HMS ANTIMICROBIAL INITIATIVE TIER 1 TOOLKIT: QUICK REFERENCE GUIDE

This reference document provides a summary of the Tier 1 Toolkit for the HMS Antimicrobial Initiative that aims to implement global strategies to improve antimicrobial use

Convene a Workgroup to Focus on Tier 1 Strategies

The workgroup will likely be a new subgroup of your antimicrobial stewardship team. For maximum impact, the workgroup should consist of a multidisciplinary team that includes (but is not limited to) key stakeholders, such as a hospitalist, infectious disease physician and/or pharmacist, emergency medicine physician, house officers, IT personnel, microbiology lab representative, and nursing.

Tools and Resources:

- HMS site reports (hard copy distributed at collaborative wide meetings and live reports available daily via the HMS data entry system)
- CDC Core Elements of Hospital Antibiotic Stewardship Programs

Develop and Share Institutional Guidelines for UTI and Community-Acquired Pneumonia (CAP)

Develop institutional guidelines, locally-adapted from national and HMS guidelines, for treatment of community-acquired pneumonia (CAP) and UTI. If institution specific guidelines already exist, they should comply with the following:

CAP

Institutional guidelines should:

- Recommend 5-day antibiotic treatment duration for uncomplicated CAP
- Review the risk factors for Multi-Drug Resistant Organisms (MDRO) and/or Healthcare-Associated Pneumonia (HCAP)
- Provide recommendations for transition to oral therapy
- De-emphasize fluoroquinolones

UTI

Institutional guidelines should:

- Recommend against sending urine cultures in the absence of urinary symptoms
- Recommend against treating a positive urine culture in the absence of urinary symptoms
- De-emphasize fluoroquinolones
- Provide recommendations for transition to oral therapy

Tools and Resources:

- IDSA, HMS, and Institutional Guidelines:
  - CAP
  - UTI
- HMS Pocket Card Examples:
  - CAP
  - UTI

Integrate and Operationalize Institutional Guidelines for UTI and CAP

Integrate recommendations into key processes within the healthcare system such as into order sets, individual orders, discharge planning/processes, required yearly education for staff, etc.

Educate providers, including hospitalists, internal medicine, family medicine, emergency medicine physicians, residents, advanced practice professionals (APPs), and nursing staff about antibiotic resistance and appropriate antimicrobial prescribing.

Educate patients and families about antibiotic resistance and appropriate antimicrobial prescribing.

After 3 months of guideline use, obtain provider feedback from multiple groups (including hospitalists, internal medicine, emergency department, etc.), and modify accordingly.

Tools and Resources:

- CAP Order Set Example
- Patient Education Handout Example
  - Patients: *What you need to know when you are prescribed an antibiotic*

Interventions continued on back page

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Reduce Duration of Antibiotic Treatment for Uncomplicated CAP to 5 Days

Educate providers on the justification for 5 days of therapy for uncomplicated CAP

Evaluate and understand differences in provider groups (e.g., hospitalists, emergency medicine physicians). Target interventions to specific provider groups as necessary.

Encourage documentation of dose, indication and duration in the progress notes and on discharge.

Focus efforts on discharge prescribing, as HMS data shows that discharge prescriptions account for 80% of inappropriate antibiotic treatment for uncomplicated CAP.

Tools and Resources:

- Example of Email Feedback on Provider Performance for Duration of CAP Treatment
- Factsheet Emphasizing Focus on Discharge Prescriptions
- 72-hour Antibiotic Time Out Checklist
- Example of Hospital Newsletter Incorporating HMS Data
- CAP Pocket Card

Reduce Testing and Treatment of Asymptomatic Bacteriuria (ASB)

Educate providers, including hospitalists, internal medicine, family medicine, emergency medicine physicians, residents, advanced practice professionals (APPs), and nursing staff regarding the diagnosis of ASB vs UTI.

Utilize checklists to discourage requesting urine cultures if not indicated, in particular with frontline clinical staff.

Consider performing urine culture only when indicated, (example: reflex culture only with positive urinalysis).

Consider suppressing urine culture results by requiring providers to call the microbiology lab to request results (for non-catheterized patients).

Create a protocol assessing for UTI in patients whose primary symptom is altered mental status (AMS).

Tools and Resources:

- Educational Video: ASB vs UTI
- Checklist for Appropriate Urine Culture Ordering
- Inpatient Algorithm Assessing for UTI in Patients with Altered Mental Status (AMS)

De-escalate Antibiotic Treatment for UTI and Pneumonia

Utilize 72-hour Antibiotic Time Outs after starting antibiotics, including:

- Assess indication(s) for antibiotics
- Review culture results
- Adjust drug selection (de-escalate) and doses
- Consider switching to oral route
- Decide and document treatment duration

Encourage de-escalation of vancomycin for pneumonia with negative respiratory cultures and/or nasal swabs for MRSA.

Utilize HMS data to provide audit and feedback directly to providers regarding:

- Coverage of methicillin-resistant *Staphylococcus aureus* (MRSA) with negative MRSA nasal swabs and/or respiratory cultures
- Coverage of *Pseudomonas* with negative respiratory cultures

Utilize pharmacists to review cultures, and if positive, ensure that the narrowest, appropriate antibiotic coverage is chosen for the diagnosis.

Tools and Resources:

- Examples from Intermountain Health for Pharmacist-Driven Tools to Aid in De-escalation
- 72-hour Antibiotic Time Out Checklist
- HMS Site Reports (hard copy distributed at collaborative wide meetings and live reports available daily via the HMS data entry system)

Blue Cross Blue Shield Blue Care Network of Michigan

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Tier 1: Implement Global Strategies to Improve Antimicrobial Use

Convene a Workgroup to Focus on Tier 1 Strategies	Develop and Share Institutional Guidelines for Urinary Tract Infection (UTI) and Community-Acquired Pneumonia (CAP)	Integrate and Operationalize Institutional Guidelines for UTI and CAP	Reduce Duration of Antibiotic Treatment for Uncomplicated CAP to 5 Days	Reduce Testing and Treatment of Asymptomatic Bacteriuria (ASB)	De-escalate Antibiotic Treatment for UTI and Pneumonia

HMS
MICHIGAN HOSPITAL MEDICINE SAFETY CONSORTIUM

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Blue Cross Blue Shield Blue Care Network of Michigan

TIER 1: GLOBAL STRATEGIES TO IMPROVE ANTIMICROBIAL USE		
Recommendation	***Background, Rationale and Suggested Implementation Strategies***	***Resources, References & Tools***
1. Convene a Workgroup to Focus on Tier 1 Strategies	• The workgroup will likely be a new subgroup of your antimicrobial stewardship team. • For maximum impact, the workgroup should consist of a multidisciplinary team that includes (but is not limited to) key stakeholders, such as a hospitalist, infectious disease physician and/or pharmacist, emergency medicine physician, house officers, IT personnel, microbiology lab representative, and nursing. • Designate an internal lead for urinary tract infection (UTI) and pneumonia antibiotic-related quality improvement efforts. This person is responsible for ensuring implementation of interventions recommended by the workgroup, as well as identifying barriers and trouble-shooting during implementation. • Meet quarterly to review data, define problem areas, identify underlying causes of problem areas and determine interventions for improvement. • Communicate work to local leadership to ensure institutional buy-in. • Engage key stakeholders in the design of interventions to encourage provider buy-in. • When implementing interventions, consider using behavioral economic principles or social psychology to provide additional cultural incentives to change. • Implement at least **two** new interventions per year. • Assess post-intervention data for success or failure of intervention, and make modifications as needed.	**Resources & Tools:** • HMS site reports (hard copy distributed at collaborative wide meetings and live reports available daily via the HMS data entry system) • CDC Core Elements of Hospital Antibiotic Stewardship Programs • CDC Implementation of Antibiotic Stewardship Core Elements at Small and Critical Access Hospitals • CDC Antibiotic Training Course Series 1 (Webinar-Free CE's available) • CDC Antibiotic Training Course Series 2 (Webinar-Free CE's available) • IDSA Guidelines for Implementing an Antibiotic Stewardship Program • Quality Improvement Organizations MITIGATE Antimicrobial Stewardship Toolkit: A practical guide for implementation in adult and pediatric emergency department and urgent care setting **References:** • Saint S et al. Importance of leadership for successful implementation of interventions to prevent hospital-acquired infections. *Infect Contol Hosp Epidemiol* 2010. ▪ Strong leaders focus on overcoming barriers, inspire their employees, and think strategically while acting locally • ANA/CDC White paper. Redefining the Antimicrobial Stewardship Team. 2017. ▪ Demonstrates importance of nursing and multidisciplinary antibiotic stewardship teams, highlighting roles individuals can play in stewardship efforts • Heil E et al. Essential Role of Pharmacists in Antimicrobial Stewardship . *Infect Contol Hosp Epidemiol* 2016. ▪ Highlights the critical role of antimicrobial stewardship-trained pharmacists in a successful hospital stewardship program. • Sikkens JJ et al. Behavioral Approach to Appropriate Antimicrobial Prescribing in Hospitals: The Dutch Unique Method for Antimicrobial Stewardship (DUMAS) Participatory Intervention Study. *JAMA Intern Med* 2017.

		▪ Shared the problems of inappropriate prescribing, and allowed providers free choice to develop an intervention. ▪ Inappropriate antimicrobial prescribing decreased
2. Develop and Share Institutional Guidelines for UTI and CAP	• Develop institutional guidelines, locally-adapted from national and HMS guidelines, for treatment of community- acquired pneumonia (CAP) and urinary tract infection (UTI). If institution specific guidelines already exist, they should comply with the following: **CAP** *Institutional guidelines should:* ▪ Recommend 5-day antibiotic treatment duration for uncomplicated CAP ▪ Review the risk factors for multi-drug resistant organisms (MDRO) and/or Healthcare-Associated Pneumonia (HCAP) ▪ Provide recommendations for transition to oral therapy ▪ De-emphasize fluoroquinolones **UTI** *Institutional guidelines should:* ▪ Recommend against sending urine cultures in the absence of urinary symptoms ▪ Recommend against treating a positive urine culture in the absence of urinary symptoms ▪ De-emphasize fluoroquinolones ▪ Provide recommendations for transition to oral therapy • Share the CAP and UTI guidelines with members of the work group and frontline providers to get feedback and to ensure buy-in. • Publish guidelines in multiple formats, including booklet, hospital intranet, or an application for smartphones. • Share HMS data and local opportunities for improvement institution-wide.	**Resources & Tools:** *Examples of Guidelines that could be locally-adapted to your institution:* • National Guidelines: ▪ Infectious Diseases Society of America (IDSA)/American Thoracic Society Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults. CID 2007. ▪ IDSA Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. CID 2005. ▪ IDSA and European Society for Microbiology and Infectious Disease Guidelines for Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women. CID 2010. ▪ IDSA Guidelines for Diagnosis, Prevention, and Treatment of Catheter-Associated Urinary Tract Infection (CA-UTI) in Adults. CID 2010. • HMS Guideline: ▪ CAP ▪ UTI • Institutional Guideline Examples: ▪ CAP Guideline Examples (Appendix A) ▪ UTI Guideline Examples (Appendix B) • Pocket Cards: ▪ CAP (Appendix C) ▪ UTI (Appendix D) • Example of Educational Computer Screensaver (Appendix E)

3. Integrate and Operationalize Institutional Guidelines for UTI and CAP	• Educate providers, including hospitalists, internal medicine, family medicine, emergency medicine physicians, residents, advanced practice professionals (APPs), and nursing staff about antibiotic resistance and appropriate antimicrobial prescribing.
	• Educate patients and families about antibiotic resistance and appropriate antimicrobial prescribing.
	• During educational sessions, highlight HMS data, showing opportunities for improvement.
	• Communicate and promote institution-specific guidelines with frontline providers, including physicians, APPs, nursing, and pharmacy to ensure use of recommendations (morning report, grand rounds, medical staff meetings, division meetings).
	• Integrate recommendations into key processes within the healthcare system such as into order sets, individual orders, discharge planning/processes, required yearly education for staff, etc.
	• Build systems that can help modify provider behavior. Examples include (but are not limited to): clinical decision support tools and pharmacist review of antibiotic prescribing.
	• After 3 months of guideline use, obtain provider feedback from multiple groups (including hospitalists, internal medicine, emergency department, etc.), and modify accordingly.
	• Consider social factors in marketing guidelines to frontline providers. Highlight their participation in creation of the guidelines, and try to overcome viewpoints of loss of provider autonomy. Instead, emphasize improvement in quality and outcomes.
	• Involve hospitalist champions in the education and dissemination process.
		Resources & Tools:
		• Review HMS institution specific data to identify areas for local improvement
		• CAP Order Set Example (Appendix F)
		• UTI Order Set Example (Appendix G)
		• Patient Education Handout Example
		  ▪ Patients: *What you need to know when you are prescribed an antibiotic* (Appendix H)
		
		References:
		• Meeker D et al. Nudging guideline-concordant antibiotic prescribing: a randomized clinical trial. *JAMA Intern Med* 2014.
		  ▪ Displayed poster-sized commitment letters to avoid inappropriate antibiotic prescribing for Acute Respiratory Infections (ARIs) in exam rooms, providing patient/family education and behavioral "nudge"
		• Hartley S et al. Evaluating a Hospitalist-Based Intervention to Decrease Unnecessary Antimicrobial Use in Patients With Asymptomatic Bacteriuria. *Infect Contol Hosp Epidemiol* 2016.
		  ▪ Reduced treatment of ASB with educational sessions and pocket cards for hospitalists at all sites, and a pharmacist-led review of positive urine cultures at one site
		• Haas MK et al. Effects of a Syndrome-Specific Antibiotic Stewardship Intervention for Inpatient Community-Acquired Pneumonia. *Open Forum Infect Dis* 2016.
		  ▪ Reduced duration of CAP treatment by development of institutional guidelines and integration into CPOE for treatment of non-ICU CAP using key stakeholders and hospitalist physician champions.
		  ▪ For education/dissemination: utilized emails, posters in work rooms, presentations in Grand Rounds and division meetings
		• Scymzcak J et al. Pediatrician Perceptions of an Outpatient Antimicrobial Stewardship Intervention. *Infect Contol Hosp Epidemiol* 2014.
		  ▪ Qualitative study interviewing pediatricians after a stewardship intervention
		  ▪ Found skepticism of accuracy of audit and feedback reports.

4. Reduce Duration of Antibiotic Treatment for Uncomplicated CAP to 5 Days	• Educate providers on the justification for 5 days of therapy for uncomplicated CAP • Review CAP cases identified by HMS to implement high-yield interventions for recurrent problems • Evaluate and understand differences in provider groups (e.g., hospitalists, emergency medicine providers). Target interventions to specific provider groups as necessary. • Evaluate existing order sets to ensure antibiotic preferred options, doses, and durations are consistent with institutional pneumonia guidelines. • Require documentation of dose and indication of antibiotics prescribed in the antibiotic order. • Encourage documentation of dose, indication, and duration of antibiotics in the progress note. • Require a 72-hour Antibiotic Time Out, during which total duration should be discussed. • Focus efforts on discharge prescribing, as HMS data shows that discharge prescriptions account for 80% of inappropriate antibiotic treatment for uncomplicated CAP. • Require documentation of the total duration of antibiotics in the discharge summary, potentially incorporating an area for antibiotic duration to be filled out in an automated discharge process. • Incorporate nursing and pharmacy into review of the discharge antibiotic. • Provide audit and feedback directly to providers regarding the duration of antibiotics they use for patients with uncomplicated CAP. • Consider incorporating compliance with treatment duration for uncomplicated CAP as part of hospitalists' performance targets (for compensation).	**Resources & Tools:** • HMS Document: Treatment duration for uncomplicated community-acquired pneumonia: the evidence in support of 5 days. • Review HMS site reports (hard copy distributed at collaborative wide meetings and live reports available daily via the HMS data entry system) for the following: ▪ Uncomplicated CAP treated with 5 days of antibiotics ▪ Types of Reports Available via HMS Registry: Hospital Specific, Provider Group Specific (i.e. hospitalist v. emergency room physician), or Provider Specific • HMS Guideline: ▪ CAP • CAP Pocket Card (Appendix C) ▪ Consider modifying to poster size for posting in workrooms • Factsheet Emphasizing Focus on Discharge Prescriptions (Appendix I) • Educational Videos: ▪ Vaughn V. Antibiotic Stewardship: Community-Acquired Pneumonia: for Providers • 72-hour Antibiotic Time Out Checklist (Appendix J) • Example of hospital newsletter incorporating HMS data (Appendix K) • Example of email feedback on provider performance for duration of CAP treatment (Appendix L) **References:** • Avdic E et al. Impact of an Antimicrobial Stewardship Intervention on Shortening the Duration of Therapy for Community-acquired Pneumonia. *Clin Infect Dis* 2012. ▪ Reduced treatment duration of CAP with educational lectures based on survey results, and post-prescription pharmacy review with verbal feedback • Yogo N et al. Intervention to Reduce Broad-Spectrum Antibiotics and Treatment Durations Prescribed at the Time of Hospital Discharge: A Novel Stewardship Approach. *Infect Contol Hosp Epidemiol 2014* ▪ Reduced antibiotic duration prescribed at discharge by developing a guideline for antibiotic selection and

		treatment duration and performing pharmacy audit and feedback of discharge prescriptions • Foolad F et al. A multicenter stewardship initiative to decrease excessive duration of antibiotic therapy for the treatment of community acquired pneumonia. *J Antimicrob Chemother* 2018 ▪ Treatment duration for CAP was reduced by updating institutional CAP guidelines, providing educational sessions, and performing daily audit and feedback on appropriate treatment duration for CAP patients
5. Reduce Testing and Treatment of Asymptomatic Bacteriuria (ASB)	• Educate providers, including hospitalists, internal medicine, family medicine, emergency medicine physicians, residents, advanced practice professionals (APPs), and nursing staff regarding the diagnosis of ASB vs UTI. • Educate patients and family members regarding the diagnosis of ASB vs UTI. • Review ASB cases identified by HMS to direct high-yield intervention for recurrent problems. • Evaluate and understand differences in provider groups (e.g., hospitalists, emergency department physicians). Target interventions to specific provider groups as necessary. • Evaluate existing order sets to ensure preferred antibiotic options, doses, and durations are consistent with institutional UTI guidelines (including pre-operative order sets, ED admission sets, "commonly ordered test" lists). • Utilize clinical decision support tools to discourage inappropriate urine culture testing, by requiring documentation of symptom(s) as indication for the test. • Utilize checklists to discourage ordering of urine cultures by frontline clinical care team. • Require documentation of dose and indication of antibiotics prescribed in the antibiotic order. Consider adding documentation of urinary symptom necessitating treatment. • Encourage documentation of dose, indication, and duration of antibiotics in the progress note.	**Resources & Tools:** • Review HMS site reports (hard copy distributed at collaborative wide meetings and live reports available daily via the HMS data entry system) for the following: ▪ Testing of Asymptomatic Bacteriuria ▪ Treatment of Asymptomatic Bacteriuria with Antibiotics ▪ Types of Reports Available via HMS Registry: Hospital Specific, Provider Group Specific (i.e. hospitalist v. emergency room physician), or Provider Specific • HMS Guideline: ▪ UTI • UTI Pocket Card (Appendix D) ▪ Consider modifying to poster size for posting in workrooms • Educational Videos: ▪ ASB vs UTI ▪ Trautner, B. Antibiotic Stewardship: Urinary Tract Infection: for Providers • Checklist for Appropriate Urine Culture Ordering (Appendix M) • Tools for assessing a Urinary Tract Infection (UTI) in patients with Altered Mental Status (AMS) ▪ Inpatient Algorithm Assessing for UTI in Elderly Patients with AMS (Appendix N) ▪ Mody, L. et al. Urinary Tract Infections in Older Women: A Clinical Review. *JAMA* 2014 • Example of hospital newsletter incorporating HMS data (Appendix K) **References:**

	• Encourage documentation of the total duration of antibiotics in discharge summary, potentially incorporating an area for antibiotic duration to be filled out in an automated discharge process. • Provide audit and feedback directly to individual providers regarding their rates of testing and treatment for ASB. • Consider performing urine cultures only when indicated, (example: reflex culture only with positive urinalysis). • Consider suppressing urine culture results by requiring providers to call the microbiology lab to request results (for non-catheterized patients). • Create a protocol assessing for UTI in patients whose primary symptom is altered mental status (AMS).	• Leis JA et al. Reducing Antimicrobial Therapy for Asymptomatic Bacteriuria Among noncatheterized inpatients: a proof of concept study. *Clin Infect Dis* 2014. ▪ Intervention at the stage of lab reporting that withheld urine culture results of non-catheterized inpatients unless requested by a physician • Jones CW et al. Reflect urine culture cancellation in the emergency department. *J Emerg Med* 2014. ▪ In the ED, authors estimate a 40% reduction in urine cultures if a culture was cancelled when urinalysis did not meet criteria (one of the following: white blood cell >10, + leukocyte esterase, + nitrites, + bacteria) • Stagg A et al. Impact of two-step urine culture ordering in the emergency department: a time series analysis. *BMJ Qual Saf* 2017. ▪ In the ED, urine samples collected by nurses, then saved for 48 hours, and not processed without additional physician order ▪ Resulted in a decrease of urine cultures processed, decreased need for patient callbacks for positive cultures, and decrease in antibiotics prescribed for a urinary indication for those admitted • Munigala et al. Impact of order set design on urine culturing practices at an academic medical center emergency department. *BMJ Qual Saf* 2017. ▪ Removing all urine culture orders except "urinalysis with reflex to microscopy" from frequently ordered list of tests for the ED resulting in decreasing daily urine culture rate by about half • Trautner B et al. Effectiveness of an Antimicrobial Stewardship Approach for Urinary Catheter–Associated Asymptomatic Bacteriuria. *JAMA* 2015. ▪ A multifaceted educational implementation strategy in the VA to reduce urine culture ordering and inappropriate antibiotic prescribing in catheterized patients ▪ See Supplement- *CAUTI Diagnostic Algorithm and Audit and Feedback Script* • Daniel M et al. An Implementation Guide to Reducing Overtreatment of Asymptomatic Bacteriuria. *JAMA Intern Med* 2017. ▪ Review of different approaches used in prior studies to decrease treatment of ASB, with recommendations on steps to take to improve use in your own hospital

		• Schulz L et al. Top Ten Myths Regarding the Diagnosis and Treatment of Urinary Tract Infections. *J Emerg Med* 2016. ▪ Review of the evidence regarding commonly held misbeliefs surrounding urinary tract infections • Vaughn V et al. Revisiting the panculture. *BMJ Qual Saf* 2016 ▪ Pan culturing for fever is costly and contributes to unnecessary cultures and inappropriate antibiotic use
6. De-escalate Antibiotic Treatment for UTI and Pneumonia	• Require documentation of dose and indication of antibiotics prescribed in the antibiotic order. • Encourage documentation of dose, indication, and duration of antibiotics in the progress note. • Utilize 72-hour antibiotic time outs after starting antibiotics, including: ▪ Assess indication(s) for antibiotics ▪ Review culture results ▪ Adjust drug selection (de-escalate) and doses ▪ Consider switching to oral route ▪ Decide and document treatment duration • Utilize pharmacists to review cultures, and if positive, ensure that the narrowest, appropriate antibiotic coverage is chosen for the diagnosis. • Utilize HMS data to provide audit and feedback directly to providers regarding: ▪ Coverage of methicillin-resistant *Staphylococcus aureus* (MRSA) with negative MRSA nasal swabs and/or respiratory cultures ▪ Coverage of *Pseudomonas* with negative respiratory cultures • Encourage de-escalation of vancomycin for pneumonia with negative respiratory cultures and/or nasal swabs for MRSA. • Incorporate the effective duration of therapy into de-escalation protocols (count all days of active therapy including IV). • When reporting microbiology lab results consider:	**Resources & Tools:** • Review HMS site reports (hard copy distributed at collaborative wide meetings and live reports available daily via the HMS data entry system) for the following ▪ Antibiotic treatment regimens for UTI and CAP/HCAP ▪ Discharge antibiotics ▪ Patients with negative culture for MRSA and on MRSA coverage ▪ Patients with negative culture for *Pseudomonas* and on pseudomonas coverage • Examples from Intermountain Health for Pharmacist-driven tools to aid in de-escalation ▪ De-escalation quick reference guide for pharmacists (Appendix O) ▪ Antibiotic indications for pharmacists (Appendix P) • 72-hour Antibiotic Time Out Checklist (Appendix J) **References:** • Chotiprasitsakul D et al. The Role of Negative Methicillin-Resistant Staphylococcus aureus Nasal Surveillance Swabs in Predicting the Need for Empiric Vancomycin Therapy. *Open Forum Infect Dis* 2017. ▪ Among 11,441 ICU patients, a negative nasal MRSA surveillance swab had an NPV of 99.4% • Labelle AJ et al. A comparison of culture-positive and culture-negative health-care-associated pneumonia. *Chest* 2010. ▪ For ICU and non-ICU HCAP patients, those that had a negative culture had lower severity of illness, hospital mortality, and hospital length of stay compared with those with a positive culture • Buckel WR et al. Broad- versus Narrow-Spectrum Oral Antibiotic Transition and Outcomes in Health Care–associated Pneumonia. *Ann Am Thorac Soc* 2017.

	▪ Providing recommendations on likely contaminants (e.g., ≥ 3 organisms in a urine culture) ▪ Selective reporting of antibiotic susceptibility results: (i.e. suppressing broad spectrum antibiotic susceptibility results when a narrow spectrum antibiotic is effective)	▪ Retrospective review of patients admitted with HCAP and negative culture, initially treated with broad-spectrum antibiotics (anti-MRSA and/or anti-*Pseudomonas* activity) ▪ There was no increased 30-day readmission or all-cause mortality in patients transitioned to narrow spectrum compared to broad spectrum oral antibiotics. ▪ The majority of narrow spectrum antibiotics were oral beta-lactams • Parente D et al. The Clinical Utility of Methicillin Resistant Staphylococcus aureus (MRSA) Nasal Screening to Rule Out MRSA Pneumonia: A Diagnostic Meta-analysis with Antimicrobial Stewardship Implications. *Clin Infect Dis* 2018. ▪ A meta-analysis including 22 studies evaluating the diagnostic value of MRSA nasal screening in MRSA pneumonia. ▪ The negative predictive value (NPV) for CAP and HCAP was 98.1%. • Musgrove MA et al Microbiology Comment Nudge Improves Pneumonia Prescribing *Open Forum Infect Dis* 2018. ▪ Changing report result for respiratory cultures with no dominant organism growth from "commensal respiratory flora" to "commensal respiratory flora only: No S. aureus/MRSA [methicillin-resistant Staphylococcus aureus] or P. [Pseudomonas] aeruginosa" resulted in increased de-escalation/discontinuation (39% vs 73%, P < .001) and was associated with a 5.5-fold increased odds of de-escalation.

This toolkit is a live document and will continually be updated as new tools are developed. Please visit the HMS website for the most up-to-date toolkit. If you have tools to be added to the toolkit, please see the HMS contact information below.

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Michigan Medicine Pneumonia Guideline Treatment Pathway for Adult Patients with Pneumonia

The purpose of this document is to guide the appropriate treatment of adult patients presenting with pneumonia. Two pathways with different empiric treatment regimens based on risk of infection with multidrug-resistant (MDR) pathogens (including MRSA, *Pseudomonas* spp., *Acinetobacter* spp., organisms not susceptible to beta-lactams (ceftriaxone or ampicillin-sulbactam) and/or fluoroquinolones (ciprofloxacin, levofloxacin)) are shown below. Of note, since the 2005 American Thoracic Society/Infectious Diseases Society of America guidelines first introduced recommendations for healthcare associated pneumonia (HCAP), several studies have been published that question the predictive value of HCAP criteria for patients infected with drug-resistant pneumonia. Multiple studies have reported various risk factors and proposed scoring tools but methodology varies widely and thus an optimal model has not yet been identified. **Treatment recommendations below are based on disease severity and presence of additional risk factors for MDR pathogens. This will replace the previously defined HCAP criteria.**

Pathway A

Patients presenting from the community without any risk factors for drug-resistant pathogens (**includes patients admitted to the ICU for respiratory failure without septic shock**)

For dosing, alternative treatment options, duration, and important comments, **see page 2.**

Empiric Treatment

Ampicillin/sulbactam
+
Azithromycin

**see treatment guidelines for appropriate use of ceftriaxone as an alternative agent*

Pathway B

Patients presenting with any of the following risk factors for drug-resistant pathogens:

***Healthcare Exposure*:**

- Hospital-acquired pneumonia (current hospitalization for ≥72 hours)
- Ventilator-associated pneumonia
- Prior hospitalization for at least 48 hours within previous 90 days
- Current resident from long-term care facility, nursing home, extended care facility, skilled nursing facility **with at least partial functional dependence** in ADLs (transfer, feeding, bathing, dressing, toileting, and continence)

Disease Severity:

- **Septic shock** requiring ICU admission

Antibiotic Exposure:

- Fluoroquinolone, linezolid or any intravenous antibiotic use within previous 90 days

Immunosuppression:

- AIDS, neutropenia (ANC <1000), or active malignancy undergoing intravenous chemotherapy
- Kidney or liver or heart transplant recipient within previous 1 year in those who received induction with thymoglobulin
- Kidney or liver or heart transplant recipient within previous 6 months in those who did not receive induction with thymoglobulin
- Solid organ transplant recipient treated for rejection within previous 6 months
- Lung transplant recipient
- Autologous stem cell transplant within previous 6 months
- Allogeneic stem cell transplant within previous 1 year or those with chronic GVHD

Other Conditions:

- Current tube feeding
- History of infection or colonization with Pseudomonas spp., MRSA, or other MDR pathogens within previous 12 months
- Cystic fibrosis, chronic obstructive pulmonary disease (FEV1<35% predicted, multiple antibiotic prescriptions in last year, multiple hospital admissions in last year), or chronic bronchiectasis

For dosing, alternative treatment options, duration, and important comments,

Empiric Treatment

Piperacillin/Tazobactam
(+ Tobramycin if admitted to ICU)
+
Vancomycin

Pathway A (Part I)

Indication	Common Pathogens	Empiric Therapy	Duration of Therapy	Comments

Inpatient community-acquired pneumonia
 	
(Non-ICU patient)
	Streptococcus pneumonia
	
	Haemophilus influenzae
	
	Moraxella catarrhalis
		1st line:
		Ampicillin/sulbactam 3gm IV q6 hr (except if alcoholism with aspiration)
		PLUS
		Azithromycin 500mg IV/PO x 1 day, then 250mg q24 hr x 4 days
		
		PCN allergy without anaphylaxis, angioedema, or urticaria, or alcoholism with aspiration:
		Ceftriaxone 1gm IV q24 hr
		PLUS
		Azithromycin 500mg IV/PO x 1 day, then 250mg q24 hr x 4 days
		
		Consider the addition of anaerobic coverage with metronidazole 500mg PO q8 hr **if** aspiration with risk of enteric GNR$^{\tau}$, empyema, lung abscess, or cavitary lesion
		
		Severe PCN and cephalosporin allergy (anaphylaxis, angioedema, hives):
		Levofloxacin 750mg IV/PO q24 hr
		
		Consider the addition of anaerobic coverage with metronidazole 500mg PO q8 hr **if** alcoholism with aspiration or aspiration with risk of empyema, lung abscess, or cavitary lesion
		
		Addition of vancomycin
		Consider if high clinical suspicion for CA-MRSA (history of MRSA pneumonia or post-influenza pneumonia)
			Uncomplicated Pneumonia:
			• **5 days** for patients who defervesce within 72 hours and have **no more than 1** sign of CAP instability at the time of antibiotic discontinuation^{+}
			
			• Patients with delayed response should discontinue therapy 48-72 hours after defervesce and have no more than 1 sign of CAP instability^{+} at time antibiotic discontinuation.
			
			• Pneumonia with non-fermenting GNRs (e.g. Pseudomonas, Achromobacter, Acinetobacter, Stenotrophomonas) should receive 7 days of therapy
			
			Complicated Pneumonia:
			• Treat *Staph. aureus* for a minimum duration of 7 days
			
			• Patients with empyema, infected pleural effusions, and bacteremia secondary to pneumonia may require longer durations of therapy. Bacteremic pneumococcal pneumonia should be treated for a minimum of 10-14 days. ID consult is recommended for patients with bacteremia.
			
			$^{+}$**CAP clinical signs of instability (if different than patient baseline status)**
			1. HR $\geq$ 100 bpm
			2. RR $\geq$ 24 breaths/min
			3. SBP $\leq$ 90 mmHg
			4. Arterial O_2 sat $\leq$ 90% or pO2 $\leq$ 60 mmHg on room air
			5. Altered mental status
				• Appropriately tailor therapy based on respiratory culture results.
				
				• For culture negative pneumonia, transition to oral therapy when patient is afebrile with clinical improvement and hemodynamically stable for 48 hours:
				  • **1st line:** Amoxicillin/clavulanate 875 mg BID plus azithromycin (complete 5-day course of azithromycin)
				  • **PCN allergic, without anaphylaxis, angioedema, or urticaria:** Cefpodoxime 200 mg PO BID plus azithromycin (complete 5-day course of azithromycin)
				  • **Severe PCN allergic patients who do not tolerate cephalosporins:** Levofloxacin 750 mg PO q24
				
				• Adjust levofloxacin and ampicillin/sulbactam for renal dysfunction. Always give levofloxacin loading dose of 750mg x 1 dose
				
				• Use **azithromycin 500 mg q24 hr if high clinical suspicion for Legionella**

HMS Preferred empiric treatment for CAP includes
• Ampicillin-Sulbactam **PLUS** Azithromycin, Clarithromycin, or Doxycycline

• Ceftriaxone or Cefotaxime **PLUS** Azithromycin, Clarithromycin, or Doxycycline

Alternative but HMS Non-Preferred treatment for patients with cephalosporin allergy, allergy to both macrolides and doxycycline/tetracycline, or severe penicillin allergy

5 days of therapy for uncomplicated CAP patients

Signs of clinical instability impacting determination for therapy duration

Pathway A (Part I)				
Indication	**Common Pathogens**	**Empiric Therapy**	**Duration of Therapy**	**Comments**

Inpatient community-acquired pneumonia
 	
(Non-ICU patient)
	Streptococcus pneumonia
	
	Haemophilus influenzae
	
	Moraxella catarrhalis
	
	Mycoplasma pneumoniae
	
	Chlamydia pnemoniae
	
	Legionella species
		<u>1st line:</u>
		Ampicillin/sulbactam 3gm IV q6 hr (except if alcoholism with aspiration**)**
		PLUS
		Azithromycin 500mg IV/PO x 1 day, then 250mg q24 hr x 4 days
		
		<u>PCN allergy without anaphylaxis, angioedema, or urticaria, or alcoholism with aspiration:</u>
		Ceftriaxone 1gm IV q24 hr
		PLUS
		Azithromycin 500mg IV/PO x 1 day, then 250mg q24 hr x 4 days
		
		Consider the addition of anaerobic coverage with metronidazole 500mg PO q8 hr **if** aspiration with risk of enteric GNR$^{\tau}$, empyema, lung abscess, or cavitary lesion
		
		<u>Severe PCN and cephalosporin allergy (anaphylaxis, angioedema, hives):</u>
		Levofloxacin 750mg IV/PO q24 hr
		
		Consider the addition of anaerobic coverage with metronidazole 500mg PO q8 hr **if** alcoholism with aspiration or aspiration with risk of empyema, lung abscess, or cavitary lesion
		
		<u>Addition of vancomycin</u>
		Consider if high clinical suspicion for CA-MRSA (history of MRSA pneumonia or post-influenza pneumonia)
			<u>Uncomplicated Pneumonia:</u>
			• **5 days** for patients who defervesce within 72 hours and have **no more than 1** sign of CAP instability at the time of antibiotic discontinuation†
			
			• Patients with delayed response should discontinue therapy 48-72 hours after defervesce and have no more than 1 sign of CAP instability† at time antibiotic discontinuation.
			
			• Pneumonia with non-fermenting GNRs (e.g. Pseudomonas, Achromobacter, Acinetobacter, Stenotrophomonas) should receive 7 days of therapy
			
			<u>Complicated Pneumonia:</u>
			• Treat *Staph. aureus* for a minimum duration of 7 days
			
			• Patients with empyema, infected pleural effusions, and bacteremia secondary to pneumonia may require longer durations of therapy. Bacteremic pneumococcal pneumonia should be treated for a minimum of 10-14 days. ID consult is recommended for patients with bacteremia.
			
			†**CAP clinical signs of instability (if different than patient baseline status)**
			1. HR $\geq$ 100 bpm
			2. RR $\geq$ 24 breaths/min
			3. SBP $\leq$ 90 mmHg
			4. Arterial O_2 sat $\leq$ 90% or pO2 $\leq$ 60 mmHg on room air
			5. Altered mental status
				• Appropriately tailor therapy based on respiratory culture results.
				
				• For culture negative pneumonia, transition to oral therapy when patient is afebrile with clinical improvement and hemodynamically stable for 48 hours:
				  • **1st line:** Amoxicillin/clavulanate 875 mg BID plus azithromycin (complete 5-day course of azithromycin)
				  • **PCN allergic, without anaphylaxis, angioedema, or urticaria:** Cefpodoxime 200 mg PO BID plus azithromycin (complete 5-day course of azithromycin)
				  • **Severe PCN allergic patients who do not tolerate cephalosporins:** Levofloxacin 750 mg PO q24
				
				• Adjust levofloxacin and ampicillin/sulbactam for renal dysfunction. Always give levofloxacin loading dose of 750mg x 1 dose
				
				• Use **azithromycin 500 mg q24 hr if high clinical suspicion for Legionella**

SJMHS Inpatient Guidelines for the Empiric Treatment of Pneumonia

Infection	Antimicrobial Therapy[§]	Duration	Comments

Community-acquired pneumonia (CAP)[1]
Non-ICU
	Ceftriaxone 1g IV Q24h **PLUS** Azithromycin 500 mg IV/PO X1, then 250mg PO Q24h X 4 days **OR** doxycycline 100mg IV/PO Q12h (if macrolide intolerance/allergy)
	
	Patients with a documented TypeI IgE-medicated penicillin or cephalosporin allergy OR any legitimate cephalosporin allergy OR as PO therapy in patients tolerating PO:
	
	Levofloxacin 750 mg[1] IV/PO Q24h
		5 days*
		
		*Longer durations of therapy may be indicated, depending upon clinical response
		
		5 days if afebrile with <2 signs of clinical instability on days 3-5
		
		Signs of Clinical Instability:
		• Arterial O_2 sat $\leq$ 90%
		• HR $\geq$ 100 bpm
		• RR $\geq$ 24 breaths/min
		• BP $\leq$ 90 mmHg
		• Altered mental status (different than baseline)
			oxacin is restricted to patients with a ented TypeI IgE-medicated penicillin or cephalosporin allergy (anaphylaxis) or any legitimate cephalosporin allergy or as PO therapy in patients tolerating PO
			• Consider increased ceftriaxone dose of 2 grams Q24h if patient greater than 100kg
			• Consider doxycycline as an alternative to azithromycin in patients at high risk for QT prolongation
			  ○ Existing QT prolongation
			  ○ Hypokalemia
			  ○ Hypomagnesemia
			  ○ Significant bradycardia
			  ○ Bradyarrhythmias
			  ○ Uncompensated heart failure
			  ○ Patients receiving class IA or class III antiarrhythmic drugs
			• Patients should be switched from IV to PO when they are hemodynamically stable, improving clinically, and able to tolerate PO medications.
			• Total duration (IV plus PO step down) described in previous column
			• Options for oral step down therapy should target isolated pathogen. Options for PO step-down if no pathogen identified on respiratory culture:
			  ○ Amoxicillin/clavulanate 875mg Q12h[1] PLUS/MINUS azithromycin
			  ○ Amoxicillin 1g Q8h[1] PLUS/MINUS azithromycin
			  ○ Cefpodoxime 200mg Q12h[1] PLUS/MINUS azithromycin
			  ○ Cefuroxime 500mg Q12h[1] PLUS/MINUS azithromycin
			  ○ If TypeI IgE-mediated penicillin or any legitimate cephalosporin allergy: Levofloxacin 750mg Q24h[1]

HMS Preferred empiric treatment for CAP includes
• Ampicillin-Sulbactam **PLUS** Azithromycin, Clarithromycin, or Doxycycline

• Ceftriaxone or Cefotaxime **PLUS** Azithromycin, Clarithromycin, or Doxycycline

Alternative but HMS Non-Preferred treatment for patients with cephalosporin allergy, allergy to both macrolides and doxycycline/tetracycline, or severe penicillin allergy

5 days of therapy for uncomplicated CAP patients

Signs of clinical instability impacting determination for therapy duration

§ Prior to confirmation of pathogen
1. Refer to SJMHS antibiotic dosing tables for dose adjustments in renal dysfunction.

SJMHS Inpatient Guidelines for the Empiric Treatment of Pneumonia

Infection	Antimicrobial Therapy[§]	Duration	Comments

Community-acquired pneumonia (CAP)[1]
 	
Non-ICU
	Ceftriaxone 1g IV Q24h **PLUS** Azithromycin 500 mg IV/PO X1, then 250mg PO Q24h X 4 days **OR** doxycycline 100mg IV/PO Q12h (if macrolide intolerance/allergy)
	
	Patients with a documented TypeI IgE-medicated penicillin or cephalosporin allergy OR any legitimate cephalosporin allergy OR as PO therapy in patients tolerating PO:
	
	Levofloxacin 750 mg[1] IV/PO Q24h
		5 days*
		
		*Longer durations of therapy may be indicated, depending upon clinical response
		
		5 days if afebrile with <2 signs of clinical instability on days 3-5
		
		Signs of Clinical Instability:
		• Arterial O_2 sat ≤ 90%
		• HR ≥ 100 bpm
		• RR ≥ 24 breaths/min
		• BP ≤ 90 mmHg
		• Altered mental status (different than baseline)
			• Levofloxacin is restricted to patients with a documented TypeI IgE-medicated penicillin or cephalosporin allergy (anaphylaxis) or any legitimate cephalosporin allergy or as PO therapy in patients tolerating PO
			• Consider increased ceftriaxone dose of 2 grams Q24h if patient greater than 100kg
			• Consider doxycycline as an alternative to azithromycin in patients at high risk for QT prolongation
			  o Existing QT prolongation
			  o Hypokalemia
			  o Hypomagnesemia
			  o Significant bradycardia
			  o Bradyarrhythmias
			  o Uncompensated heart failure
			  o Patients receiving class IA or class III antiarrhythmic drugs
			• Patients should be switched from IV to PO when they are hemodynamically stable, improving clinically, and able to tolerate PO medications.
			• Total duration (IV plus PO step down) described in previous column
			• Options for oral step down therapy should target isolated pathogen. Options for PO step-down if no pathogen identified on respiratory culture:
			  o Amoxicillin/clavulanate 875mg Q12h[1] PLUS/MINUS azithromycin
			  o Amoxicillin 1g Q8h[1] PLUS/MINUS azithromycin
			  o Cefpodoxime 200mg Q12h[1] PLUS/MINUS azithromycin
			  o Cefuroxime 500mg Q12h[1] PLUS/MINUS azithromycin
			  o If TypeI IgE-mediated penicillin or any legitimate cephalosporin allergy: Levofloxacin 750mg Q24h[1]

§ Prior to confirmation of pathogen

1. Refer to SJMHS antibiotic dosing tables for dose adjustments in renal dysfunction.

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Contributors: Curtis Collins, PharmD,,Anu Malani, MD

SAINT JOSEPH MERCY HEALTH SYSTEM
A Member of Trinity Health

Guidelines for Treatment of Urinary Tract Infections (UTIs) in Adults – January 2018

Infection	Antimicrobial Therapy[§]	Duration	Comments
Asymptomatic Bacteriuria	**National guidelines recommend against testing for asymptomatic bacteriuria except in select circumstances (pregnancy, prior to urologic procedures)**		
Uncomplicated Lower Tract Infections or Cystitis • females without catheters • females without co-morbid conditions listed under complicated UTIs	Trimethoprim-Sulfamethoxazole[1] PO	3 days	• Empiric antibiotic choice should take into consideration recent previous culture results, prior antibiotic use, antibiotic allergies, and severity of presenting illness • Fluoroquinolones should be used for only when other oral antibiotic options are not feasible because of their propensity for collateral damage (antibiotic resistance, *C.difficile* infection, and other adverse effects). When a fluoroquinolone is used for uncomplicated cystitis, the duration of treatment is 3 days. • Nitrofurantoin should be avoided in patients with CrCl < 30 mL/min • If susceptibility available at 48-72 hrs, de-escalate treatment to susceptible narrow-spectrum antibiotic • *Fosfomycin is restricted to patients with suspected or confirmed multi-drug resistant organisms. Susceptibilities only established for *E. coli* and *Enterococcus* species, but there is data and clinical experience supporting the use of the same susceptibility breakpoints for other members of the *Enterobacteriaceae* group
	Nitrofurantoin	5 days	
	Alternatives		
	Fosfomycin[1*]	1 dose	
	Cephalexin[1] (or other oral β-lactam)	3-7 days	

When to order a Urinalysis or Urine Culture
Recommendations for when to order a urinalysis or urine culture based on Signs/Symptoms of a UTI

- Fever >38° C or rigors without alternative cause
- Urgency, frequency, dysuria
- Suprapubic pain or tenderness
- Costovertebral pain or tenderness
- New onset mental status changes without alternative cause
- Acute hematuria
- Spinal cord injury spasticity or autonomic dysreflexia
- > 2 SIRS criteria (T > 38 C or < 35 C, HR > 90, RR >20 or PaCO bands) OR shock with concerns for sepsis

Do not send urine culture if none of these symptoms are present or there is an alternative cause

No Antibiotic Treatment for ASB
Recommendation **in the absence of signs or symptoms** attributable to a urinary tract infection, patients with a positive urine culture and/or pyuria **should not** be treated with antibiotics

In the **absence of signs or symptoms*** (see above) attributable to a urinary tract infection, patients with a positive urine culture **should not be treated** with antibiotics irrespective of whether there is pyuria, high bacterial colony count, or a multi-drug resistant organism. *Exceptions to this recommendation include pregnant patients and patients with asymptomatic bacteriuria prior to a urologic procedure*.

Treatment of Uncomplicated Lower UTI or Cystitis
HMS recommendation of antibiotic treatment and duration

§ Prior to confirmation of pathogen
1. Refer to SJMHS antibiotic dosing tables for dose adjustments in renal dysfunction.

References
- Gupta K et al. International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update from the IDSA and ESCMID. *Clin Infect Dis*. 2011;52(5):e103-e120.
- Hooton et al. Diagnosis, Prevention, and Treatment of Catheter Associated UTI in Adults: 2009 International Clinical Practice Guidelines from the IDSA. *Clin Infect Dis*. 2010;50:625-663.
- Nicolle LE et al. Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. *Clin Infect Dis*. 2005;40:643-54.

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Contributors: Curtis Collins, PharmD, Anu Malani, MD

SAINT JOSEPH MERCY HEALTH SYSTEM
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Complicated Lower Tract Infections or Cystitis

Includes patients with catheter associated-urinary tract infections (CA-UTI) and patients not meeting the definition for uncomplicated lower UTI/cystitis: Male, urinary catheter present or removal within the last 48 hrs., GU instrumentation, anatomic abnormality or obstruction, significant co-morbidities, such as:

- Nephrolithiasis
- Urolologic surgery
- Urinary obstruction
- Urinary retention
- Spinal cord injury
- Asplenia
- Receiving chemotherapy for a malignancy or malignancy not in remission
- Moderate/severe liver disease
- Hemiplegia
- CHF
- Cardiomyopathy
- Moderate/severe CKD or on HD
- Sickle cell disease
- Chronic anti-coagulation
- Bedridden or using a wheelchair
- Diabetes mellitus with Hgb A1C>8%
- Immunodeficiency or immunosuppressive treatments
- Structural lung disease (moderate-severe COPD, bronchiectasis, home oxygen)

Treatment of Complicated Lower UTI without sepsis/bacteremia
HMS recommendation of antibiotic treatment and duration

Trimethoprim-Sulfamethoxazole[1] PO	7 days
Nitrofurantoin	7 days
Fosfomycin[1*]	Q 48 h X 3 doses
Cephalexin[1]	7 days
IV Ceftriaxone OR IV β-lactam followed by other oral agent	≤ 7 days

- Empiric antibiotic choice should take into consideration recent previous culture results, prior antibiotic use, antibiotic allergies, and severity of presenting illness
- Final choice depends upon confirmation of specific pathogen, the susceptibility pattern, and patient allergies
- Nitrofurantoin should be avoided in patients with CrCl < 30 mL/min
- A 3-dose fosfomycin treatment course can be used for women ≤ 65 years who develop a CA-UTI without upper tract symptoms after the indwelling catheter has been removed
- Fluoroquinolones should be used for only when other oral antibiotic options are not feasible because of their propensity for collateral damage (antibiotic resistance, *C.difficile* infection, and other adverse effects). When a fluoroquinolone is used for complicated lower UTIs, the duration of treatment is 7 days.
- *Fosfomycin is restricted to patients with suspected or confirmed multi-drug resistant organisms. Susceptibilities only established for *E. coli* and *Enterococcus* species, but there is data and clinical experience supporting the use of the same susceptibility breakpoints for other members of the *Enterobacteriaceae* group

Treatment of Uncomplicated Pyelonephritis

HMS recommendation of antibiotic treatment and duration

Pyelonephritis and Urinary Tract Infections Associated with Bacteremia

Uncomplicated Pyelonephritis: female pts without catheters or any of the co-morbid conditions listed in the definition for complicated lower UTI

Complicated Pyelonephritis: patients with pyelonephritis not meeting definition for uncomplicated pyelonephritis

Uncomplicated Pyelonephritis	
Trimethoprim-Sulfamethoxazole[1]	7-14 days

- Empiric antibiotic choice should take into

§ Prior to confirmation of pathogen
1. Refer to SJMHS antibiotic dosing tables for dose adjustments in renal dysfunction.

References

- Gupta K et al. International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update from the IDSA and ESCMID. *Clin Infect Dis*. 2011;52(5):e103-e120.
- Hooton et al. Diagnosis, Prevention, and Treatment of Catheter Associated UTI in Adults: 2009 International Clinical Practice Guidelines from the IDSA. *Clin Infect Dis*. 2010;50:625-663.
- Nicolle LE et al. Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. *Clin Infect Dis*. 2005;40:643-54.

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Contributors: Curtis Collins, PharmD, Anu Malani, MD

Treatment of Uncomplicated Pyelonephritis

HMS recommendation for antibiotic treatment and duration

PO	
Fluoroquinolones[1]	5-7 days
β-lactams (Ceftriaxone)	IV therapy: 7 days IV to PO β-lactam/other susceptible PO agent: 7-14 days (combined IV+PO)

Treatment of Complicated Pyelonephritis and UTI with Bacteremia

HMS recommendation for antibiotic treatment and duration

Complicated Pyelonephritis and UTI with Bacteremia	
Complicated Pyelonephritis β-lactams (Ceftriaxone or cefepime[1]; may be followed by oral antibiotic therapy)	7-14 days
UTI with Bacteremia** β-lactams (Ceftriaxone or cefepime[1])	7-14 days Shorter courses of therapy (7-days) with a fluoroquinolone or IV β-lactam can be considered in female patients without co-morbid conditions who are bacteremic secondary to pyelonephritis or cystitis/lower UTI who have rapid clinical response

consideration recent previous culture results, prior antibiotic use, antibiotic allergies, and severity of presenting illness

- Final antibiotic choice should be based on antibiotic susceptibilities of the pathogen and take into consideration antibiotic allergies of the patient
- Nitrofurantoin and fosfomycin should not be used for pyelonephritis, upper urinary tract infection, or patients with bacteremia
- Oral β-lactams are associated with lower efficacy and higher relapse rates compared to trimethoprim-sulfamethoxazole and fluoroquinolones. If a β-lactam is used then initial therapy should be IV therapy followed by oral β-lactam (assuming uropathogen is susceptible)
- **Due to potential complications from PICC lines (e.g. DVT, CLABSI), oral fluoroquinolones are preferred over PICC line placement for IV antibiotics when the urinary pathogen is susceptible and there are no contraindications to fluoroquinolones.

§ Prior to confirmation of pathogen

1. Refer to SJMHS antibiotic dosing tables for dose adjustments in renal dysfunction.

References

- Gupta K et al. International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update from the IDSA and ESCMID. *Clin Infect Dis*. 2011;52(5):e103-e120.
- Hooton et al. Diagnosis, Prevention, and Treatment of Catheter Associated UTI in Adults: 2009 International Clinical Practice Guidelines from the IDSA. *Clin Infect Dis*. 2010;50:625-663.
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Contributors: Curtis Collins, PharmD, Anu Malani, MD

Guidelines for Treatment of Urinary Tract Infections (UTIs) in Adults Dosing Recommendations

Antibiotic	Dose*
Trimethoprim-sulfamethoxazole (160 mg/800 mg) [1]	1 DS tablet po BID
Nitrofurantoin[1]	100 mg po BID
Fosfomycin	3 g dose (see tables for complicated and uncomplicated lower UTI)
Amoxicillin-clavulanate[1]	875mg po BID Uncomplicated Cystitis: 500 mg po BID
Cephalexin[1]	500 mg po BID-QID Uncomplicated Cystitis: 500 mg po BID
Cefpodoxime[1]	100-200 mg po BID Uncomplicated Cystitis: 100 mg po BID
Cefazolin[1]	1-2g IV q 8 hr
Cefuroxime[1]*	500 mg po BID 750 mg-1.5g IV q 8 hr Uncomplicated Cystitis: 250 mg po BID
Piperacillin-tazobactam[1]	3.375 g IV q 6 hr or 4.5 g IV q 6-8 hr
Ceftriaxone	1-2 g IV once daily
Cefepime[1]	1-2 g IV q 8-12 hr
Levofloxacin[1]	250-750 mg QD Uncomplicated Cystitis: 250 mg po QD Uncomplicated Pyelonephritis: 7-day duration: 500 mg po QD 5-day duration: 750 mg po QD
Ciprofloxacin[1]	250-750 mg po BID 400 mg IV q12 hr Uncomplicated Cystitis: 250 mg po BID Uncomplicated Pyelonephritis: 500 mg po BID

* Dose depends on disease state (Uncomplicated UTI, Complicated UTI, Pyelonephritis), severity of presentation (e.g. septic shock, severe sepsis), presence of bacteremia, and susceptibilities of the pathogen

§ Prior to confirmation of pathogen

1. Refer to SJMHS antibiotic dosing tables for dose adjustments in renal dysfunction.

References

- Gupta K et al. International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update from the IDSA and ESCMID. *Clin Infect Dis*. 2011;52(5):e103-e120.
- Hooton et al. Diagnosis, Prevention, and Treatment of Catheter Associated UTI in Adults: 2009 International Clinical Practice Guidelines from the IDSA. *Clin Infect Dis*. 2010;50:625-663.
- Nicolle LE et al. Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. *Clin Infect Dis*. 2005;40:643-54.

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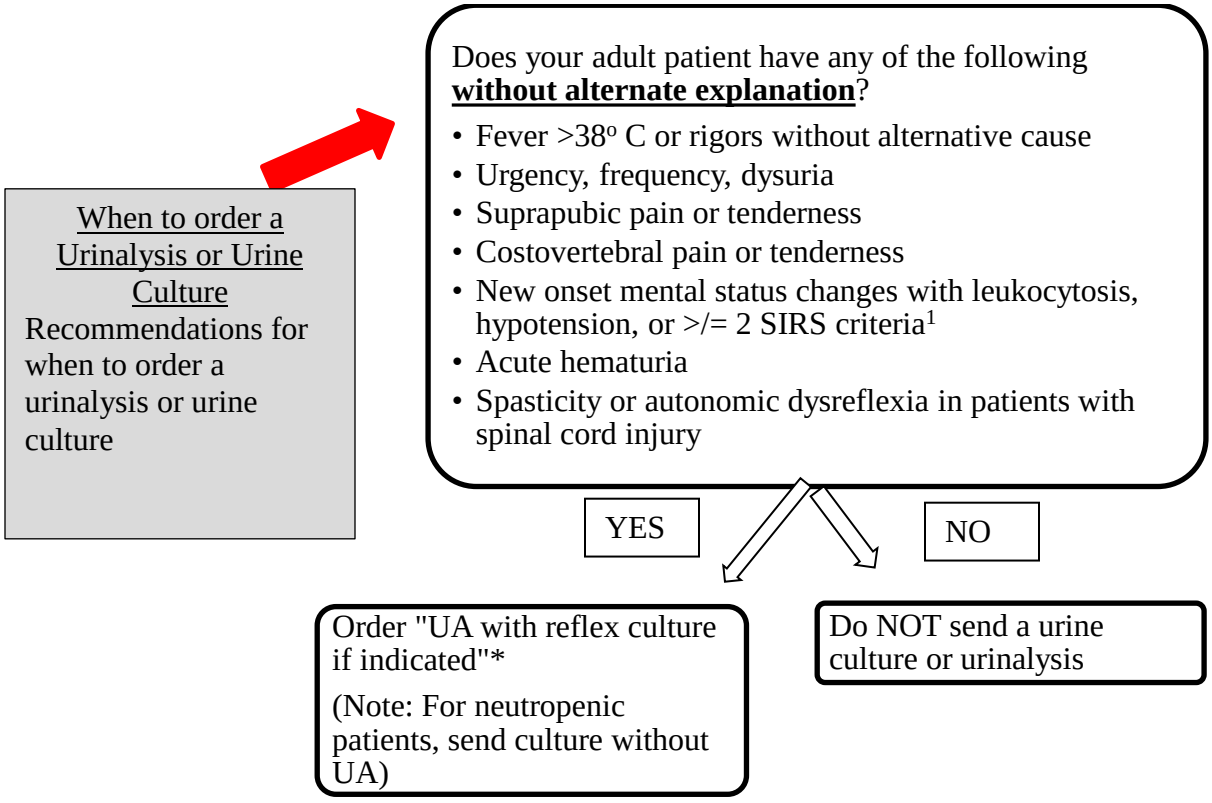
Contributors: Curtis Collins, PharmD, Anu Malani, MD

MICHIGAN MEDICINE GUIDELINES FOR TREATMENT OF URINARY TRACT INFECTIONS IN ADULTS

When to Order a Urine Culture: Asymptomatic bacteriuria is often treated unnecessarily, and accounts for a substantial burden of unnecessary antimicrobial use. National guidelines recommend against testing for asymptomatic bacteriuria, except in select circumstances. Therefore urine cultures should only be obtained on adult inpatients for appropriate reasons. In the absence of signs or symptoms (see below) attributable to a urinary tract infection, patients with a positive urine culture and/or pyuria should not be treated with antibiotics irrespective of high bacterial colony count, or a multi-drug resistant organism. The following is an effective strategy for how and when to order a urinalysis and/or urine culture. NOTE: this does not apply to patients being screened for asymptomatic bacteruria (see subsequent page for recommendations in such patients).



*: With this order, a urine culture will only be performed if a urinalysis result indicates infection. This is a strategy to decrease unnecessary antibiotic treatment in samples indicative of colonization and not infection [6]

[a] SIRS Criteria: Heart rate greater than 90bpm, respiratory rate greater than 20 breaths per minute, temperature less than 36° C, white blood count less than 4,000 cells/mm3, temperature greater than 38o C, white blood count greater than 12,000 cells/mm3.

MICHIGAN MEDICINE GUIDELINES FOR TREATMENT OF URINARY TRACT INFECTIONS IN ADULTS

Clinical Setting	Empiric Therapy	Duration	Comments
Asymptomatic Bacteriuria[1] No symptoms of UTI (listed below) UTI symptoms include (without alternative explanation): - Fever >38ºC or rigors without alternative cause - Urgency, frequency, dysuria - Suprapubic pain or tenderness - Costovertebral pain or tenderness - New onset mental status changes with leukocytosis, hypotension, or >/= 2 SIRS criteria[a] - Acute hematuria - Spasticity or autonomic dysreflexia in patients with spinal cord injury	In most circumstances, asymptomatic bacteriuria **should not be treated,** regardless of pyuria, bacterial density, or isolation of resistant organisms.		
Uncomplicated Cystitis[3] (Non-pregnant female without obstruction, catheters, flank pain, or co-morbid conditions except well-controlled diabetes mellitus)	**Preferred** Nitrofurantoin 100 mg po BID (contraindicated if CrCl <50 ml/min. Due to the cost of fosfomycin, nitrofurantoin is preferred if not contraindicated) OR Fosfomycin 3 gm po once **Alternative** Cephalexin* 500 mg po BID OR TMP/SMX* 1DS tab po BID ***Adjust dose based on renal function**	Nitrofurantoin: 5 days Fosfomycin: 1 dose Cephalexin: 7 days TMP/SMX: 3 days	• Fluoroquinolones are no longer recommended as 1st-line agents due to high rates of *E coli* resistance and propensity for collateral damage (resistance, *C difficile* infection). Use should be reserved when other options are not feasible; duration of therapy should be 3 days. • Extended spectrum beta-lactamase positive cases of uncomplicated cystitis can be treated with piperacillin/tazobactam, ampicillin/sulbactam, amoxicillin/clavulanate, cefepime, ceftriaxone or aztreonam when susceptible[5]

No Antibiotic Treatment for ASB

Recommendation **in the absence of signs or symptoms** attributable to a urinary tract infection, patients with a positive urine culture and/or pyuria **should not** be treated with antibiotics irrespective of high bacterial colony count, or a multi-drug resistant organism

*Exceptions to this recommendation include pregnant patients and patients bacteriuria prior to a urologic

Treatment of Uncomplicated Lower UTI or Cystitis

HMS recommendation of antibiotic treatment and duration

MICHIGAN MEDICINE GUIDELINES FOR TREATMENT OF URINARY TRACT INFECTIONS IN ADULTS

No antibiotic treatment for ASB

Clinical Setting	Empiric Therapy (<u>should take into account recent previous cultures</u>)	Duration	Comments
Complicated Lower Urinary Tract Infection Without Sepsis or Bacteremia [4] (Male, urinary catheter present or removal within the last 48 hrs, recent GU instrumentation , anatomic abnormality or obstruction, pregnancy or other significant co-morbid conditions such as uncontrolled diabetes or immunosuppression) <u>Treatment of Complicated Lower UTI without sepsis/bacteremia</u> HMS recommendation of antibiotic treatment and duration ***Adjust dose based on renal function**	**Preferred oral regimens:** Nitrofurantoin 100 mg po BID (contraindicated if CrCl <50 ml/min) OR Fosfomycin 3 gm po X 3 doses given every 48 hours **Alternative oral regimens** Cephalexin* 500 mg po QID OR TMP/SMX* 1 DS tab po BID (if susceptibility confirmed) **Preferred IV option if patient cannot take PO medications** Cefazolin* 1g IV Q8H **Alternative IV option in patients with anaphylactic PCN/Cephalosporin allergy** Aztreonam* 1g IV q8H **History of resistant Gram-negative bacteria OR Not responding to PO antibiotics** Piperacillin-tazobactam* 4.5 gm IV q8h **Alternative in patients with anaphylactic PCN/Cephalosporin allergy** Aztreonam* 1g IV q8H	**Non-Catheter-associated:** Treatment duration depends on patient characteristics and clinical response, 7 days usually appropriate **Catheter-associated**: Prompt resolution of symptoms**:** 7 days Delayed response to therapy: 10-14 days **Special Populations:** Women <65 y/o without upper tract symptoms after catheter removal: 3 days	• **Asymptomatic bacteriuria in catheterized patients, even in the presence of pyuria, is NOT an indication for treatment** • Remove urinary catheter whenever possible • Nitrofurantoin and Fosfomycin should be avoided if pyelonephritis is suspected • Definitive antimicrobial choice should be adjusted based on urine culture and susceptibility testing

MICHIGAN MEDICINE GUIDELINES FOR TREATMENT OF URINARY TRACT INFECTIONS IN ADULTS

Clinical Setting	Empiric Therapy (<u>should take into account recent previous cultures</u>)	Duration	Comments
Uncomplicated Pyelonephritis[3] (healthy non-pregnant female) <u>Treatment of Uncomplicated Pyelonephritis</u> HMS recommendation of antibiotic treament and duration	**Preferred** Ceftriaxone 1 gm IV daily followed by step-down to oral TMP/SMX* 1 DS tab po BID if susceptible **Alternative in patients with anaphylactic PCN/Cephalosporin allergy** Ciprofloxacin* 500 mg po BID or 400 mg iv BID + Gentamicin 2 mg/kg X 1 dose ***Adjust dose based on renal function**	TMP/SMX: 14 days Ciprofloxacin: 7days Beta-lactams: 14 days	• Urine culture and susceptibility testing should be obtained • Step-down to oral therapy is dependent on the susceptibility of the organism • Fluoroquinolones may cause tendinopathy and tendon rupture especially among patients who are older (>60 yo), malnourished, and on oral glucocorticoids • Fluoroquinolones may lead to potentially fatal arrhythmias in patients with QT interval prolongation, electrolyte abnormalities, clinically significant bradycardia, and in patients receiving antiarrhythmic medications

MICHIGAN MEDICINE GUIDELINES FOR TREATMENT OF URINARY TRACT INFECTIONS IN ADULTS

Clinical Setting	Empiric Therapy (should take into account recent previous cultures)	Duration	Comments
Complicated Urinary Tract Infection with Sepsis or Bacteremia, Complicated Pyelonephritis	**Community-acquired:** Ceftriaxone 1 gm IV daily **Critically ill, septic shock, healthcare- or hospital-acquired:** Piperacillin/tazobactam* 4.5gm IV q 8 hrs **Alternative** PCN allergy without anaphylaxis, angioedema, or urticaria Cefepime* 1 gm IV q 8h + Vancomycin ** Anaphylactic PCN/Cephalosporin allergy Vancomycin** + Aztreonam* 2gm IV q8h	**Sepsis w/o bacteremia:** 10-14 days, can step-down to oral therapy when stable (see comment) **Sepsis with bacteremia:** 14 days from first negative blood culture with IV antibiotics or oral quinolone if susceptible gram-negative **Complicated Pyelonephritis:** 14 days	Treatment of Complicated Pyelonephritis and UTI with Bacteremia HMS recommendation of antibiotic treatment and duration

Last updated 12/15/2015 (revision to Page 1 made 2/22/2018)
***Renal Dosing Recommendations:**
https://pharmwebsp.med.umich.edu/AC/Antimicrobial%20Use%20Guidelines/Antimicrobial%20Dosing%20Guidelines/Antimicrobial_dosing_recommendations_4-9-2014.pdf

[a] SIRS Criteria: Heart rate greater than 90bpm, respiratory rate greater than 20 breaths per minute, temperature less than 36° C, white blood count less than 4,000 cells/mm3, temperature greater than 38o C, white blood count greater than 12,000 cells/mm3.

[1] Nicolle LE, et al. Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. Clin Infect Dis 2005;40:643-654.
[2] Sousa R, et al. Is Asymptomatic Bacteriuria a Risk Factor for Prosthetic Joint Infection? Clin Infect Dis 2014;59:41-47.
[3] Gupta K, et al. International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. Clin Infect Dis 2011;52:e103-e120.
[4] Hooton TM, et al. Diagnosis, Prevention, and Treatment of Catheter- Associated Urinary Tract Infection in Adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America. Clin Infect Dis 2010;50:625-663.
[5] Harris PN, et al. β-lactam and β-lactamase inhibitor combinations in the treatment of extended-spectrum β-lactamase producing Enterobacteriaceae: time for a reappraisal in the era of few antibiotic options? Lancet Infect Dis 2015;15:475-485.
[6] Gandhi T, et al. Importance of urinary tract infection to antibiotic use among hospitalized patients. Infect Control Hosp Epidemiol 2009;30:193-5.

Appendix C

EMPIRIC TREATMENT OF COMMUNITY-ACQUIRED PNA IN NON-ICU PATIENTS

Community-acquired pneumonia is defined as pneumonia acquired outside of hospitals or extended-care facilities.

HMS PREFERRED THERAPY	ALTERNATIVE BUT HMS NON-PREFERRED Preferred for patients with cephalosporin allergy, allergy to both macrolides and doxycycline/tetracycline, or severe penicillin allergy.
Ampicillin-Sulbactam 3gm IV q6h, Ceftriaxone 1gm IV q24h, **OR** Cefotaxime 1g IV q8h **PLUS** Azithromycin 500mg IV/PO x 1 day, then 250mg q24h x 4 days* **OR** Clarithromycin 500mg PO BID **OR** Doxycycline 100mg PO BID	Levofloxacin 750 mg PO/IV Once Daily **OR** Moxifloxacin 400mg PO/IV Once Daily

*Consider substituting doxycycline for azithromycin in patients with a macrolide allergy or at risk for prolonged QT interval.

ORAL STEP-DOWN THERAPY WHEN NO ETIOLOGIC PATHOGEN IDENTIFIED FOR CAP**		
Amoxicillin (1g PO 3 x daily) **Amoxicillin/clavulanate** (875 mg - 2g PO 2 x daily) **Cefpodoxime** (200mg PO 2 x daily) **Cefdinir** (300mg PO 2 x daily) **Cefditoren** (400mg PO 2 x daily) **Cefuroxime** (500mg PO 2 x daily)	+/-	**Azithromycin, Doxycyline, or Clarithromycin** (see dosing above)
Alternatives: Levofloxcin or Moxifloxacin in setting of severe PCN allergy		

**Suggested dosing only. Please individualize based on renal function or other pertinent clinical factors.
Anaerobic coverage is not routinely warranted in non-critically ill patients with aspiration pneumonia.
For more detail about these guidelines, please see the Treatment of Community-Acquired Pneumonia Guidelines published by HMS.

THERAPY DURATION & ORAL STEP-DOWN THERAPY RECOMMENDATIONS FOR PATIENTS WITH CAP

DEFINTIONS OF COMPLICATED CAP & UNCOMPLICATED CAP	
COMPLICATED CAP	Patients with structural lung disease (e.g. bronchiectasis, pulmonary fibrosis, interstitial lung disease); moderate/severe COPD (excluding COPD exacerbation without pneumonia); documented pnuemonia withMRSA, MSSA, or pseudomonas (or other non-fermenting gram-negative pneumonia); or those who are immunosuppressed.
UNCOMPLICATED CAP	Patients who do not meet any of the criteria above.

DURATION OF ANTIMICROBIAL THERAPY (INCLUDES IV & ORAL)	
COMPLICATED CAP	**7 Days** if patient is afebrile for 48 hours and has ***no more than one*** sign of clinical instability* by day 7 of treatment (Note: Azithromycin duration should be no more than 5 days) Therapy can be continued for patients who are febrile or clinically unstable* on day 7 of treatment
UNCOMPLICATED CAP	**5 Days** if the patient is afebrile for 48 hours and has ***no more than one*** sign of clinical instability* by day 5 of treatment Therapy can be continued for patients who are febrile or clinically unstable* on day 5 of treatment

****Signs of Clinical Instability:*** O2 saturation < 90% or new oxygen requirement, HR > 100 bpm, RR > 24 bpm, SBP <90 mmHg, altered mental status (different than baseline)

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Appendix D

SHOULD THIS PATIENT BE EVALUATED FOR A URINARY TRACT INFECTION?*

Does the patient have any of the following ***without alternate explanation***?

1. Urgency, frequency, dysuria
2. Suprapubic pain or tenderness
3. Costovertebral pain or tenderness
4. New onset mental status changes with leukocytosis (WBC > 10 x 10^9/L), or hypotension (SBP < 90mmHg), or ≥ 2 SIRS criteria
5. Fever > 38^{O} C or Rigors
6. Acute hematuria
7. Increased spasticity or autonomic dysreflexia in a spinal cord injury patient

YES

Send UA and, if positive, send Urine Culture**

Document indication for sending urine culture

Start empiric therapy (see reverse side)

NO

Do ***NOT*** send urine testing

*Symptom-based screening may not be reliable in the in the setting of renal transplants, urinary diversion, or severe sepsis or septic shock. Use your clinical judgment in this population

** Urine culture alone is appropriate for febrile neutropenia and ASB screening for pregnancy or prior to urologic procedures.

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EMPIRIC THERAPY BASED ON CLASSIFICATION OF URINARY TRACT INFECTION

Empiric choices should take into account previous cultures.

If urine culture is negative & patient was on antibiotics at the time of culture & patient has symptoms (1-7 on the reverse side), it may be appropriate to treat.

PATIENT CATEGORY	PREFERRED**	ALTERNATIVES	DURATION
ASYMPTOMATIC BACTERIURIA* Defined as having NONE of the symptoms (1-7) listed on reverse side	Treatment indicated during pregnancy and prior to urologic procedures		
UNCOMPLICATED LOWER UTI (CYSTITIS)***	Nitrofurantoin or TMP/SMX	Fosfomycin IV or Oral Beta-Lactam (e.g. Cephalexin or Cefpodoxime)	Nitrofurantoin x 5 days (avoid in CrCl < 30 mL/min) Fosfomycin x 1 dose TMP/SMX x 3 days IV or Oral Beta-Lactam x 3-7 days
COMPLICATED LOWER UTI (CYSTITIS)*** Male, urinary catheter present or within last 48 hours, anatomic abnormality or obstruction, significant co-morbidities	Nitrofurantoin, Fosfomycin, **or** TMP/SMX, Oral Beta-Lactam or IV Beta-Lactam, <u>Severe PCN or Cephalosporin Allergy:</u> Aztreonam		Nitrofurantoin x 7 days Fosfomycin (q48h) x 3-5 doses TMP/SMX x 7 days Oral Beta-Lactam, IV Beta-Lactam, **or** Aztreonam x 7 days
UNCOMPLICATED PYELONEPHRITIS	TMP/SMX, Fluoroquinolones, **or** Beta-Lactams		IV Beta-Lactam Therapy followed by Oral Beta-Lactam **or** Oral TMP/SMX therapy : 7-14 days IV Beta-Lactam Therapy x 7 days TMP/SMX x 7-14 days Fluoroquinolones x 5-7 days
COMPLICATED PYELONEPHRITIS, UTI WITH BACTEREMIA & SEPSIS	Defer to Individual Institutions		**Complicated Pyelonephritis** : 7-14 days **UTI with Bacteremia** : 7-14 days [Shorter courses of therapy (7 days) with a fluoroquinolone or IV beta-lactam can be considered in female patients without co-morbid conditions who are bacteremic secondary to pyelonephritis or cystits/lower UTI and have rapid clinical response to therapy.]

*refer to reverse side for conditions when symptom based screening may not be appropriate

**preferred therapies should reflect local antibiogram data for *E.coli* >80% susceptible

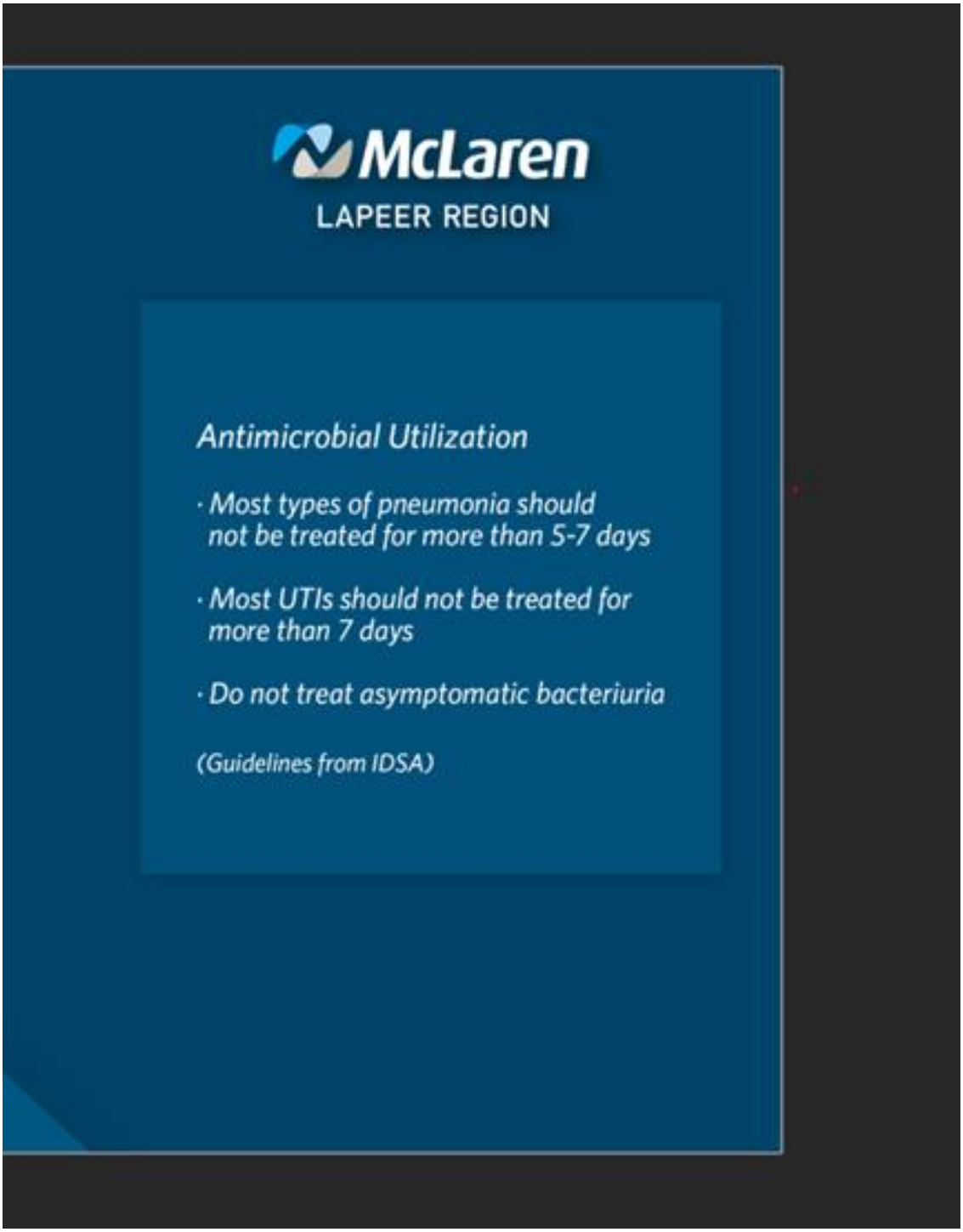
*** excludes patients with sepsis and bacteremia

Follow culture results and de-escalate therapy based on final results and sensitivities.

FOR EACH ANTIBIOTIC: DOCUMENT INDICATION AND PLANNED DURATION FOR ALL PATIENTS.

For more detail about these guidelines, please see the Guidelines for Treatment of UTIs published by HMS.

SITE EXAMPLE OF EDUCATIONAL COMPUTER SCREENSAVER



CAP ORDER SET EXAMPLE

Community Acquired Pneumonia (Pathway A- Non ICU patient)

- **Duration of therapy is 5 days** for patients who defervesce within 72 hours and have **no more than 1** sign of CAP instability at the time of antibiotic discontinuation
- Patients with delayed response should discontinue therapy 48-72 hours after defervesce and have no more than 1 sign of CAP instability at time antibiotic discontinuation

CAP clinical signs of instability (if different then patient baseline status)

1. HR ≥ 100 bpm
2. RR ≥ 24 breaths/min
3. SBP ≤ 90 mmHg
4. Arterial O2 sat ≤ 90% or pO2 ≤ 60 mmHg on room air
5. Altered metal status

☐ Preferred Therapy
☐ PCN allergy without anaphylaxis, angioedema or urticarial
☐ Severe PCN allergy AND/OR cephalosporin allergy (anaphylaxis, angioedema, hives)

☑ **Preferred Therapy**

Preferred regimen- ampicillin/sulbactam AND azithromycin IV/PO

☐ ampicillin-sulbactam (UNASYN) IV 3 g, Intravenous, EVERY 6 HOURS SCHEDULED

☐ azithromycin (ZITHROMAX) tablet 500 mg, Oral, ONCE

☐ azithromycin (ZITHROMAX) tablet 250 mg, Oral, ONCE DAILY, starting H+24 Hours for 4 doses

☐ azithromycin (ZITHROMAX) IV 500 mg, Intravenous, ONCE

☐ azithromycin (ZITHROMAX) IV 250 mg, Intravenous, EVERY 24 HOURS, Starting H+24 Hours

☐ doxycycline hyclate (VIBRAMYCIN) capsule- ALTERNATIVE for macrolide allergy 100 mg, Oral, 2 TIMES DAILY

☑ **PCN allergy without anaphylaxis, angioedema, or urticarial**

Ceftriaxone AND azithromycin

☐ ceftriaxone (ROCEPHINE) IV 1g, Intravenous, EVERY 24 HOURS

☐ azithromycin (ZITHROMAX) tablet 500 mg, Oral, ONCE

☐ azithromycin (ZITHROMAX) tablet 250 mg, Oral, ONCE DAILY, starting H+24 Hours for 4 doses

☐ azithromycin (ZITHROMAX) IV 500 mg, Intravenous, ONCE

☐ azithromycin (ZITHROMAX) IV 250 mg, Intravenous, EVERY 24 HOURS, Starting H+24 Hours

☐ doxycycline hyclate (VIBRAMYCIN) capsule- 100 mg, Oral, 2 TIMES DAILY

☑ **Severe PCN allergy AND/OR cephalosporin allergy (anaphylaxis, angioedema, hives)**

Levofloxacin

☐ levofloxacin (LEVAQUIN) tablet 750 mg, Oral, DAILY

☐ levofloxacin (LEVAQUIN) IV 750 mg, Intravenous, EVERY 24 HOURS

UTI ORDER SET EXAMPLE

GEN ADULT Urinary Tract infection

NOTE FOR UTI: *** Empiric therapy selection should take into account recent previous cultures***

- **Asymptomatic bacteriuria:** In most circumstances, **should not be treated,** regardless of pyuria, bacterial density, or isolation of resistant organisms. Treatment is recommended in the following circumstance: pregnancy and prior to urologic procedures.
- **Uncomplicated cystitis:** Non- pregnant female without obstruction, catheters, flank pain, or co-morbid conditions except well-controlled diabetes mellitus.
- **Complicated Lower UTI WITHOUT Sepsis or Bacteremia:** Male, urinary catheter present or removal within the last 48 hrs, recent GU instrumentation, anatomic abnormality or obstruction, pregnancy or other significant co-morbid conditions such as uncontrolled diabetes or immunosuppression.

Uncomplicated Cystitis (Single Response)

Nitrofurantoin is contraindicated if CrCl < 50mL/min. Due to the cost of fosfomycin, nitrofurantoin is preferred if not contraindicated. Adjust **cephalexin** and **sulfamethoxazole-trimethoprim** dose based on renal function

☐ PREFERRED: nitrofurantoin (MACROBID) capsule (Do NOT use if CrCl<50) 100 mg, Oral, 2 TIME DAILY for 5 Days

☐ PREFERRED: fosfomycin (MONUROL) packet 3 g, Oral, ONCE for 1 Doses, for 1 Doses

☐ ALTERNATIVE: cephalexin (KEFLEX) capsule 500 mg, Oral, EVERY 12 HOURS SCHEDULED for 7 Days

☐ ALTERNATIVE: sulfamethoxazole-trimethoprim DS (BACTIRM DS) tablet 1 tablet, Oral, EVERY 12 HOURS SCHEDULED for 3 Days

Complicated Lower Urinary tract infection without Sepsis or Bacteremia (Single Response)

Treatment duration:
Non-Catheter Associated: depends on patient characteristic and clinical response, 7 days usually appropriate
Catheter Associated:
-Prompt resolution of symptoms: 7 days
-Delayed response to therapy: 10-14 days
-Women <65 y/o without upper tract symptoms after catheter removal: 3 days

Adjust **cephalexin, sulfamethoxazole-trimethoprim, cefazolin, aztreonam,** and **pipercillin-tazobactam** dose based on renal function

Oral Regimens (Single Response)
☐ PREFERRED: nitrofurantoin (MACROBID) capsule (Do NOT use if CrCl<50) 100 mg, Oral, 2 TIME DAILY for 5 Days
☐ PREFERRED: fosfomycin (MONUROL) packet 3 g, Oral, ONCE for 1 Doses, for 1 Doses
☐ ALTERNATIVE: cephalexin (KEFLEX) capsule 500 mg, Oral, EVERY 12 HOURS SCHEDULED for 7 Days
☐ ALTERNATIVE: (if susceptibility confirmed) sulfamethoxazole-trimethoprim DS (BACTIRM DS) tablet 1 tablet, Oral, EVERY 12 HOURS SCHEDULED for 3 Days

IV options if patients cannot take PO medications (Single Response)
☐ PREFERRED: cefazolin (ANCEF) IV 1 g, Intravenous, EVERY 8 HOURS SCHEDULED
☐ ALTERNATIVE (In patients with anaphylactic PCN/Cephalosporin allergy): aztreonam (AZCTAM) IV 1 g, Intravenous, EVERY 8 HOURS SCHEDULED

History of resistant Gram-negative bacteria OR Not responding to PO antibiotics (Single Response)
☐ PREFERRED: piperacillin-tazobactam (ZOSYN) IV 4.5 g, Intravenous, EVERY 8 HOURS SCHEDULED
☐ ALTERNATIVE (In patients with anaphylactic PCN/Cephalosporin allergy): aztreonam (AZCTAM) IV 1 g, Intravenous, EVERY 8 HOURS SCHEDULED

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What You Need to Know When You Are Prescribed an Antibiotic

Your healthcare team has prescribed antibiotics for you because they think you may have an infection, or another condition which requires antibiotics. Some infections can be treated with antibiotics, which are powerful medications that kill bacteria and can save lives. Like all medications, antibiotics have side effects and should only be used when necessary. Your doctor thinks the benefits of antibiotics outweigh the potential risks at this time.

What are some questions to ask my doctor about antibiotics?

As a patient or caregiver, it is important to understand your or your loved one's antibiotic treatment. Here are some important questions to ask your healthcare team if you haven't already been told the answers:

- What infection or condition is this antibiotic treating and how do you know I have that infection or condition?
- What side effects might occur from this antibiotic?
- How long will I need to take this antibiotic?
- Is it safe to take this antibiotic with other medications or supplements (e.g., vitamins) that I am taking?
- Are there any special directions I need to know about taking this antibiotic? For example, should I take it with food?
- How will I be monitored to know whether my infection or condition is responding to the antibiotic?

Will I have side effects from my antibiotic?

You might. One of the most common side effects of nearly all antibiotics is diarrhea. Usually this is not severe, but occasionally diarrhea can be caused by

a bacteria called *Clostridium difficile (C. difficile,* often shortened to "*C. diff*"*).* This occurs because antibiotics destroy some of the normal, helpful bacteria in the gut. This allows the *C. difficile* to take over, and puts patients at high risk for this serious infection.

Another common side effect of antibiotics is an allergic reaction. A rash is most common, but some reactions can be more serious. Not all rashes are allergies, though, so it is important to discuss with your doctor if this occurs. The most serious reactions include hives (itchy red patches with pale swelling on top), lip, tongue or throat swelling, wheezing or difficulty breathing, or vomiting.

When should I call my doctor?

Most diarrhea caused by antibiotics is not infectious and should not cause concern. You should let your healthcare team know **right away** if you **develop watery stool three times or more per day** while taking an antibiotic, because that may be a sign of a *C. difficile* infection. Diarrhea caused by *C. difficile* can be serious and must be treated quickly. The risk of getting *C. difficile* diarrhea is highest during the first month, but it can last for up to three months after you stop taking antibiotics. Let your healthcare team know if you develop diarrhea even after you stop taking an antibiotic.

Call your doctor if you develop a rash or other sign of a reaction while taking an antibiotic.

Call 911 to get help immediately if you:

- develop lip, tongue or throat swelling
- are wheezing or have difficulty breathing

Remember, antibiotics are life-saving drugs and they need to be used properly. It is important to take your antibiotics exactly as prescribed. If you have any questions about your antibiotics, please talk to your healthcare team.

Adapted from CDC. *You've Been Prescribed an Antibiotic Now What?* Access at: https://www.cdc.gov/getsmart/healthcare/pdfs/16_265926_antibioticfactsheet_v7_508-final.pdf

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D.I.S.Ch.A.R.G.E. Antibiotics: FACTS AND SOLUTIONS

D.I.S.Ch.A.R.G.E. Antibiotics: FACTS AND SOLUTIONS

D.I.S.Ch.A.R.G.E!

How to improve antibiotic prescribing at hospital discharge.

Defaults and order sets

- Consider use of default durations, default transitions from IV to oral, and recommendations within computerized order-entry to improve early transition to appropriate oral therapy (which can then be continued on discharge)
- Make sure default orders and order sets recommend guideline-appropriate antibiotic choice and duration

Incentivize

- Consider incorporating discharge antibiotic metrics into quality or compensation targets

Discharge **S**ummary

- Require documentation of total antibiotic duration in discharge summary
  - Consider enforcing this rule by using smart phrases with hard stops for antibiotic duration in the discharge summary
  - E.g.: To treat (disease), Mr(s) X will continue (abx name) for X additional days, for X days total.

Checklist

- Use an antibiotic checklist at discharge to evaluate and ensure antibiotic appropriateness

Audit and Feedback

- Audit and provide feedback of discharge prescriptions (e.g., pharmacists or stewardship team, performance review, quality compensation targets)

Review: Incorporate antibiotic appropriateness into discharge review process using different members of the care team

- For example
  - With pharmacists (when reviewing or filling discharge medications)
  - With bedside nurse (when reviewing discharge medications)
  - During multidisciplinary/discharge rounds

Guidelines

- Make sure your institutional guidelines include oral antibiotic recommendations for discharge for common infections (e.g., pneumonia, urinary tract infection)
  - Prioritize non-fluoroquinolone antibiotics in guidelines
  - Recommend alternatives to fluoroquinolone antibiotics when possible
  - Provide a recommendation for appropriate duration for different disease states (e.g., 5 days for community-acquired pneumonia), making sure that total duration includes effective inpatient therapy

Educate providers on guidelines and discharge recommendations

- Formal lectures to residents, physicians (e.g., hospitalist, ID, ED), APPs
- Consider using pocket card
- Consider the use of multiple ways to post guidelines (e.g., websites, apps, printed books)

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ANTIBIOTIC TIME-OUT ✓ CHECKLIST

How to use this checklist:

- Review the need for antibiotics on each patient on antibiotics daily. This review allows you to evaluate new information, such as clinical improvement and new culture results, to update your treatment plan. At a minimum, there are two key times to review antibiotic treatment:

  - ✓ 48-72 hours after admission
    - A lot of diagnostic information has likely returned by now and the patient has likely either improved (or deteriorated) on current therapy. It's therefore time to reassess all information

  - ✓ At hospital discharge
    - Patients being discharged are often less sick and recovering, but not completely better. Sometimes they need to continue antibiotics to treat the infection for which they were hospitalized. This is a great time to make sure the rest of their treatment is guidelines appropriate

  - ✓ Other useful times include: any transition of care, change in status, or handoff between providers.

ANTIBIOTIC TIME-OUT CHECKLIST

Do we still think this patient has a bacterial infection or is another diagnosis more likely?

- Problems which initially begin as symptoms (e.g., dyspnea) should be updated to diagnoses (e.g., community-acquired pneumonia, acute on chronic systolic heart failure).
- Is the diagnosis still infectious? Bacterial, fungal, viral?
- If the problem is no longer thought to be due to an infection, stop antibiotics.

If the patient has a bacterial infection, can we de-escalate?

- If culture results have returned, de-escalate to the narrowest effective antibiotic.
- If culture results are negative, the patient is improving, and the patient was on broad-spectrum antibiotics, de-escalate by removing anti-MRSA and anti-pseudomonal coverage.
  - This does not need to be done over multiple days but can be done at the same time (e.g., changing vancomycin + zosyn to ceftriaxone)
- If no cultures were obtained, but the patient is improving, consider de-escalation.

Can the patient be switched to an oral antibiotic?

- If a patient has a functional GI tract, is tolerating oral intake, and is hemodynamically stable then usually an oral antibiotic is appropriate.
  - Exceptions include complicated infections (e.g., meningitis, endocarditis, bacteremia)
- A patient on oral antibiotics is often able to be discharged.

How long should the patient receive antibiotics?

- In order to prevent patients from staying on prolonged courses, plan a course early.
- Patients should receive the minimum effective antibiotic duration for their diagnosis.
  - For example, patients with community-acquired pneumonia who are improving, afebrile, and clinically stable by day 2 or 3 only need 5 *total* days of antibiotics, including any effective IV therapy they receive.

Now that you have decided on a final antibiotic, is it prescribed at the right dose?

- Make sure you consider the type of infection, route of administration, renal and hepatic function, and interaction(s) with other medications.

Have we documented dose, duration and indication for all antibiotics?

- In the discharge summary, you should also include total planned antibiotic duration (Including start and planned stop dates).

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Bugs and Drugs

Beaumont Farmington Hills

The Farmington Hills Antimicrobial Stewardship Newsletter **December 2017**

Antibiotics for Community-Acquired Pneumonia (CAP): Less is More!!

HMS Data for Beaumont Hospital – Farmington Hills

- The Michigan Hospital Medicine Safety Consortium, or HMS, is a Collaborative Quality Initiative supported by Blue Cross and Blue Shield of Michigan and Blue Care Network. The goal of HMS is to help improve patient safety and the quality of care for hospitalized medical patients. Beaumont Hospital-Farmington Hills participates in and submits data to the HMS Consortium.
- Data for pneumonia was recently received from the HMS Consortium for Beaumont Hospital – Farmington Hills

Average Duration of Antibiotics for CAP and HCAP (Inpatient & Outpatient)

Place graph of your data

On average, patients with CAP received antibiotic therapy for ___days! This is not in accordance with guidelines that recommend 5 days.

Place graph of your data

___% of all patients with CAP received an inappropriate length of therapy. **Most received XX extra days** of antibiotics!

IDSA/ATS Consensus Guidelines regarding CAP Length of Therapy

- **Patients with uncomplicated CAP can be treated for just 5 days if afebrile ≥ 48 hours and have no more than 1 CAP sign of clinical instability on day 5 of treatment.**
- **Patients with complicated CAP can be treated for 7 days if afebrile ≥ 48 hours and have no more than 1 CAP sign of clinical instability on day 7 of treatment. NOTE: Azithromycin duration should be no more than 5 days.**
- Longer duration of therapy may be warranted in the following: patients with persistent clinical instability, pleural effusion, tissue necrosis, cavities, extrapulmonary complications such as meningitis or endocarditis, or pneumonia caused by *Staphylococcus aureus, Pseudomonas aeruginosa, Bulkholderia pseudomallei,* or endemic fungi.
- Patients should be switched to oral antibiotics and discharged as soon as they are stable and improving clinically. **Make sure to count effective inpatient antibiotics days before prescribing outpatient antibiotics**

Are these CAP recommendations valid for only 5 days of therapy? YES

- Uranga et al. conducted a multicenter, noninferiority randomized clinical trial to validate the IDSA/ATS guidelines for duration of therapy.
- Patients were included if they had a diagnosis of mild-to-severe CAP. At day 5, 312 patients were randomized to either stop antibiotics or continue antibiotics at the physician's discretion.
- There was no significant differences for time until clinical improvement, days to return to normal activity, radiographic resolution (Day 30), adverse effects (Day 30), in-hospital mortality, 30 day mortality, in-hospital complications, recurrence by day 30, and length to stay.
- There was **no statistically significant difference in clinical success in patients treated for 5 days compared to longer durations**

CAP: Take Away Messages

___ % of patients with CAP who qualified for 5 days of therapy received excess therapy. The average antibiotic duration for CAP was ____ days	**On average, CAP patients received an excess of __ days of antibiotics. This places the patient at risk for C. diff and resistance.**	**Patients can be successfully treated with 5 days of antibiotics for uncomplicated CAP and 7 days for complicated CAP per consensus guidelines**	**Patients can be switched to oral therapy and discharged as soon as they are stable and clinically improving**	**Make sure to count effective inpatient antibiotics days before prescribing outpatient antibiotics**

References:

- Mandell LA, et al. Infectious Diseases Society of America/American Thoracic Society Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults. Clin Infect Dis. 2007; 44:S27-72.
- Uranga A, et al. Duration of Antibiotic Treatment in Community-Acquired Pneumonia: A Multicenter Randomized Clinical Trial. JAMA Intern Med. 2016;176(9):1257-65.

For more information please contact:

Bugs and Drugs
Beaumont
Farmington Hills

The Farmington Hills Antimicrobial Stewardship Newsletter _____ April, 2018

Asymptomatic Bacteriuria

Diagnosis

- Asymptomatic bacteriuria (ASB) is a positive urine culture in a patient with no signs or symptoms of a urinary tract infection (e.g., dysuria, frequency, urgency, fever, flank pain).

- Asymptomatic bacteriuria (ASB) is common and often assocated with pyuria (urine containing ≥10 white blood cells per high-powered field).

Population	Prevalence of ASB	Prevalence of Pyuria in Persons With ASB
Healthy premenopausal women	< 5%	32%
Women 65-90 years old	6-16%	
Women > 90 years old	22-43%	
Diabetic women	9-27%	70%
People receiving hemodialysis	28%	90%
Female long-term care residents	25-50%	90%
Male long-term care residents	15-35%	90%
Presence of indwelling urinary catheter	100%	50-100%

Treatment

- The majority of patients with ASB and/or asymptomatic pyuria **SHOULD NOT** be treated.
- Studies have demonstrated that treatment of ASB does not prevent urinary tract infections (UTIs), but is associated with adverse events related to antibiotic use and the development of future UTIs that are antibiotic resistant.
- Exceptions
  - Pregnant patients: treatment prevents preterm labor and pyelonephritis.
  - Patients about to undergo a urologic procedure in which mucosal bleeding is expected (not urinary catheter placement): treatment prevents urosepsis.

How can I prevent unnecessary treatment of asymptomatic bacteriuria?

- Do not order urine cultures unless your patient has signs and symptoms of a UTI, including in patients undergoing preoperative evaluation or patients with urinary catheters (except in pregnant patients or those about to undergo a urologic procedure in which mucosal bleeding is expected).
  Note:
  - Foul-smelling or cloudy urine does not indicate a UTI.
  - Mental status change alone does not indicate a UTI.

4 Opportunities for Antimicrobial Stewardship in Urinary Tract Infections

When It Comes To Urine Testing, Hold It.

Four opportunities for antimicrobial stewardship in urinary tract disease

Only order a UA to assess for a UTI if symptoms are present

- Symptoms of UTI include dysuria, hematuria, urinary urgency, urinary frequency, fever, suprapubic pain/tenderness, costovertebral pain tenderness and mental status changes without other explanations.
- An abnormal UA does not equal a UTI.

Do not start antibiotics for an abnormal UA

- Many patients can have abnormalities (white blood cells, blood, bacteria, etc.).
- Without symptoms of a UTI, antibiotics are not required.

Only order a urine culture if symptoms of a UTI are present

- Without UTI symptoms, a urine culture is not a useful test.
- Symptoms of UTI do NOT include: dizziness, falls, cloudy urine, foul smelling urine, isolated nausea and vomiting.
- Overuse of this test can lead to downstream antibiotic use, allergic reactions and Clostridium difficile infection.

Do not start antibiotics for an abnormal urine culture

- Urine cultures are frequently abnormal, particularly in females and the elderly.
- There are very few indications for treatment of bacteriuria without symptoms; these include an upcoming urologic surgery or if the patient is pregnant.

Antimicrobial Stewardship Contact: Leslie A. Smith, Antimicrobial Stewardship Pharmacist, 248-471-8058 or Leslieanne.smith@Beaumont.org

Beaumont

Uncomplicated CAP

Dear _____

YOU ARE A TOP PERFORMER!

Upon reviewing the following Uncomplicated Community Acquired Pneumonia (CAP) patient, we would like to share the following with you. Your patient with FIN# _____, admitted on _____, was given a total duration of ___ days of antibiotics. According to both our evidenced-based Institutional and the Michigan Hospital Medicine Safety (HMS) guidelines, this patient received an appropriate duration of antibiotic treatment.

If you have any questions, please contact xxxx (nurse abstractor)or xxxx (ID physician champion). We appreciate your ongoing efforts to provide Remarkable Patient Care, every patient, every time.

Sincerely,

Hospital Medicine Safety Quality Improvement Team-Ann Arbor

"This is a confidential professional/peer review and quality improvement document of xxxx"

Prolonged Duration of Antibiotics for Uncomplicated CAP

Dear _____

Upon reviewing the following Uncomplicated Community Acquired Pneumonia (CAP) patient, we would like to share the following with you. Your patient with FIN# _____, admitted on _____, was given a total duration of ___ days of antibiotics. According to both our evidenced-based Institutional and the Michigan Hospital Medicine Safety (HMS) guidelines, this patient should have received only 5 days of antibiotic treatment. Although we value your clinical judgment, over prescribing of antibiotic therapy increases the risk of *Clostridium difficile* infection, antimicrobial resistance, and the development of antibiotic-associated adverse events. If you have any questions, please contact xxx (nurse abstractor) or xxx (ID physician champion) and we will contact you as soon as possible to discuss.

We appreciate your ongoing efforts to provide Remarkable Patient Care, every patient, every time.

Sincerely,

Hospital Medicine Safety Quality Improvement Team-Ann Arbor

"This is a confidential professional/peer review and quality improvement document of xxxxxxx"

Appendix M

URINE CULTURE ORDERING CHECKLIST

Asymptomatic bacteriuria is often treated unnecessarily, and accounts for a substantial burden of unnecessary antimicrobial use. Therefore, urine cultures should only be obtained on adult inpatients for appropriate reasons.

The following is an effective strategy for how and when to order a urinalysis and/or urine culture:

Does the patient have any of the following ***without alternate explanation***?

- ☐ Urgency, frequency, dysuria
- ☐ Suprapubic pain or tenderness
- ☐ Costovertebral pain or tenderness
- ☐ New onset mental status changes with leukocytosis (WBC > 10 x 10^9/L), hypotension (SBP < 90mmHg), or ≥ 2 SIRS criteria*
- ☐ Fever > 38^{O} C or Rigors
- ☐ Acute hematuria
- ☐ Increased spasticity or autonomic dysreflexia in a spinal cord injury patient

****SIRS Criteria includes:*** temperature > 38°C or < 36°C, HR > 90 bpm, RR > 20 breaths per minute or $PaCO_2$ < 32 mmHg, abnormal WBC (> 12,000/µL or < 4,000/ µL or > 10% immature [band] forms)

YES

Send UA and, ***if positive***, send Urine Culture

Document indication for sending urine culture

NO

Do ***NOT*** send urinalysis or urine culture

Note: Change in urine color, urine smell, and/or urine sediment alone are not a reason to send a urine culture.

**Symptom-based screening is not reliable in the following cases: pregnancy, prior to urologic procedures, patients with complex urinary anatomy (i.e. nephrostomy tubes, urinary tract stents, h/o urinary diversion surgery, or renal transplant), patients admitted to the ICU, or patients with neutropenia. Use your clinical judgment for this population.

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HMS MICHIGAN HOSPITAL MEDICINE SAFETY CONSORTIUM

Support for HMS is provided by Blue Cross and Blue Shield of Michigan and Blue Care Network as a part of the BCBSM Value Partnerships program. Although Blue Cross Blue Shield of Michigan and HMS work collaboratively, the opinions, beliefs, and viewpoints expressed by the author do not necessarily reflect the opinions, beliefs, and viewpoints of BCBSM or any of its employees.

Inpatient Algorithm Assessing for Urinary Tract Infection in Elderly Patients with Acutely Altered Mental Status (AMS)

Change in Mental Status (Only Symptom)
(i.e., periods of altered perception, disorganized speech, lethargy)

Yes

One or more of the following (without an alternative explanation):

- Elevated WBC (>10,000 cells/mm^3)
- Hypotension (< 90 mmHg Systolic)
- 2 or more SIRS Criteria
  Temp >38°C or <36°C, HR >90 bpm, RR> 20 breaths per minute or $PaCO_2$ <32 mmHg, abnormal WBC (>12,000 cells/mm^3 or <4,000 cells/mm^3 or >10% immature [band] forms)

No

- Evaluate for other causes of altered mental status
- Attempt hydration (oral or intravenous)
- Evaluate medications for new medications, potential interactions and polypharmacy or adverse events
- Consider changes to current medication regimen (i.e., consider holding diuretic or psychotropic medications)
- Acutely observe for prompt resolution within 24-48 hours

If change in mental status does not resolve in 24-48 hours or UTI specific signs or symptoms develop, perform urinalysis

UTI Specific Signs and Symptoms (without alternative cause)
Urgency
Frequency
Dysuria
Costovertebral Pain or Tenderness
Flank Pain
Suprapubic Pain or Tenderness
Acute Hematuria
Fever (>38° C) or Rigors

Yes

Send urine sample for urinalysis

If urinalysis is positive, send urine sample for culture

If urinalysis is negative, stop further evaluation of UTI

If the urine culture is negative but presenting symptoms persist, continue to evaluate for other etiologies and do not treat with antibiotics

If symptoms have resolved without antibiotic therapy, do not treat regardless of urine culture results

If the urine culture is positive and symptoms have not resolved, consider antibiotic therapy

Do not send urinalysis or urine culture for test of cure.
If presenting symptoms persist, consider evaluation for other possible etiologies

HMS
MICHIGAN HOSPITAL MEDICINE SAFETY CONSORTIUM

Modeled based on Mody, L (2014). JAMA. 2014 February 26; 311(8): 844–854. doi:10.1001/jama.2014.303

De-escalation

Quick Reference Guide for Hospital Pharmacists

Intermountain® Healthcare

*This quick reference guide describes the process of antibiotic de-escalation in patients with **positive bacterial cultures**. This guide is not intended for use in patients on empiric antibiotics with negative bacterial cultures. This 6-step process ensures that patients receive the narrowest-spectrum antibiotic to treat the infection.*

What is de-escalation?

As you know, we often prescribe broad-spectrum antibiotics because we don't have the full clinical picture. In many cases, the initial empiric antibiotic is not the best option for treatment of the patient's infection. De-escalation is when we switch to a narrower-spectrum antibiotic to target the causative pathogen(s) identified on culture.

Key Points

Switching to narrower spectrum antibiotics when clinically indicated can prevent adverse reactions and reduce antibiotic resistance.

What is my role in de-escalation?

Every day, review all patients on broad-spectrum antibiotics in your patient care area and identify those with positive cultures. Review these patients using the 6-step process outlined in this guide to determine whether a narrower antibiotic would optimize therapy. If you feel a change in therapy is needed, work with the prescribing provider and recommend an alternate therapy.

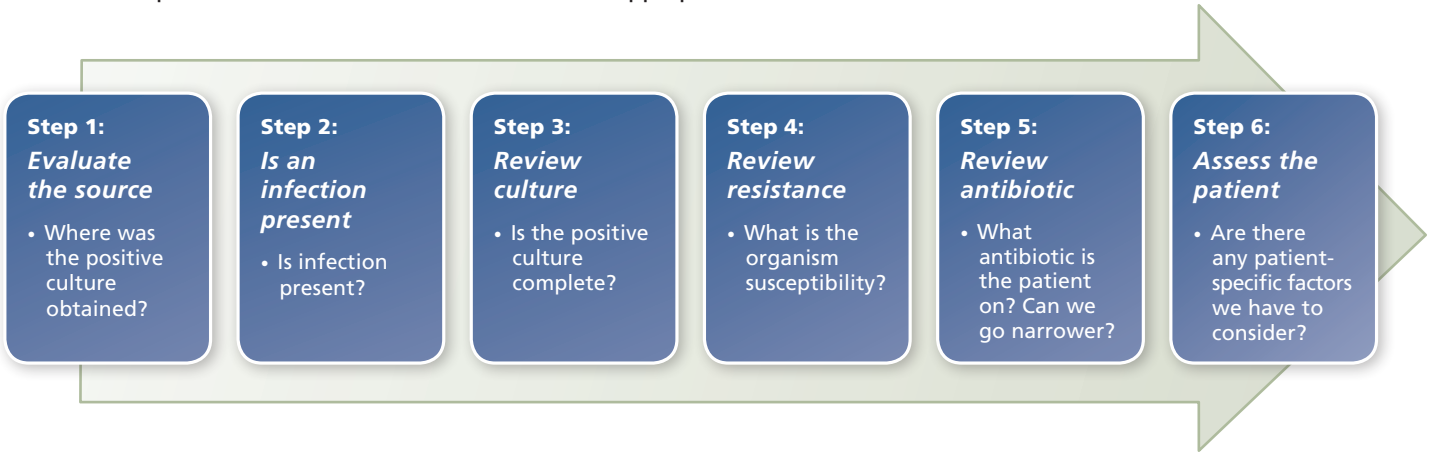
This process is designed for patients with positive cultures only!

Key Point:

The goal of de-escalation is to determine whether a narrower antibiotic would be more appropriate for each patient.

What is the process?

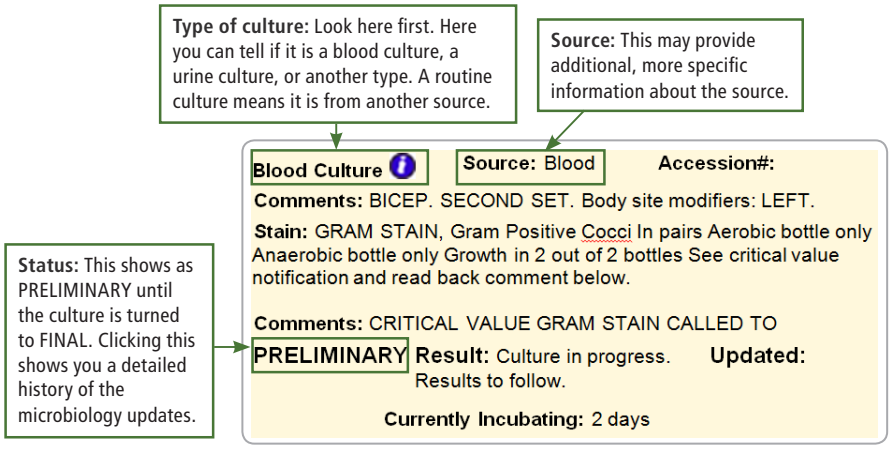
For every patient on broad-spectrum antibiotics with a positive culture, review the 6-steps to determine whether de-escalation is appropriate.



Step 1: Evaluate the source

Where was the positive culture obtained? Positive cultures in sites considered sterile need to be taken very seriously. For positive cultures taken from non-sterile sites, use your clinical judgment to determine whether the culture represents an infection or colonization (step 2).

Review the **type**, **source**, and **status** of the culture.



Key Point:

- ***Sterile sites:*** *blood, CSF, bone, pleural fluid, synovial fluid, and other deep surgical sites.*
- ***Non-sterile sites:*** *urine, skin, wounds, sputum, etc.*

Step 2: Is an infection present

Is an infection present? The positive culture may represent any one of the following:

- **Infection:** The presence of pathogenic microorganisms that invade a body part or tissue to cause symptomatic disease.
- **Colonizer:** The presence of microorganisms in a non-sterile site that is not causing infection. These are typically commensal organisms belonging to normal flora and harmless to healthy people; sometimes they perform a vital function (e.g., gut bacteria aid in digestion).
- **Contaminant:** The unintentional or accidental introduction of microorganisms into a culture, either when the culture was obtained or in the microbiology laboratory.

If a colonizer or contaminant is the cause of the positive culture, **discuss the clinical significance with the provider**.

Key Point:

If the culture shows a colonizer or a contaminant is present, suggest that the provider stop or adjust the patient's antimicrobials.

Example colonizer: *A superficial wound swab grows coagulase-negative staphylococci and Enterococcus spp. The site is not sterile, and these bacteria can colonize human skin. In the absence of signs and symptoms of infection, this culture likely represents colonization.*

Example contaminant: *A female patient with a yeast infection provides a midstream urine culture. Yeast from the urine culture would not represent a Candida UTI.*

Step 3: Review culture

Is the positive culture complete? Ask yourself:

- Is the culture finalized? Are other cultures pending?
- Are there other organisms on the Gram stain that didn't grow?
- **Does the infectious syndrome warrant broader therapy than the culture would suggest? Do you need to cover more than just the positive culture?** For example, if the patient has an intra-abdominal abscess and the blood culture grows *E coli*, anaerobic coverage is still required even though the culture didn't grow anaerobes.
- Does the patient have a comorbid infectious syndrome that warrants broader therapy?

Key Point:

If all cultures aren't final, consider waiting on giving the provider a recommendation for de-escalation.

Step 4: Review resistance

What is the organism's susceptibility profile?

Always review the susceptibility profile to determine what antibiotics will be active. If there is an antibiotic you would like to use that isn't listed on the culture, call your microbiology laboratory for more information.

Key Point:
Talk to the microbiology lab or refer to GermWatch on ***intermountainphysician.org*** *for regional antibiogram information.*

Step 5: Review antibiotic

What antibiotic is the patient on? Can we go any narrower?

After you've assessed the culture and susceptibility profile, ask yourself:

- Is there a narrower antibiotic that will better meet the needs of the patient?
- What exactly should I recommend?

Key Point:
When you are ready to make a de-escalation recommendation, be specific (e.g., include patient-specific dosing).

Narrower → ***Broader***

• Penicillin • Oxacillin (nafcillin) • Dicloxacillin • Ampicillin • Amoxicillin • Cefazolin • Cephalexin • Nitrofurantoin	• Doxycycline • Trimethoprim/ sulfamethoxazole • Cefoxitin • Cefuroxime • Azithromycin • Clindamycin	• Amoxicillin/ clavulanate • Ampicillin/ sulbactam • Ceftriaxone	• Aztreonam • Levofloxacin • Ciprofloxacin • Cefepime • Ceftazidime • Ertapenem • Vancomycin • Ceftaroline	• Imipenem • Meropenem • Piperacillin/ tazobactam • Daptomycin • Linezolid

Step 6: Assess the patient

Are there any patient-specific factors we have to consider?

Consider the following patient-specific factors before making your recommendation:

- Convenience (e.g., dosing interval, IV and PO, side effects, etc.)
- Allergies*
- Drug-drug interaction
- IV or oral conversion*

* Allergies and IV or PO conversions have their own Quick Reference Guides for your reference. These are included in your training, and you can access them here at any time: intermountain.net/qpsafety/Pages/SCORE.aspx.

Key Point:
Individualize your recommendation to the patient.

Intermountain® Healthcare

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Optimizing Stewardship in Community Hospitals
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Antibiotic Indications

Quick Reference Guide for Hospital Pharmacists

Intermountain® Healthcare

This quick reference guide describes the purpose, process, and requirements for including indications in HELP1 for every antimicrobial prescription. All antibiotics, antifungals, and antivirals are in the scope of these procedures; this card focuses on antibiotics.

The goal

To ensure that antibiotics are prescribed correctly. Ask yourself, is this...

- The RIGHT patient — *Does the patient have an infection or need antibiotics based on an upcoming procedure?*
- The RIGHT drug — *Which antibiotic is most appropriate?*
- The RIGHT dose — *What dose is most appropriate?*
- The RIGHT route — *IV, oral, switch from IV to oral?*
- The RIGHT duration — *3 days, 7 days, 6 weeks?*

Key Point:

Knowing why the patient is receiving an antibiotic will enable you to assist the prescriber in providing the RIGHT care to the patient.

What is an antibiotic indication?

- An antibiotic indication is the reason for antibiotic use — either an infection being treated or prophylaxis against an infection.
- Every antibiotic needs to come with an indication for use (like radiology and PRN orders need indications).
- Indications should be as specific as possible — and they are **NOT symptoms** (like pain).
- The syndrome the antibiotic is treating, not the organism, is needed for an antibiotic indication.
- A list of appropriate indications is located on the Intermountain Antibiotic Stewardship home page: **intermountain.net/qpsafety/Pages/SCORE.aspx**.

Good indication examples:

- *Surgical prophylaxis*
- *Cellulitis*
- *Community acquired pneumonia*
- *Empiric sepsis*

Bad indication examples:

- *Cloudy urine*
- *Fever*
- *Pain*

Why are antibiotic indications important?

Reason 1: It will help you as a pharmacist.

What indications enable you to do:	*For example:*
Assess the dose based on the indication and the patient's renal function.	Ceftriaxone 1 gram IV daily is appropriate for community-acquired pneumonia, but not for meningitis.
Assess the spectrum of activity for the given indication.	Piperacillin/tazobactam is appropriate for a healthcare-associated pneumonia but is too broad for a urinary tract infection.
Assist with documenting SCIP compliance, and therefore reimbursement.	Levofloxacin for 7 days after a surgical procedure is appropriate if an infection is documented, but is a SCIP failure if an indication for use is not given.

Key Point:

Antibiotic indications help you validate the dose, spectrum, and documentation of antibiotic prescriptions.

Why are antibiotic indications important? (continued)

Reason 2: Including an antibiotic indication in the EMR is an upcoming CMS requirement.

CMS draft requirements[1]
1. C.2.a Facility has a multidisciplinary process in place to review antimicrobial utilization, local susceptibility patterns, and antimicrobial agents in the formulary and there is evidence the process is followed.
1. C.2.b Systems are in place to prompt clinicians to use appropriate antimicrobial agents (e.g., computerized physician order entry, comments in microbiology susceptibility reports, notifications from clinical pharmacists, formulary restrictions, evidence-based guidelines and recommendations).
1. C.2.c Antibiotic orders include an indication for use.
1. C.2.d There is a mechanism in place to prompt clinicians to review antibiotic courses of therapy after 72 hours of treatment.
1. C.2.e The facility has a system in place to identify patients currently receiving intravenous antibiotics who might be eligible to receive oral antibiotic treatment.

Key Point:

Knowing why the patient is receiving an antibiotic will meet upcoming CMS requirements.

Reference

1 Centers for Medicare & Medicaid Services. Pre-decisional surveyor worksheet: assessing hospital compliance with the condition of participation for Infection Control. Pilot draft. http://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/Downloads/Survey-and-Cert-Letter-12-32.pdf. Published May 18, 2012. Accessed November 13, 2013.

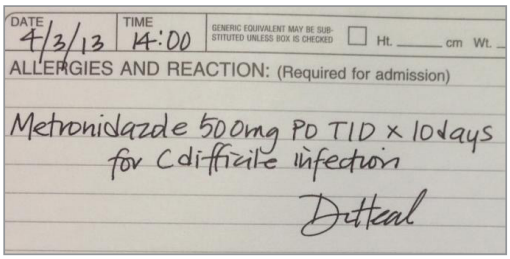
Where are antibiotic indications entered?

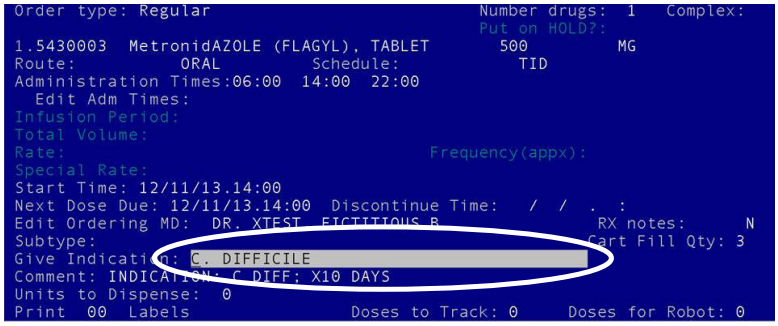
Every antibiotic order should have:

- Patient name
- Time and date
- Antibiotic prescribed
- Dose
- Route
- Frequency
- **Indication**
- Duration (optional)

Key Point:

The prescribing provider writes the indication in the order. The pharmacist enters the indication into HELP1 with the antibiotic.





What if there isn't an indication given?

Do not delay filling the order due to lack of indication!

- Contact the provider at a convenient time (don't call after service hours).
- Add a clarification to the paper chart and indication to the electronic order.
- If the provider gives an invalid indication, refer the provider to the Antimicrobial Prescribing Procedure at your facility.

Key Point:

Fill the prescription, even if an indication isn't provided. Work with the prescribing provider to add the indication to the patient record.

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