Introduction to Antimicrobial Stewardship

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Antimicrobials and Antimicrobial Resistance

Definitions

- **Antimicrobial agent**: drugs, chemicals, or other substances that kill or slow the growth of microbes (tiny organisms) that can cause infection.
  - Examples of antimicrobial agents:
    - antibacterial drugs (e.g., amoxicillin)
    - antiviral agents (e.g., acyclovir)
    - antifungal agents (e.g., fluconazole)
    - antiparasitic drugs (e.g., ivermectin)

- **Antimicrobial resistance** occurs when microbes resist the effect of drugs, resulting in antimicrobial agents having reduced or no activity against certain viruses, bacteria, fungi and parasites.

Why do we need antimicrobial stewardship?

Few new antibiotics have come to market over the last decade; we have relatively few options left.

At the same time, a world-wide trend of prescribing anti-infectives indiscriminately, without targeting specific organisms, at incorrect doses, for prolonged duration, and/or without accountability has led numerous bacteria, fungi, and parasites exposed to drugs to develop resistance.

• Familiar examples include:
  – Methicillin-resistant Staphylococcus aureus (MRSA)
  – Vancomycin-resistant Enterococcus (VRE)

Therefore, drug resistant infections are rapidly outpacing the development of new antibiotics.
Antimicrobial Stewardship

ANTIMICROBIAL STEWARDSHIP

• Coordinated interventions to improve and measure the appropriate use of antimicrobials by promoting selection of the optimal antimicrobial drug regimen, dose, duration of therapy, and route of administration.

• Antimicrobial stewards seek to achieve optimal clinical outcomes, minimize toxicity and other adverse events, reduce health care costs for infections, and limit development of resistance to antimicrobials.

WHAT DOES THAT MEAN IN PRACTICE?

• We need programs in place that promote consistent actions on the part of prescribers, healthcare workers, and patients to ensure that antibiotics work to cure infections now, and in the future.

Definition adapted from: The Infectious Disease Society of America (IDSA) [http://www.idsociety.org/Stewardship_Policy/#sthash.WYHnaDpu.dpuf](http://www.idsociety.org/Stewardship_Policy/#sthash.WYHnaDpu.dpuf)
Why do we need antimicrobial stewardship in long-term care facilities?

• The CDC estimates that roughly 40-75% of antibiotics are prescribed incorrectly in nursing homes and nearly 50% of antibiotics may be given longer than necessary.

• This leads to antibiotic resistance, infections that are costly and difficult to treat, and residents becoming colonized with multidrug-resistant organisms (MDROs).¹

• Inappropriate antimicrobial use also results in an increased prevalence of adverse drug events and complications such as Clostridium difficile infection (CDI).¹ More than 90% of CDI occurs following or during treatment with antibiotics.²

Sources:
1. CDC http://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html
Residents at highest risk for infections in the long-term care setting

Those with:

• Hospital or emergency room visit in the last 90 days
• 10 or more medications per day
• A high degree of functional impairment
• Wounds or pressure ulcers
• Feeding tubes
• Indwelling catheters
• Central lines
What can long-term care facilities do?

1. START AN INFECTION CONTROL TEAM
   - The CDC believes that the key antimicrobial stewardship leaders in nursing homes are the:
     - Medical Director
     - Director of Nursing
     - Consultant Pharmacist
   - Each nursing home should individualize selection for this team and utilize staff they feel are in the best position to effect change

2. IDENTIFY PATTERNS
   - Track infections, antibiotic prescribing patterns, duration of antibiotic use, costs, and outcomes on a monthly basis

3. STREAMLINE EMPIRIC ANTIBIOTIC ORDERS
   - Implement timely follow up after empiric* prescribing of broad spectrum antibiotics to determine if orders can be changed to a narrower spectrum agent and/or if duration of therapy can be limited

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*Empiric: the practice of initially prescribing antibiotic treatment based on clinical experience, usually without objective data to support its use, such as a culture and sensitivity (e.g., a “best guess”)
Where do Directors of Nursing fit in?

Directors of Nursing can:

• Establish standards for nursing staff to assess, monitor and communicate changes in a resident’s condition that could impact the need for antibiotics

• Participate in the development of the facility’s antimicrobial stewardship policies and procedures

• Use their influence as nurse leaders to reinforce that antibiotics should be prescribed only when appropriate

• Educate front line nursing staff about the importance of antimicrobial stewardship, and ensure adherence to policies that improve antibiotic use
Where do Directors of Nursing fit in?

Directors of Nursing can:

• Coordinate with the facility’s admission team to ensure appropriate information regarding infection type and antibiotic duration is obtained for new admissions

• Implement education for families on facility protocols for appropriate use of antibiotics

• Ensure that residents have advanced directives that include decisions regarding antibiotic use in end of life care
Where do nurses fit in?

Nurses who regularly “work the floor” are the most consistent provider of clinical care at the facility, and should be included in antimicrobial stewardship programs (ASP)

Empowering nurses in monitoring and decision making related to antimicrobial therapy can increase the success of ASP

Standards should be established for nursing staff to assess, monitor, and communicate changes in a resident’s condition that could potentially influence the need for antibiotics
Evidence-based criteria

Part of antibiotic stewardship is adhering to practices that are supported by evidence-based guidelines whenever possible.

The infection control team can assist the facility in adapting and implementing clinical tools, algorithms and guidelines so that:

- Nurses are trained to assess and document consistently throughout the facility to help prescribers make well-informed decisions regarding antibiotic need and use.
- Nurses can help facilitate prescriber monitoring of resident status, labs and therapeutic drug concentrations throughout the course of illness.
- Antibiotics are prescribed only when certain criteria are met and are stopped, changed, or adjusted as needed.
Evidence-based criteria

An example of evidence-based assessment standards useful in practice are the McGeer/SHEA*/CDC Criteria

These criteria provide assessment checklists for signs/symptoms of disease states that are common in long-term care. Examples include:

- Urinary Tract Infections (UTI) with and without an indwelling catheter
- Respiratory Tract Infections (RTI), Pneumonia and Bronchitis/Tracheobronchitis
- Respiratory Tract Infections (RTI), Common Cold or Influenza-like Illness
- Skin and Soft Tissue Infection (SSTI) Cellulitis and Scabies
- Signs/Symptoms of Clostridium difficile Infection

*Where SHEA = Society of Healthcare Epidemiology of America
How can nurses make a big impact in an easy way?

Before sending orders to pharmacy, nurses should ensure that all antibiotic orders are written correctly.
Antibiotic order requirements

A correct antibiotic order includes:

- Name of medication
- Strength of medication
- Dose to be given
- Route of administration
- Frequency of dosing
- Indication for use
- Stop date
- Any monitoring that may be required such as
  - vancomycin trough
  - proactively reducing warfarin dose and checking INRs more frequently

DON’T FORGET TO CHECK FOR MEDICATION ALLERGIES
Where does the Consultant Pharmacist fit in?

Facility leadership should work with the Consultant Pharmacist to establish specific expectations and responsibilities.
The Consultant Pharmacist can be a useful resource

Consultant Pharmacists can become involved by:

• Providing education to staff about the different types of antibiotics and their appropriate use

• Reviewing antibiotic prescriptions as part of the drug regimen review for new medications and ensure they are ordered appropriately

• Participating in the development of the facility’s antimicrobial stewardship policies and procedures
The Consultant Pharmacist can be a useful resource

Consultant Pharmacists can become involved by:

Assisting in the establishment of laboratory testing protocols to monitor for adverse events and drug interactions related to use of antibiotics and other high risk medications (e.g., warfarin)

Reviewing microbiology culture results and provide feedback to prescribers on initial antibiotic selection
CMS Focus Surveys on Infection Prevention and Control in Skilled Nursing Facilities

Pilot Surveys initiated in June 2016 by CMS

Criteria to be evaluated through a combination of

- Observations
- interview with staff,
- Interview with residents and their family
- review of medical records
- Review of infection control program documentation
CMS Focus Surveys on Infection Prevention and Control in Skilled Nursing Facilities

Pilot surveys include an assessment of the following aspects of antimicrobial use:

• The role of facility leadership in Antimicrobial Stewardship
• Antimicrobial Utilization in the last six months
• Indication for every antimicrobial including the indication on pharmacy label
• Use of assessment tools (McGreer, Loeb, SBAR) to assess for the need of an antimicrobial order
• Number of infections per 1000 patient days
• Number of C Difficile Infections and isolation precautions
• Education materials on antimicrobial stewardship for residents and families
Definition and Epidemiology of UTI

**Definition** - presence of localized genitourinary symptoms with significant colony counts of bacteria in the resident’s urine

**UTI** – most common cause of LTC hospitalizations and sepsis
- One in three of all hospitalizations from LTC are due to UTIs
- Urosepsis has a 40-60% mortality rate

**Suspected UTIs** represent 30-60% of LTC antibiotic use
Obtaining Urine for Culture is Not Always the Correct Action

Change in urine odor and color may be related to many factors other than infection such as dehydration, poor hygiene, medication, diet, or infection.

Urine cultures will over-diagnose “infection” in 1/3 of cases, resulting in inappropriate antibiotic use for asymptomatic bacteriuria (bacteria in the urine without an infection, without localized symptoms).

Improved fluid intake and toileting are often better therapy than antibiotics; hydration and perineal hygiene can prevent recurrence.

Culture only if new symptoms of a urinary tract infection are present, such as fever, urgency, frequency, flank pain, hematuria, urinary incontinence or suprapubic pain.
### McGeer/SHEA Criteria for signs/symptoms of UTI WITHOUT an Indwelling Catheter

Criteria 1 AND Criteria 2 must be present

#### CRITERIA 1
At least one of the following signs or symptoms

- **A.** Acute burning urination or acute pain, swelling or tenderness of the testes, epididymis or prostate
- **B.** Fever* or leukocytosis** and at least one of the following:
  1. Acute costovertebral angle pain or tenderness
  2. Suprapubic pain
  3. Gross hematuria
  4. New or marked increase in incontinence
  5. New or marked increase in urgency
  6. New or marked increase in frequency
- **C.** In the absence of fever or leukocytosis, then two or more of the following sub-criteria:
  1. Suprapubic pain
  2. Gross hematuria
  3. New or marked increase in incontinence
  4. New or marked increase in urgency
  5. New or marked increase in frequency

#### CRITERIA 2

- A. At least 100,000 cfu/mL of no more than 2 species of microorganisms in a voided urine sample
  **OR**
- B. At least 100 cfu/mL of any number of organisms in a specimen collected by in-and-out catheter

*Fever

1. Single oral temperature > 100°F
   **OR**
2. Repeated oral temperatures of > 99°F or rectal temperature > 99.5°F
   **OR**
3. Single temperature > 2°F over baseline from any site

**Leukocytosis

1. Neutrophilia: > 14,000 leukocytes/mm³
   **OR**
2. Left shift
   - > 6% bands or ≥ 1500 bands/mm³

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*cfu = colony forming units*
McGeer/SHEA Criteria for signs/symptoms of UTI WITH an Indwelling Catheter

<table>
<thead>
<tr>
<th>CRITERIA 1</th>
<th>CRITERIA 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>At least one of the following signs or symptoms</strong></td>
<td>Urinary catheter specimen culture with at least 100,000 cfu/mL of any organism</td>
</tr>
<tr>
<td>• Fever*, rigors, or new-onset hypotension, with no alternate site of infection</td>
<td>*Fever</td>
</tr>
</tbody>
</table>
| • Either acute change in mental status or acute functional decline, with no alternate diagnosis and leukocytosis** | 1. Single oral temperature > 100°F  
   OR |
| • New-onset suprapubic pain or costovertebral angle pain or tenderness | 2. Repeated oral temperatures of > 99°F or rectal temperature > 99.5°F  
   OR |
| • Purulent discharge from around the catheter or acute pain, swelling, or tenderness of the testes, epididymis, or prostate | • Single temperature > 2°F over baseline from any site  
   **Leukocytosis |

- Neutrophilia: > 14,000 leukocytes/mm3  
  OR |
- > 6% bands or ≥ 1500 bands/mm³
Evaluation of New Urinary Symptoms

Before contacting the prescriber

• Ask the resident if new local symptoms are present:
  – suprapubic pain, flank pain, tenderness, painful urination, new or worsening incontinence, urgency, or frequency

• Visually inspect urine for gross hematuria

• Palpate flank and lower back for tenderness

• Note temperature and any shaking, chills or rigors
Asymptomatic Bacteriuria (Bacteria in the Urine without Infection)

No symptoms, but urinalysis is positive for bacteria - Incidence:

- Asymptomatic bacteriuria in non-catheterized residents:
  - 20-60% for females and 20-40% for males
  - 100% after 30 days of an indwelling catheter

Antibiotic therapy is NOT recommended, not warranted

Recurrence rate 43%

Why is antibiotic therapy NOT RECOMMENDED?

- Has little effect on life-expectancy or repeat infections
- Increases the risk of emergence and persistence of resistant organisms
- Increases the risk for adverse drug reactions, such as Clostridium difficile-associated diarrhea
Types of UTI

**Symptomatic bacteriuria**
- Usually requires therapy

**Upper track infection**
- Pyelonephritis (kidney)

**Lower track infection**
- Urethritis (urethra)
- Cystitis (bladder)
- Prostatitis (prostate)

**Uncomplicated**
- Normal, unobstructed genitourinary tract
- No history of recent catheterization
- Symptoms confined to the urinary tract

**Complicated**
- Resident is catheterized
- Functional or Structural abnormalities
- Male (usually considered complicated)

**More Difficult to Treat**
Empiric choice of antibiotic is based on previous antibiotic exposure and the known or suspected resistant organisms of the facility as well as resident-specific risks such as the presence of an indwelling urinary catheter or diabetes

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Pathogens</th>
<th>Initial Treatment*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute uncomplicated cystitis</td>
<td>E. coli, S. saprophyticus</td>
<td>TMP/SMZ 160 mg / 800 mg ** twice daily x 3-7 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alternative: fluoroquinolone such as Ciprofloxacin 250 - 500 mg twice daily x 5 d</td>
</tr>
<tr>
<td>Pyelonephritis (uncomplicated)</td>
<td>E. coli</td>
<td>TMP/SMZ 160 mg / 800 mg ** twice daily x 10-14 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alternative: fluoroquinolone such as Ciprofloxacin 500 mg twice daily x 5-7 d</td>
</tr>
<tr>
<td>Pyelonephritis (complicated)</td>
<td>E. coli, P. mirabilis, Ps. aeruginosa, E. faecalis</td>
<td>Ciprofloxacin PO / IV 500 mg twice daily x 14 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ampicillin/sulbactam IV 1.5–3 g every 6h - 8h x 14 d</td>
</tr>
</tbody>
</table>

* Adjust dose for renal impairment
** TMP/SMZ: Trimethoprim-sulfamethoxazole 160 mg/800 mg (Bactrim DS, Deptra DA)
Narrow and Broad Spectrum

The visible spectrum of colors is broad going from violet to red.

If we were to only look at the yellow colors in the black rectangle, we would be choosing only a narrow spectrum. Being able to identify what we need to focus on (such as just yellow) helps us narrow our spectrum of color choices.

In the same way, we may categorize antibiotics into broad, intermediate or narrow spectrum. Instead of colors, we evaluate the spectrum of activity against different bacteria such as gram-positive organisms (e.g., Streptococci) and gram-negative organisms (e.g., E. coli).

Knowing the expected or actual (based upon culture results) pathogens involved in an infection, may allow us to narrow the spectrum of antibiotic used.
Empiric antibiotic therapy should be active against the bacteria likely to cause the infection. A broader spectrum antibiotic is often chosen as empiric therapy.

Knowing the bacteria that are most likely to cause an infection (the pathogens) can help narrow our antibiotic choices.

- e.g., E. coli is the cause in ~90% of uncomplicated UTIs. Choose a narrow spectrum antibiotic that only covers gram-negative bacteria. If our resident was diabetic or had an indwelling urinary catheter, we would need to broaden the spectrum of our beginning (empiric) antibiotic choice.

Culture and sensitivity data (C&S data)

- Identifies the pathogen and relative activity of antibiotics (S= sensitive, I= intermediate, R=resistant)

Case

- Pyelonephritis in a female resident with diabetes, empiric antibiotic is ampicillin/sulbactam (Unasyn) IV = broad spectrum) to cover the many possible pathogens and levels of resistance. The C&S data identify an E.coli sensitive to ciprofloxacin. Discontinue ampicillin/sulbactam and switch to oral ciprofloxacin (Cipro), the more narrow spectrum antibiotic.
Antibiotic Appropriateness

Empiric antibiotic choice has a broad spectrum of activity. Should be active against several likely potential pathogens.

Switch to an antibiotic with a more narrow spectrum of activity.
Culture & sensitivity data identify the causative organism (pathogen) and active antibiotic choices.

Narrowing the Spectrum of the Antibiotic
Decreases the risk of antibiotic-associated diarrhea (C. difficile)
Decreases the risk of developing a resistant organism.
Recommended for Prevention

Meticulous infection control protocols should be in place and monitored

Patient Care: perineal hygiene, catheter drainage bag care, hydration

Eliminate high-risk therapies

• Medications e.g., oxybutynin (Ditropan), amitriptyline (Elavil), cyclobenzaprine (Flexeril), olanzapine (Zyprexa) and paroxetine (Paxil)

• Procedures and appliances such as catheters

Intravaginal estrogen for women at high risk of recurrent UTIs

Cranberry juice or tablets

• Small but statistically non-significant benefit in elderly

• May be useful for younger women with recurrent UTIs
Antimicrobial Stewardship in Action

On the 4/28/16 CMS National Provider call Janet Snipes, NHA from Holly Height Nursing Center in Denver CO presented on their facilities Performance Improvement Project for Management of Asymptomatic Bacteriuria they completed in 2015

• Objectives were to reduce UAs, C&S and Antibiotic usage for UTIs by 25% in 2015 compared to 2014

• Root Cause Analysis
  – Families often insist on antibiotics
  – Hydration is not always adequate
  – Physician, Nurses, families, others require education on indication/ criteria
Antimicrobial Stewardship in Action

Utilized McGreer Criteria for UTI surveillance and to guide decision making related to antibiotic use

Education targeted nurses, therapists, senior leaders, CNAs, Residents and Families

Education provided on multiple topics

- McGree Criteria
- Reading and understanding culture and sensitivity
- Colonization and Asymptomatic Bacteriuria
- Appropriate peri-care
- Risks of C- Diff and adverse events
Antimicrobial Stewardship in Action

Results of the Antimicrobial Stewardship Program (goal was a 25% reduction)

Actual Results greatly exceeded goals

- 81% reduction in UAs obtained
- 82% reduction in C&S obtained
- 67% reduction in use of antibiotics for UTIs
## Cost Savings due to Antimicrobial Stewardship

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urinalysis</strong></td>
<td>150 UA x $31.24 = $4686</td>
<td>60 UA x $31.24 = $1875</td>
<td>$2811</td>
</tr>
<tr>
<td><strong>Culture and Sensitivity</strong></td>
<td>117 C&amp;S x $25.94 = $3035</td>
<td>49 C&amp;S x $25.94 = $1271</td>
<td>$1764</td>
</tr>
<tr>
<td><strong>Antibiotic (based on average cost of top 5)</strong></td>
<td>79 ABX x $26.00 = $2054</td>
<td>33 ABX x $26.00 = $858</td>
<td>$1196</td>
</tr>
<tr>
<td><strong>Total Savings</strong></td>
<td></td>
<td></td>
<td>$5771</td>
</tr>
</tbody>
</table>
Summary

- UTIs are common and represent up to 60% of antibiotic use in LTC
- 1/3 of antibiotics used for “UTIs” are prescribed inappropriately for asymptomatic bacteriuria
- Correctly assessing the resident’s signs and symptoms as well as urinary cultures, where appropriate, helps the prescriber determine whether or not antibiotic treatment is necessary
- Optimal antibiotic use depends on knowing the most common bacteria that cause an infection, knowing when to obtain urinary cultures, and correct interpretation of the culture and sensitivity data
- The correct dose is dependent on renal function and indication for antibiotic use
- Set a stop date to avoid prolonged therapy that may be inappropriate
IV to PO Antibiotic Conversion

Considerations of an Antimicrobial Stewardship Program
Background on IV to PO Antibiotic Conversion

Antibiotics are commonly used and contribute to significant expense for most institutional settings.

Intravenous (IV) to oral (PO) conversion is well-established in the medical literature and is practiced in many developed countries.

The Centers for Disease Control and Prevention (CDC) consider IV to PO Antibiotic Conversion one of the many strategies for creating an effective antibiotic stewardship program (ASP).

Repeatedly demonstrated as:

- Therapeutically-effective
- Convenient
- Cost-effective
- Safe

Some studies have shown that 1/3 of IV antibiotics are eligible for conversion to PO therapy.
Potential Benefits of IV to PO Conversion

- Lowers antibiotic acquisition cost
- Promotes patient comfort
- Eliminates / minimizes risk of IV line infections
- No IV antibiotic preparation costs
- Decreases length of stay (earlier discharge)
- Decreases risk of phlebitis
- Decreases administration time and costs
- Promotes earlier and easier ambulation
- Improves adherence
Route of Administration Matters

The need for IV therapy should not be the sole justification for a hospitalization

The CDC’s “Core Elements of Antibiotic Stewardship for Nursing Homes” include evaluating “is the resident on the most appropriate antibiotic(s), dose, and route of administration?”

According to the American Society of Health-System Pharmacists (ASHP): “The ideal route of administration for any medication is one that achieves serum concentrations sufficient to produce the desired effect without producing undesired effects.”
What is Bioavailability?

“Extent of absorption” – percentage of the drug that reaches the bloodstream

- IV medications have 100% bioavailability
- PO medications can have between <1% to 100% bioavailability

If you can achieve adequate tissue and blood concentrations, there is little to no benefit of IV versus PO therapy

Antibiotics with > 80% bioavailability are the most suitable candidates but even some drugs with lower bioavailability can produce comparable clinical effects
Antibiotics Considered Candidates for PO Conversion*

**HAS AN ORAL ALTERNATIVE WITH EXCELLENT PO BIOAVAILABILITY (>90%)**
- Ciprofloxacin (Cipro)
- Doxycycline (Vibramycin)
- Levofloxacin (Levaquin)
- Linezolid (Zyvox)
- Metronidazole (Flagyl)
- Minocycline (Minocin)
- Moxifloxacin (Avelox)

**HAS AN ORAL ALTERNATIVE WITH GOOD PO BIOAVAILABILITY (60-90%)**
- Ampicillin (Principen)
- Azithromycin (Zithromax)
- Cefazolin (Ancef)
- Ceftazidime (Fortaz)
- Cefuroxime (Zinacef)
- Clindamycin (Cleocin)
- Erythromycin (Erythrocin)

* Not all inclusive

The final choice of antibiotic therapy is a decision that should be made by the prescriber based on the individual patient characteristics, culture and sensitivity data, and the clinical situation.
### 3 Types of IV to PO Conversions

<table>
<thead>
<tr>
<th>Type of Conversion</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequential</td>
<td>converting from the IV to the PO formulation of the same drug</td>
<td>linezolid (Zyvox) 600 mg IV Q12H to linezolid (Zyvox) 600 mg PO Q12H</td>
</tr>
<tr>
<td>Switch</td>
<td>converting from an IV drug to a PO drug with an identical potency</td>
<td>cefazolin (Ancef) 1 g IV Q8hrs to cephalaxin (Keflex) 500 mg PO Q6H</td>
</tr>
<tr>
<td>Step-Down</td>
<td>converting from an IV drug to a PO drug with reduced potency</td>
<td>ampicillin/ sulbactam (Unasyn) 3 g IV Q6H to amoxicillin/ clavulanate (Augmentin) 875/125 mg PO Q12H</td>
</tr>
</tbody>
</table>
## Determining Appropriate Candidates for IV to PO Conversion

### Inclusion Criteria:
(continue IV therapy if the following conditions are **not** met)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is an oral alternative available</td>
<td></td>
</tr>
<tr>
<td>In the absence of a positive culture, the alternative oral agent empirically covers the commonly suspected organism(s)</td>
<td></td>
</tr>
<tr>
<td>Patient is conscious</td>
<td></td>
</tr>
<tr>
<td>Tolerating food or enteral feedings</td>
<td></td>
</tr>
<tr>
<td>Able to take other medications by mouth</td>
<td></td>
</tr>
</tbody>
</table>
**Exclusion Criteria**
(continue IV therapy if **any** of the following criteria are met)

<table>
<thead>
<tr>
<th>IV antibiotic is being used for endocarditis, osteomyelitis, severe cellulitis, sepsis, meningitis or other CNS infections, or an infection involving a prosthetic device</th>
<th>IV antibiotic used for less than 48 hours or is scheduled to be discontinued in the next 24 hours</th>
<th>Allergy to alternative agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive culture shows resistance to the alternative</td>
<td>Active GI bleed</td>
<td>Hematological malignancy (e.g., leukemia, lymphoma) or documented neutropenia</td>
</tr>
<tr>
<td>Patient is unstable or their clinical condition is worsening as evidenced by any of the following in the past 24 hours:</td>
<td>Severe or persistent nausea or vomiting</td>
<td>NPO status (nothing by mouth)</td>
</tr>
<tr>
<td>Fever ≥ 38° C (100° F)</td>
<td>Systolic blood pressure ≤ 90 mmHg</td>
<td>Heart rate ≥ 100 beats per minute</td>
</tr>
</tbody>
</table>

* Only applies to particular antibiotics (e.g., fluoroquinolones) that must be separated from enteral products by several hours.
Assessment Tool

Assessment for IV to PO Therapy Switch

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there an oral alternative available? (refer to chart on page 2)</td>
<td></td>
</tr>
<tr>
<td>Is the IV antibiotic being used for one or more of the following conditions:</td>
<td></td>
</tr>
<tr>
<td>- endocarditis, osteomyelitis, sepsis, severe cellulitis, meningitis or other CNS infections, infection of a prosthetic device</td>
<td></td>
</tr>
<tr>
<td>Is the IV antibiotic treatment scheduled to be discontinued in the next 24 hours?</td>
<td></td>
</tr>
<tr>
<td>Has the IV antibiotic been used for less than 48 hours?</td>
<td></td>
</tr>
<tr>
<td>Is there a positive culture that shows resistance to an alternative agent?</td>
<td></td>
</tr>
<tr>
<td>In the absence of a positive culture, does the alternative oral agent empirically cover the commonly suspected organism(s)?</td>
<td></td>
</tr>
<tr>
<td>Does the patient have any drug allergies that would prevent use of an alternative agent?</td>
<td></td>
</tr>
<tr>
<td>[Verify allergy history and type of reaction before answering]</td>
<td></td>
</tr>
</tbody>
</table>

Overall Patient Considerations - Is the patient:

- scheduled for upcoming surgery (within the next 48 hours)?
- tolerating food or enteral feedings?
- able to take other medications by mouth?
- conscious?

- unstable or is their clinical condition worsening, as evidenced by the presence of any of the following:
  - a temperature greater than or equal to 38° C (100° F) in the past 24 hours
  - an abnormal WBC count that is not improving (e.g., a decrease of at least 2 per microliter in the last 24 hours)
  - a systolic blood pressure less than or equal to 90 mmHg
  - a heart rate greater than or equal to 100 beats per minute
  - a respiratory rate greater than or equal to 24 breaths per minute
  - a worsening chest x-ray (if applicable)

The complete tool is available at https://omniview.omnicare.com

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Additional IV to PO Conversion Considerations

Follow-up evaluation is essential

- Monitor for clinical progress and tolerability
- Evaluate at least 24 and 48 hours after conversion

If the patient’s condition worsens or fails to improve:

- Contact the prescriber immediately
- Consider alternative therapy
- Consider conversion back to IV therapy
Thank You

Comments and questions are welcomed.