95% or higher, even without ribavirin

**Regimen**

<table>
<thead>
<tr>
<th>Regimen</th>
<th>Approved Genotypes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grazoprevir/elbasvir*</td>
<td>1, 4</td>
</tr>
<tr>
<td>Sofosbuvir/ledipasvir</td>
<td>1, 4, 5, 6</td>
</tr>
<tr>
<td>Sofosbuvir/velpatasvir</td>
<td>1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Sofosbuvir/velpatasvir/voxilaprevir</td>
<td>1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Glecaprevir/pibrentasvir</td>
<td>1, 2, 3, 4, 5, 6</td>
</tr>
</tbody>
</table>

*Approved in advanced renal insufficiency and dialysis of Hepatitis C

Infectious Diseases: HCV Update

**Adverse Events**

- DAAs do not have the same adverse events as interferon and are generally well tolerated.
- Most common adverse events:
  - Headaches
  - Anemia (when ribavirin needed)
  - Other common adverse events: fatigue, nausea, diarrhea

**HCV Treatment for People Who Inject Drugs**

- **AASLD/IDSA HCV Treatment Guidelines:** "Recent or active IDU should not be seen as an absolute contraindication to HCV therapy"
  - "Scaling up HCV treatment in persons who inject drugs is necessary to positively impact the HCV epidemic in the US and globally"

- **Treatment as prevention**

**BENEFITS OF HCV TREATMENT**

- **Community**
  - Decreased risk of HCV transmission
  - Long-term cost savings
  - Impact greatest among groups with high transmission rates (PWIDs)

**Treated Individual**

- Cured of HCV
- Decreased risk of liver failure and liver cancer

**IFN-Free DAA Therapy: Opioid Substitution Therapy vs No Opioid Substitution Therapy**

![Graph showing SVR12 (%) for different treatment regimens with and without opioid substitution therapy.](#)
What About HCV Reinfection After SVR?

- Among 28 pts who completed HCV treatment in urban methadone clinic with follow-up viral testing, no reinfections identified through 1 yr posttreatment follow-up[6]


Recommended for GT1 Treatment-Naive or IFN- Experienced Pts, ± Compensated Cirrhosis

<table>
<thead>
<tr>
<th>Treatment Experience</th>
<th>Recommended Regimens for GT1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment naive</td>
<td>• EBR/GZR* 12 wks&lt;br&gt;• GLE/PIB 8 wks if no cirrhosis, 12 wks if compensated cirrhosis&lt;br&gt;• LDV/SOF 12 wks&lt;br&gt;• LDV/SOF 8 wks if no cirrhosis, nonblack, no HIV, HCV RNA &lt; 6 million IU/mL&lt;br&gt;• SOF/VEL 12 wks</td>
</tr>
<tr>
<td>PegIFN/RBV experienced</td>
<td>• EBR/GZR* 12 wks&lt;br&gt;• GLE/PIB 8 wks (only if no cirrhosis)&lt;br&gt;• LDV/SOF 12 wks (only if no cirrhosis)&lt;br&gt;• SOF/VEL 12 wks&lt;br&gt;• GLE/PIB 12 wks (compensated cirrhosis)</td>
</tr>
</tbody>
</table>

*For GT1a, only if no baseline NS5A resistant PNAS detected.

Recommended Regimens for Treatment-Naive or PegIFN/RBV-Experienced Pts With GT2 HCV

<table>
<thead>
<tr>
<th>No Cirrhosis</th>
<th>Compensated Cirrhosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>• GLE/PIB 8 wks&lt;br&gt;• SOF/VEL 12 wks</td>
<td>• SOF/VEL 12 wks&lt;br&gt;• GLE/PIB 12 wks</td>
</tr>
</tbody>
</table>

AASLD/IDSA HCV Guidance for Stage 4 or 5 Chronic Kidney Disease

- Stage 4 (severe) CKD: eGFR 15-29 mL/min
- Stage 5 (end-stage) CKD: eGFR <15 mL/min

<table>
<thead>
<tr>
<th>HCV GT</th>
<th>Recommended Regimens for Stage 4 or 5 CKD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a, 1b, 4</td>
<td>EBR/GZR 12 wks</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>GLE/PIB 8-16 wks*</td>
</tr>
</tbody>
</table>

*Use durations recommended for pts without CKD - based on cirrhosis, previous treatment experience.

Recommended Follow-up After HCV Treatment

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>No advanced fibrosis (Metavir stage F0-F2)</td>
<td>No hepatitis C follow-up</td>
</tr>
<tr>
<td>Advanced fibrosis (Metavir stage F3 or F4)</td>
<td>Twice-yearly ultrasound surveillance for hepatocellular carcinoma - If compensated cirrhosis (F4) also test for varices using baseline endoscopy</td>
</tr>
<tr>
<td>Ongoing hepatitis C risk or unexplained hepatic dysfunction</td>
<td>Test for recurrence or reinfection with quantitative hepatitis C RNA assay, counsel on risk of reinfection</td>
</tr>
<tr>
<td>Persistently abnormal liver tests</td>
<td>Test for other causes of liver disease</td>
</tr>
</tbody>
</table>

HBV Testing/Monitoring During HCV DAA Therapy

- Test all pts initiating HCV therapy for HBsAg, anti-HBc, and anti-HBs
  - Vaccinate if no HBV markers; follow flow chart below if HBV markers present

<table>
<thead>
<tr>
<th>HBsAg positive</th>
<th>HBsAg negative; anti-HBs positive (I anti-HBs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBV DNA detectable</td>
<td>Administer prophylaxis; HBV drug until HCV SVR12 or monitor for reactivation</td>
</tr>
<tr>
<td>HBV DNA &gt; 10^5 copies/mL or &gt; 1000 IU/mL when previously undetectable/quantifiable</td>
<td>“Insufficient data to provide clear recommendations” (Consider HBV reactivation if liver enzymes unexpectedly increase)</td>
</tr>
<tr>
<td>Treat with HBV drug</td>
<td></td>
</tr>
</tbody>
</table>
## Conclusion

- Remarkable advances in HCV treatment tolerability and efficacy
- Successful treatment prevents cirrhosis, decrease decompensation, hepatocellular cancer, and overall mortality and morbidity.
- Post SVR: continue liver disease management/HCC screening, monitor for HBV reactivation, and consider repeating HCV RNA quantitative PCR if ongoing risk of reinfection.
- HCV Treatment as Prevention has potential to decrease ongoing transmission.
- HCV elimination only possible with engagement, linkage, and treatment of more challenging populations.
Infectious Diseases: Adult Immunizations

Updates in Adult Vaccinations

David S. DeFeo, DO
NJAOPS Board of Directors
Diplomate AOBIHP
Diplomate AOBEM

What’s trending?

Disclosures

- NJAOPS Board of Directors
- I am in no way financially involved with the Centers for Disease Control, Food and Drug Administration, Advisory Committee for Immunization Practices, or any of the manufacturers of the following vaccines
- I am receiving no compensation aside from the standard honorarium

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Let's jump right in...

Zoster (Shingles)

- One million cases in the US each year
- Incidence of 5/1000 in 50-59 yo, and 11/1000 in those over 80 yo

Zoster Vaccine - Recombinant, Adjuvanted

- FDA Approved 10/20/17
- GlaxoSmithKline
- Two 0.5ml doses 2-6 months apart
- ACIP recommended for those 50 and older
- Efficacy wanes about 19 years post administration
- NNT to prevent Zoster 11-17
- NNT to prevent PHN 70-187
Infectious Diseases: Adult Immunizations

Phase 3 trial

- >30,000 participants
- Vaccine vs Placebo
- 96.6% effective adults 50-59
- 97.4% effective adults 60-69
- 91.3% effective adults 70 and older
- PHN was prevented in 91.2% of 50-59 yo, and 88.8% of those 70 and older

Side Effects

- 16.5% Grade 3 reaction rate
- 9.4% Grade 3 site reaction rate
- 10.8% of recipients reported grade 3 myalgias, fatigue, headache, fever, shivering, and/or GI symptoms
- Overall, 78% of recipients reported any pain, 45% reported any myalgias, and 45% reported any fatigue

Everything has side effects
Grades of Side effects

- **GRADE 1 (Mild)**
  - Transient or mild discomfort without limitation in activity. No medical intervention/therapy required.

- **GRADE 2 (Moderate)**
  - Daily activity is affected mild to moderately. No or minimal medical intervention/therapy required.

- **GRADE 3 (Severe)**
  - Daily activity is markedly reduced where some assistance usually required. Medical intervention/therapy required, hospitalization is possible.

- **GRADE 4 (Potentially life threatening)**
  - Extreme limitation to daily activity. Significant assistance required. Significant medical intervention/therapy, hospitalization or hospice care very likely.

Recommendations

- For use in immunocompetent persons 50-59, regardless if they’ve had ZVL or not
- If second dose is given more than 6 months after first, efficacy drops but still benefit
- Second dose does need to be repeated if given less than 4 weeks after first dose
- Can be co-administered with other vaccines

Contraindications

- Should not be given during active varicella outbreak
- Can be given to those on low dose immunotherapy (Those on 20mg or less of prednisone, or using inhaled steroids)
- High dose immunotherapy not studied
- Has not been studied in those who are seronegative for VZV
- Should not be given to those with allergies to the components of the vaccine
Alternative Therapy

- Merck
- Single Dose
- Recommended by ACIP in those 60 and older
- Efficacy wanes about 4-12 years post administration

Zoster Vaccine Live

- 2 RCT and 7 observational studies
- 70% efficacy in those 50-59
- 64% efficacy in those 60-69
- 38% in those 70 and older
- PHN was prevented in 65.7% in the 60-69 yo group, and 66.8% in those 70 and older

Efficacy
Infectious Diseases: Adult Immunizations

**Side effects**

- Site reactions reported in 48% of recipients
- Less than 1% reported grade 3 reactions
- Reports of disseminated rash and Zoster outbreaks in some trials with immunocompetent patients
- Fatal complications reported in immunocompromised recipients

**Time for a throwback**

Mom: He’s about to go viral any day now
Woman: You started an Instagram for him?
Mom: I didn’t vaccinate him

**Measles Mumps and Rubella**

- Still recommended 2 doses
- Ideally at 12-15 months old with booster at 4-6 yo (before school entry)
- Second dose can be given as soon as 28 days after first
Infectious Diseases: Adult Immunizations

Special Populations

- Students at post-high school educational institutions
- International travelers
- Healthcare professionals
- Women of childbearing age who are not pregnant
- People who care for or are around immunocompromised people
- People living with HIV without evidence of severe immunosuppression

Students Post-High School

- Titers should be checked
- Should undergo a 2 vaccine series separated by 28 days if immunity is not evident
- If not at a post-secondary institution, they should get at least one dose of vaccine
- Women of childbearing age who are not pregnant and do not have evidence of immunity should get one dose. They should not get pregnant for 28 days
  - If pregnant, should not get Rubella vaccine, despite lack of evidence the vaccine causes fetal harm

International Travel

- Children 6-11 months should get one dose
  - They should still get the standard series once 12 months of age
- Children 12 months and older should get 2 doses 28 days apart
- Teenagers and adults who do not show immunity on titre testing should receive 2 doses 28 days apart
Infectious Diseases: Adult Immunizations

Healthcare Professionals
- Should have immunity testing prior to starting
- If not proven to be immune, should have 2 doses 28 days apart
- Can continue to work despite still undergoing the series
  - No reports of recently vaccinated persons transmitting virus to patients

Immunocompromised Persons
- Household contacts of immunocompromised persons, 12 months or older, should get 2 doses 28 days apart unless already immune
- Those with HIV and no evidence of immunity should get 2 doses 28 days apart
- Those who were exposed peri-natally and received MMR before anti-retroviral therapy was begun should undergo a 2 dose series

Mumps Update
- Increase in outbreaks since 2015
- Vaccine rates highest on east coast, lower on west coast, and lower still in midwest
- As of October 2017, the ACIP recommends a third dose of mumps containing vaccine for those individuals identified by public health officials as being at risk of contracting mumps during an outbreak
What caused these outbreaks?

- 1977 the recommendation was one dose after 12 months of age
- 1989 recommendation was changed to current guidelines (2 doses, 12-15 mos and 4-6 yo)
- Decrease in mumps cases from 1990-2005
- Then 6584 cases reported in 2006, mostly in the midwest and college towns
- ACIP instituted 2 dose guidelines for school aged children and adults in high risk populations
  - Outbreaks continued to occur, prompting the ACIP to investigate a 3rd dose

Reasoning

- Median immunity from 2 dose guideline is 88%, with ranges of 31% to 95%
  - Predominant mumps strain in US is genotype G
  - Most mumps containing vaccines contain genotype A
- Individuals who had gotten their second dose of MMR greater than 13 years prior to outbreak were at 9+ times greater risk of contracting than those who had gotten their 2nd dose within the last 2 years

2 Dose efficacy


Infectious Diseases: Adult Immunizations

- **3rd dose guideline**

  - Recommended in October 2017 by ACIP
  - Three studies demonstrated 61-88% increased immunity from mumps during outbreaks
    - Only one study was statistically significant
    - Immunity waned after one year back to baseline
    - Offers short term immunity during outbreaks

  - **MMR Contraindications/Precautions**
    - Do not administer the MMR vaccine to those who:
      - Had severe allergic reaction to the vaccine or components
      - Are severely immunodeficient
      - Are pregnant
      - History of allergic reaction to neomycin
    - Use caution when considering MMR for those who:
      - Have moderate to severe illness (+/- fever)
      - Have received anti-body containing blood products in the last 12 months
      - Have history of thrombopenia or thrombocytopenic purpura
      - Need TB testing
      - PMHx/FHx of seizure disorder

  - Still looking for it...
Infectious Diseases: Adult Immunizations

**Influenza**

- Since 2010, the CDC estimates there have been 140,000-710,000 influenza related hospitalizations
- In the same period of time, an estimated 12,000 to 56,000 influenza related deaths have occurred
- ACIP recommends everyone 6 months or older (including people who are pregnant or have chronic medical conditions) get a yearly influenza vaccine with either inactivated or recombinant vaccine (Injectable)
- Nasal spray was not recommended for 2017-18

**Influenza Vaccines**

- Trivalent: Contains H1N1, H3N2, Influenza B
  - Standard dose: Inactivated virus grown in egg, ages 18-64
  - High dose for those 65 and over
  - Recombinant vaccine that is egg free, for those 18 and older and pregnant women
  - Adjuvant formulation
- Quadrivalent: Same as trivalent, but contains additional Influenza B
  - Those approved for children as young as 6 months
  - Intradermal: For those 18-64
  - Virus grown in cell culture, approved for 4 yo and up
  - Recombinant for those 18 and older, including pregnant women

**High Risk Populations**

- Children younger than 5 yo
  - Even higher risk under 2 yo
- Adults 65 and older
- Pregnant women
  - And two weeks post partum
- Residents of NH and long term care facilities
- Native Americans (and Alaskans)
Infectious Diseases: Adult Immunizations

Cormorbidities at Risk

- Asthma and other chronic lung diseases
- Neurological disorders
- Heart disease
- Blood disorders
- Endocrine disorders
- Kidney disease
- Liver disease
- Metabolic disorders
- Immunocompromised persons
- Children and adolescents on long term aspirin therapy
- BMI of 40 or greater

Misconceptions

- People who are pregnant or have comorbidities do not need medical clearance for the vaccine
- Those who have an egg allergy can still get vaccinated for the flu (example recombinant trivalent types)
- The influenza vaccine does not make you more susceptible to other respiratory viruses
- There is no added immunity for a person getting more than one dose of vaccine, unless they are between 6 months and 8 years of age, getting the vaccine for first time
- You cannot get the flu from the vaccine. It is inactivated or recombinant
Contraindications/Precautions

- Those who have had a severe allergic reaction to previous influenza vaccine or component should not receive the influenza vaccine
- Use precaution if the patient has:
  - History of GBS within 6 weeks of receiving the vaccine
  - Has moderate to severe illness

Questions
Infectious Diseases: Adult Immunizations

Warning

References

- www.cdc.gov
- www.fda.gov