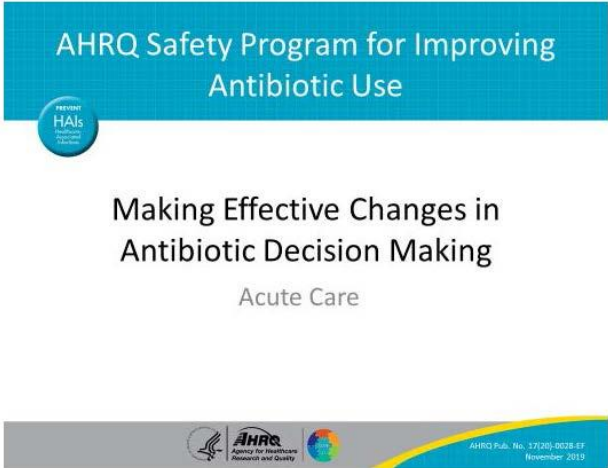
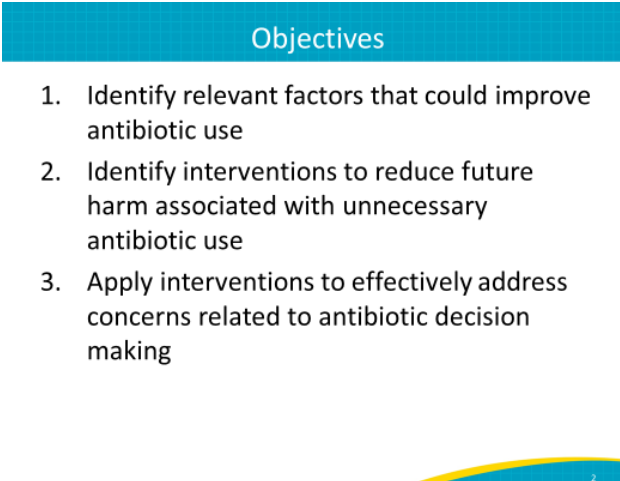


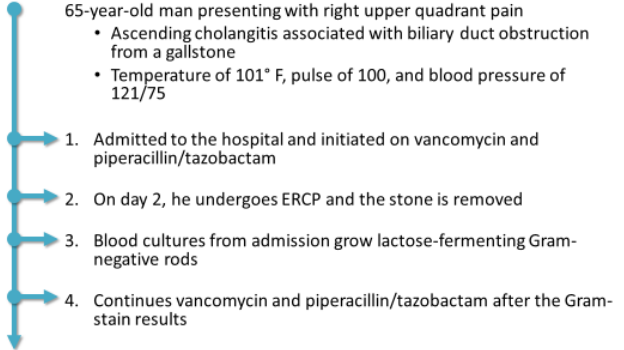
# AHRQ Safety Program for Improving Antibiotic Use

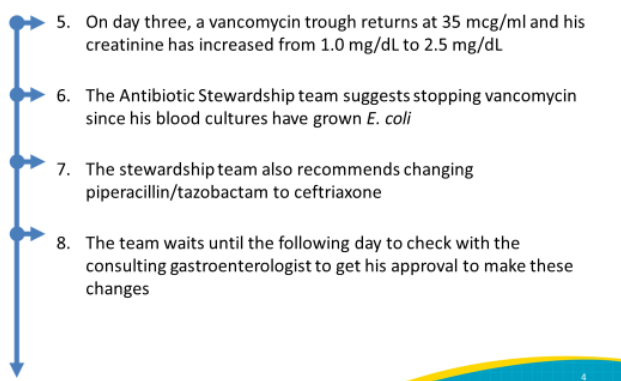


## Making Effective Changes in Antibiotic Decision Making Acute Care

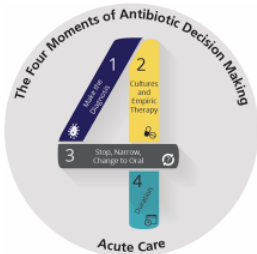
Slide Title and Commentary	Slide Number and Slide
<p><b>Making Effective Changes in Antibiotic Decision Making Acute Care</b></p> <p>SAY:</p> <p>This presentation is titled “Making Effective Changes in Antibiotic Decision Making.”</p>	<p><b>Slide 1</b></p> 
<p><b>Objectives</b></p> <p>SAY:</p> <p>By the end of this presentation, participants will be able to:</p> <ol style="list-style-type: none"> <li>1. Identify relevant factors that could improve antibiotic use</li> <li>2. Identify interventions to reduce future harm associated with unnecessary antibiotic use</li> <li>3. Apply interventions to effectively address concerns related to antibiotic decision making</li> </ol>	<p><b>Slide 2</b></p> 



Slide Title and Commentary	Slide Number and Slide
<p><b>Let's Begin With a Case</b></p> <p>SAY:</p> <p>Let's start with a case. A 65-year-old man presents to the hospital with right upper quadrant abdominal pain and is found to have ascending cholangitis associated with bile duct obstruction because of a gallstone.</p> <p>He is febrile to 101 degrees Fahrenheit. His heart rate is 100 beats per minute, and his blood pressure is normal at 121 over 75. His mental status is appropriate.</p> <p>He is admitted and started on vancomycin and piperacillin/tazobactam.</p> <p>On his second hospital day, he undergoes an endoscopic retrograde cholangiopancreatography (ERCP) and the gallstone is removed.</p> <p>During the afternoon of the procedure, blood cultures obtained at admission grow lactose-fermenting Gram-negative rods.</p> <p>His team continues to administer vancomycin and piperacillin/tazobactam after the Gram-stain results return.</p>	<p><b>Slide 3</b></p> <p style="text-align: center;"><b>Let's Begin With a Case</b></p>  <p>65-year-old man presenting with right upper quadrant pain</p> <ul style="list-style-type: none"> <li>• Ascending cholangitis associated with biliary duct obstruction from a gallstone</li> <li>• Temperature of 101° F, pulse of 100, and blood pressure of 121/75</li> </ul> <ol style="list-style-type: none"> <li>1. Admitted to the hospital and initiated on vancomycin and piperacillin/tazobactam</li> <li>2. On day 2, he undergoes ERCP and the stone is removed</li> <li>3. Blood cultures from admission grow lactose-fermenting Gram-negative rods</li> <li>4. Continues vancomycin and piperacillin/tazobactam after the Gram-stain results</li> </ol> <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p style="text-align: right;">Making Effective Changes 3</p>

Slide Title and Commentary	Slide Number and Slide
<p><b>Case, Continued</b></p> <p>SAY:</p> <p>Although he has defervesced and is improved, his appetite is poor, and he is unable to take enough fluids by mouth to stay hydrated.</p> <p>On his third day of hospitalization, a vancomycin trough returns at 35 micrograms per milliliter, and his creatinine increases from 1.0 milligrams per deciliter to 2.5 milligrams per deciliter.</p> <p>During their routine post-prescription review of patients receiving vancomycin, the antibiotic stewardship team notices that the vancomycin trough is elevated and calls the clinical team.</p> <p>After hearing the clinical story, the stewardship team suggests stopping vancomycin as biliary infections are generally not caused by MRSA.</p> <p>As cultures grew a relatively susceptible <i>E. coli</i>, the stewardship team recommends changing piperacillin/tazobactam to ceftriaxone.</p> <p>The clinical team is uncomfortable making these changes without talking to the gastroenterology or GI consultant during rounds the next day to get their permission to make these changes.</p>	<p><b>Slide 4</b></p> <p style="text-align: center;"><b>Case Continued</b></p> <ol style="list-style-type: none"> <li>5. On day three, a vancomycin trough returns at 35 mcg/ml and his creatinine has increased from 1.0 mg/dL to 2.5 mg/dL</li> <li>6. The Antibiotic Stewardship team suggests stopping vancomycin since his blood cultures have grown <i>E. coli</i></li> <li>7. The stewardship team also recommends changing piperacillin/tazobactam to ceftriaxone</li> <li>8. The team waits until the following day to check with the consulting gastroenterologist to get his approval to make these changes</li> </ol> 

Slide Title and Commentary	Slide Number and Slide
<p><b>Case, Continued</b></p> <p>SAY:</p> <p>The following day, the vancomycin is stopped. The creatinine is now 2.7 mg/dL.</p> <p>The patient is started on ceftriaxone but the provider forgets to discontinue the piperacillin/tazobactam order.</p> <p>The patient has a renal ultrasound to further evaluate his acute renal failure and undergoes numerous blood draws to obtain vancomycin troughs as well as serum creatinine levels.</p> <p>On day 5, his creatinine is improving and discharge planning is initiated.</p>	<p><b>Slide 5</b></p> <p style="text-align: center;">Case Continued</p> <ol style="list-style-type: none"> <li>9. The following day vancomycin is stopped</li> <li>10. The creatinine is now 2.7 mg/dL</li> <li>11. The patient is started on ceftriaxone but the provider forgets to discontinue the piperacillin/tazobactam order</li> <li>12. The patient has a renal ultrasound to evaluate his acute renal failure and undergoes several needle sticks to obtain vancomycin troughs</li> <li>13. On day 5, his creatinine is improving and discharge planning is initiated</li> </ol>
<p><b>Case, Continued</b></p> <p>SAY:</p> <p>His nurse asks whether he needs a PICC, or peripherally inserted central catheter, inserted for receipt of IV piperacillin/tazobactam and ceftriaxone, prompting the team to realize that the piperacillin/tazobactam was never stopped when the ceftriaxone was started.</p> <p>Although the <i>E. coli</i> is susceptible to ciprofloxacin, a PICC is placed for the patient to receive IV ceftriaxone for 5 more days.</p>	<p><b>Slide 6</b></p> <p style="text-align: center;">Case Continued</p> <ol style="list-style-type: none"> <li>14. The bedside nurse asks a questions about discharge medications which makes the team realize that the piperacillin/tazobactam was never discontinued</li> <li>15. A PICC was placed for the patient to receive IV ceftriaxone for five more days</li> </ol>

Slide Title and Commentary	Slide Number and Slide
<p><b>The Four Moments of Antibiotic Decision Making</b></p> <p>SAY:</p> <p>There are several antibiotic-associated adverse events in this case.</p> <p>It is helpful to review this case using the Four Moments of Antibiotic Decision Making framework to understand what led to the adverse events identified.</p> <ol style="list-style-type: none"> <li>1. Does my patient have an infection that requires antibiotics?</li> <li>2. Have I ordered appropriate cultures before starting antibiotics? What empiric antibiotic therapy should I initiate?</li> <li>3. A day or more has passed. Can I stop antibiotics? Can I narrow therapy or change from IV to oral therapy?</li> <li>4. What duration of antibiotic therapy is needed for my patient's diagnosis?</li> </ol>	<p><b>Slide 7</b></p> <p>The Four Moments of Antibiotic Decision Making</p>  <ol style="list-style-type: none"> <li>1. Does my patient have an infection that requires antibiotics?</li> <li>2. Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate?</li> <li>3. A day or more has passed. Can I stop antibiotics? Can I narrow therapy or change from IV to oral therapy?</li> <li>4. What duration of antibiotic therapy is needed for my patient's diagnosis?</li> </ol>

## Moments of Antibiotic Decision Making

SAY:

Let's review some antibiotic-associated adverse events specific to this patient.

First, vancomycin was started empirically. Methicillin-resistant *Staphylococcus aureus*, or MRSA, is unlikely to be a pathogen in uncomplicated biliary infections and was unnecessary in this case. This is a moment 2–related issue.

Similarly, piperacillin/tazobactam was prescribed empirically. This is also a moment 2–related issue. This patient was not severely ill and did not have risk factors for *Pseudomonas aeruginosa* such as extensive health care exposure, extensive previous antibiotic use, immunocompromised status, or previous infections with *P. aeruginosa*. Therefore, an agent like ceftriaxone would have been sufficient.

Furthermore, the patient continued on vancomycin even after the blood culture results indicated growth of a Gram-negative rod. This is an issue related to moment 3. The vancomycin should have been discontinued at this time. This could have prevented the development of acute kidney injury or AKI, and additional laboratory tests and imaging to further evaluate the AKI could have been avoided.

After the ceftriaxone was started, the piperacillin/tazobactam was never discontinued. This is another moment 3 issue.

Additionally, after the antibiotic stewardship team informed the team that vancomycin could be discontinued, instead of stopping the vancomycin, they waited until clinical rounds the next morning to discuss this with the GI consultant. This is also a moment 3 issue. The providers continued an antibiotic that they knew was unnecessary because of concerns related to prescriber etiquette.


When the vancomycin was finally discontinued, an order to discontinue sending vancomycin troughs was never entered. This led to unnecessary patient inconvenience, costs, and personnel time.


## Slide 8

### Moments of Antibiotic Decision Making

Defect	Issue	Moment
Vancomycin started empirically	MRSA unlikely to be a pathogen in uncomplicated biliary infections	2
Piperacillin/tazobactam started empirically	Patient does not have risk factors for <i>Pseudomonas aeruginosa</i> and is not severely ill	2
Continues on vancomycin after blood cultures grow a Gram-negative rod	Vancomycin should have been stopped; acute kidney injury could have been avoided and unnecessary lab tests and imaging could have been avoided	3
Piperacillin/tazobactam continued after ceftriaxone started	Piperacillin/tazobactam should have been stopped when ceftriaxone was started	3
Team waits to discuss modifying antibiotic regimen with GI consultant	Antibiotics with synergistic nephrotoxicity were continued because of concern for prescribing etiquette	3
Vancomycin trough obtained after vancomycin discontinued	This leads to unnecessary patient inconvenience, costs, and personnel time.	3


8

Slide Title and Commentary	Slide Number and Slide												
<p><b>Moments of Antibiotic Decision Making Continued</b></p> <p>SAY:</p> <p>The patient remained on intravenous antibiotics for the duration of his hospitalization. This is another moment 3 issue. As soon as the patient demonstrated clinical improvement and was able to tolerate enteral medications, he should have been switched to an effective oral alternative. This could have led to avoidance of the PICC that was placed.</p> <p>Finally, there was also a moment 4 issue. The patient received 10 days of antibiotics when a shorter duration of therapy should have been considered based on his early clinical improvement and no concerns for ongoing source control issues such as undrained intra-abdominal abscesses.</p> <p>We will discuss appropriate therapy for biliary infections in more depth in the presentation titled: <a href="#">“Best Practices in the Diagnosis and Treatment of Diverticulitis and Biliary Tract Infections.”</a></p>	<p><b>Slide 9</b></p> <div style="background-color: #0072bc; color: white; padding: 5px; text-align: center;">Moments of Antibiotic Decision Making Continued</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #0072bc; color: white;">Defect</th> <th style="background-color: #0072bc; color: white;">Issue</th> <th style="background-color: #0072bc; color: white;">Moment</th> </tr> </thead> <tbody> <tr> <td>Patient remained on IV antibiotics for duration of hospitalization</td> <td>Antibiotics could have been changed from IV to PO once clinical improvement and able to tolerate PO demonstrated</td> <td style="text-align: center;">3</td> </tr> <tr> <td>PICC placed</td> <td>No need for PICC if patient could have received an oral regimen</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Received 10 days of antibiotics</td> <td>Reasonable to consider shorter course of therapy given clinical improvement and appropriate source control measures</td> <td style="text-align: center;">4</td> </tr> </tbody> </table> 	Defect	Issue	Moment	Patient remained on IV antibiotics for duration of hospitalization	Antibiotics could have been changed from IV to PO once clinical improvement and able to tolerate PO demonstrated	3	PICC placed	No need for PICC if patient could have received an oral regimen	3	Received 10 days of antibiotics	Reasonable to consider shorter course of therapy given clinical improvement and appropriate source control measures	4
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<p><b>Learning From Antibiotic-Associated Adverse Events</b></p> <p>SAY:</p> <p>There are many areas for improvement in the case that was just presented, highlighting the complexity of antibiotic administration in an institution. Using one of the areas of harm, acute kidney injury from unnecessary vancomycin, let's consider how to evaluate the causes and develop a plan for change. The questions that should be discussed as a group are:</p> <ol style="list-style-type: none"> <li>1. What happened?</li> <li>2. Why did it happen?</li> <li>3. How will you reduce the risk of the adverse event from happening again?</li> <li>4. How will you know the risk is reduced?</li> </ol> <p>In this patient's case, antibiotic-related adverse events caused harm but when thinking of potential antibiotic-related adverse events to tackle, you should consider both events that caused identifiable harm as well as those that had the potential to cause harm.</p>	<p><b>Slide 10</b></p> <p>Learning from Antibiotic-Associated Adverse Events</p>  <p><b>Adverse event:</b> Patient develops acute kidney injury.</p> <p><b>Learning from antibiotic-associated adverse events:</b></p> <ol style="list-style-type: none"> <li>1. What happened?</li> <li>2. Why did it happen?</li> <li>3. How will you reduce the risk of the adverse event from happening again?</li> <li>4. How will you know the risk is reduced?</li> </ol> <p>Antibiotic-related adverse events are events that either caused harm or had the potential to cause harm.</p>




Slide Title and Commentary	Slide Number and Slide
<p><b>Learning From Antibiotic-Associated Adverse Events</b></p> <p>SAY:</p> <p>When evaluating factors that contributed to an actual or potential adverse event, it is useful to list all of the contributing factors and then identify those that negatively contributed and positively contributed as well as to identify what category they fall into: patient factors, technical factors, healthcare worker factors, team factors, and institutional factors.</p> <p>Negative contributing factors are those that harmed or increased the risk of harm for the patient—these are factors you want to change.</p> <p>Positive contributing factors are factors that limited the impact of harm. Sometimes we forget to acknowledge the factors that mitigated potential harm from the adverse event. It is important to list these so we make sure they remain in place or are enhanced in some way, if possible.</p>	<p><b>Slide 11</b></p> <p style="text-align: center;"><b>Why Did It Happen?</b></p> <ul style="list-style-type: none"> <li>• <b>Negative contributing factors</b> – Factors that increased the risk of harm for the patient (want to change these)</li> <li>• <b>Positive contributing factors</b> – factors that limited the impact of harm for the patient (want to keep these)</li> </ul> <div data-bbox="1053 512 1370 693" style="text-align: center;"> </div>

Slide Title and Commentary	Slide Number and Slide
<p><b>Factors Associated With Adverse Events</b></p> <p>SAY:</p> <p>The five main categories that can contribute to antibiotic-associated adverse events are patient factors, technical factors, health care worker factors, team factors, and institutional factors.</p> <p>Patient factors are related to the clinical or emotional condition of the patient/family.</p> <p>Negative patient factors include an unclear clinical diagnosis or a strong family preference for a certain antibiotic regimen.</p> <p>Positive patient factors include a clear clinical syndrome or a patient informed about stewardship issues (for example, the patient wants to review what antibiotics he or she is receiving).</p> <p>Technical factors are those related to stewardship resources including information technology or IT resources.</p> <p>Negative factors include the lack of guidelines; knowledge gaps in education; too many dose options in the electronic health record or EHR; difficulties with ordering the desired cultures; no order sets; or day of antibiotic therapy not documented in progress notes.</p> <p>Positive technical factors include the existence of local guidelines; a mechanism to work with the information technology department to develop reports, order sets, etc.</p>	<p><b>Slide 12</b></p> <p><b>Factors Associated With Antibiotic-Associated Adverse Events</b></p> <ul style="list-style-type: none"> <li>• Five categories of factors that contribute to adverse events <ul style="list-style-type: none"> <li>– <u>Patient factors</u> are those related to the clinical or emotional condition of the patient/family <ul style="list-style-type: none"> <li>• Negative: Unclear clinical diagnosis; family strongly prefers a certain antibiotic regimen</li> <li>• Positive: Clear clinical syndrome; patient informed about stewardship issues</li> </ul> </li> <li>– <u>Technical factors</u> are those related to stewardship resources including information technology resources <ul style="list-style-type: none"> <li>• Negative: No guidelines; knowledge gaps in education; too many dose options in EHR; difficult to order the desired cultures; no order sets; day of antibiotic therapy not documented in progress notes</li> <li>• Positive: Guidelines exist; mechanism to work with IT to develop reports, order sets, etc.</li> </ul> </li> </ul> </li> </ul> 

Slide Title and Commentary	Slide Number and Slide
<p><b>Factors Associated With Adverse Events</b></p> <p>SAY:</p> <p>Health care worker factors are those related to individual members of the patient care team.</p> <p>Negative factors include that the provider has too many responsibilities or that the provider doesn't know who to contact for additional antibiotic decision-making guidance, etc.</p> <p>Positive factors include an interest in stewardship; dedicated time to perform interventions.</p> <p>Team factors are those related to communication and teamwork.</p> <p>Negative team factors include no mechanism for daily review of antibiotics; poor written or verbal communication during handoffs; or the treatment plan not being discussed as a group</p> <p>Positive team factors include the existence of a daily briefing about antibiotic regimens with the clinical team.</p> <p>Finally, institutional factors are those related to institution culture and resources.</p> <p>Negative institutional factors include that stewardship is not prioritized or that there is a lack of resources available for stewardship.</p> <p>Positive factors include that the institution endorses stewardship or there is acknowledgement for good stewardship practices.</p>	<p><b>Slide 13</b></p> <p>Factors Associated With Antibiotic-Associated Adverse Events</p> <ul style="list-style-type: none"> <li>• Types of factors <ul style="list-style-type: none"> <li>– <u>Healthcare worker factors</u> are those related to individual members of the patient care team <ul style="list-style-type: none"> <li>• Negative: provider has too many responsibilities; provider doesn't know who to contact for additional antibiotic decision-making guidance, etc.</li> <li>• Positive: interest in stewardship; dedicated time to perform interventions</li> </ul> </li> <li>– <u>Team factors</u> are those related to communication and teamwork <ul style="list-style-type: none"> <li>• Negative: no mechanism for daily review of antibiotics; poor written or verbal communication during handoffs; treatment plan not discussed as a group</li> <li>• Positive: daily briefing about antibiotic regimen with team</li> </ul> </li> <li>– <u>Institutional factors</u> are those related to institution culture and resources <ul style="list-style-type: none"> <li>• Negative: stewardship is not prioritized; lack of resources for stewardship;</li> <li>• Positive: institution endorses stewardship; acknowledgement of good stewardship</li> </ul> </li> </ul> </li> </ul>

Slide Title and Commentary	Slide Number and Slide										
<p><b>Negative and Positive Contributing Factors</b></p> <p>SAY:</p> <p>There were some negative contributing factors which increased the risk of harm for the case patient including the unnecessary initiation of vancomycin and not discontinuing vancomycin when the cultures revealed <i>E. coli</i>. These are technical factors (no access to guidelines about indications for vancomycin), health care worker factors (potential lack of interest in guidelines or advice), and team factors (no daily review of antibiotics, poor team communication).</p> <p>Also, the team waited until the next morning during rounds to discuss stopping vancomycin with the GI service. This is likely both a health care worker and team factor (provider did not have time or did not want to offend, and team did not intervene).</p> <p>Furthermore, there was no mechanism in place for the laboratory to notify the prescriber and/or the bedside nurse when the vancomycin trough was supratherapeutic. This is a technical factor (no mechanism to handle abnormal lab results).</p> <p>Note that there may be institutional factors at play with all of these examples. If antibiotic stewardship is not an institutional priority, there will be inadequate resources to prevent these harms and lack of prescriber interest in improving antibiotic use.</p> <p>It is important to note there were some positive contributing factors too. For example, the antibiotic stewardship team reviewed the case and identified unnecessary vancomycin use. It was also helpful that the team was monitoring both serum creatinine and vancomycin troughs. We want to make sure these positive contributing factors remain in place.</p>	<p><b>Slide 14</b></p> <p style="text-align: center;"><b>Example: Patient Develops AKI</b></p> <table border="1" data-bbox="906 323 1495 709"> <thead> <tr> <th data-bbox="906 323 1198 392">Negative Contributing Factors</th> <th data-bbox="1198 323 1495 392">Positive Contributing Factors</th> </tr> </thead> <tbody> <tr> <td data-bbox="906 392 1198 464"> <ul style="list-style-type: none"> <li>• Vancomycin unnecessarily started empirically</li> </ul> </td> <td data-bbox="1198 392 1495 464"> <ul style="list-style-type: none"> <li>• Antibiotic stewardship team reviewed case and recommended stopping vancomycin</li> </ul> </td> </tr> <tr> <td data-bbox="906 464 1198 514"> <ul style="list-style-type: none"> <li>• Vancomycin not discontinued when cultures revealed <i>E. coli</i></li> </ul> </td> <td data-bbox="1198 464 1495 514"> <ul style="list-style-type: none"> <li>• Serum creatinine was monitored</li> </ul> </td> </tr> <tr> <td data-bbox="906 514 1198 590"> <ul style="list-style-type: none"> <li>• Team waited to discuss stopping vancomycin with the GI service until clinical rounds the next day</li> </ul> </td> <td data-bbox="1198 514 1495 590"> <ul style="list-style-type: none"> <li>• Vancomycin trough was monitored</li> </ul> </td> </tr> <tr> <td colspan="2" data-bbox="906 590 1495 709"> <ul style="list-style-type: none"> <li>• No mechanism in place for laboratory to notify prescribers and/or bedside nurse when vancomycin troughs are supratherapeutic</li> </ul> </td> </tr> </tbody> </table>	Negative Contributing Factors	Positive Contributing Factors	<ul style="list-style-type: none"> <li>• Vancomycin unnecessarily started empirically</li> </ul>	<ul style="list-style-type: none"> <li>• Antibiotic stewardship team reviewed case and recommended stopping vancomycin</li> </ul>	<ul style="list-style-type: none"> <li>• Vancomycin not discontinued when cultures revealed <i>E. coli</i></li> </ul>	<ul style="list-style-type: none"> <li>• Serum creatinine was monitored</li> </ul>	<ul style="list-style-type: none"> <li>• Team waited to discuss stopping vancomycin with the GI service until clinical rounds the next day</li> </ul>	<ul style="list-style-type: none"> <li>• Vancomycin trough was monitored</li> </ul>	<ul style="list-style-type: none"> <li>• No mechanism in place for laboratory to notify prescribers and/or bedside nurse when vancomycin troughs are supratherapeutic</li> </ul>	
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<p><b>Reducing the Risk of the Negative Contributing Factors</b></p> <p>SAY:</p> <p>Let’s discuss some potential solutions for the negative contributing factors we just reviewed.</p> <p>Vancomycin was unnecessarily started empirically. Some solutions to this include:</p> <p>Developing local guidelines for intra-abdominal infections that provide specific information when vancomycin is and is not indicated in these infections. Remember, creating guidelines will help standardize practices and will get stakeholders involved in the decision-making process.</p> <p>Ensure guidelines are available at the point of care so clinicians know where to find them and that they are easy to refer to when making antibiotic-related decisions.</p> <p>If you have the resources available, implement a pre-prescription authorization system for vancomycin. As a minority of patients who receive vancomycin empirically probably need it, this is an agent that might be worth restricting so the stewardship team can assist with whether vancomycin is needed or not. Alternatively, consider making an order set for vancomycin that forces the prescriber to choose an accepted indication for vancomycin before ordering it.</p>	<p><b>Slide 15</b></p> <p>How Do You Reduce the Risk of the Negative Contributing Factors Happening Again?</p> <p><b>Negative Contributing Factors</b> Vancomycin unnecessarily started empirically</p> <ul style="list-style-type: none"> <li>• Develop local guidelines for intra-abdominal infections which discuss the limited situations in which empiric vancomycin may be necessary</li> <li>• Ensure guidelines are available at the point of care</li> <li>• Develop indications for appropriate vancomycin use</li> <li>• Implement a pre-prescription authorization system for vancomycin</li> </ul> 

## Reducing the Risk of the Negative Contributing Factors

SAY:

Vancomycin was not discontinued when cultures revealed *E. coli*. To reduce the likelihood of this from occurring again, you can:

Discuss in the intra-abdominal infection guidelines when therapy should be de-escalated and reasonable regimens to consider when cultures are available and when they are not available.

Implement a daily antibiotic time out. This creates an independent check to review all the antibiotics a patient is receiving and to make sure an antibiotic is not accidentally being continued when it is no longer necessary.

The antibiotic stewardship team can review all patients who are on vancomycin to determine if it is still indicated. This activity can also be integrated into existing vancomycin therapeutic monitoring programs as the first step before recommending dose alterations should be confirming the patient needs to continue vancomycin.

Consider vancomycin auto-stops at 48 or 72 hours. These can be somewhat controversial as on rare occasions a patient may have vancomycin stopped when it was needed for treatment, and if you are uncomfortable implementing antibiotic auto-stops at 48–72 hours, you may want to consider them at 7 days. Educate nurses about reviewing culture results. Although nurses may not feel comfortable suggesting antibiotics to prescribe, if they notice their patient is receiving an antibiotic for which the organism is noted as “resistant” in the medical record, they should feel comfortable bringing this up with prescribers. Similarly, if their patient is receiving meropenem and they know this is a restricted antibiotic because it has such broad-spectrum activity, and they see “susceptible” next to several other antibiotic agents, they should feel comfortable asking the prescribing clinician if it might be reasonable to adjust the antibiotic therapy. The comfort level of nurses to review culture results may vary but they should feel secure voicing any concerns.

## Slide 16

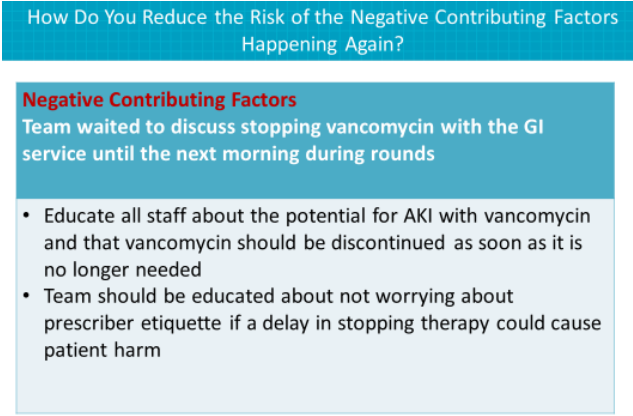
How Do You Reduce the Risk of the Negative Contributing Factors Happening Again?


### Negative Contributing Factors

Vancomycin not discontinued when cultures revealed *E. coli*


- Develop guidelines for intra-abdominal infections which discuss culture-directed therapy recommendations
- Educate nursing about reviewing culture results and how they should be comfortable discussing with prescribers whether changes in antibiotic regimens are needed
- Implement an antibiotic time-out tool to be reviewed on clinical rounds
- Develop vancomycin auto-stops


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Slide Title and Commentary	Slide Number and Slide
<p><b>Reducing the Risk of the Negative Contributing Factors</b></p> <p>SAY:</p> <p>The team waited to discuss stopping vancomycin with the GI service until the next morning during rounds instead of writing the order to discontinue it as soon as they knew it was no longer necessary and potentially causing harm. To prevent this from happening again:</p> <p>Educate all staff about the potential for AKI with vancomycin so they understand that vancomycin should be discontinued as soon as it is no longer needed.</p> <p>Providers should be comfortable not worrying so much about prescriber etiquette if a delay in stopping therapy could cause patient harm.</p>	<p><b>Slide 17</b></p> <p>How Do You Reduce the Risk of the Negative Contributing Factors Happening Again?</p> <p><b>Negative Contributing Factors</b> Team waited to discuss stopping vancomycin with the GI service until the next morning during rounds</p> <ul style="list-style-type: none"> <li>• Educate all staff about the potential for AKI with vancomycin and that vancomycin should be discontinued as soon as it is no longer needed</li> <li>• Team should be educated about not worrying about prescriber etiquette if a delay in stopping therapy could cause patient harm</li> </ul> 

Slide Title and Commentary	Slide Number and Slide
<p><b>Reducing the Risk of the Negative Contributing Factors</b></p> <p>SAY:</p> <p>There was no mechanism in place for the laboratory to notify prescribers and/or the bedside nurse when vancomycin troughs were supratherapeutic.</p> <p>Establish parameters for supratherapeutic vancomycin troughs for the laboratory to call the prescriber or bedside nurse</p> <p>If the prescriber is called, he or she should notify the bedside nurse immediately to hold off on administering further vancomycin doses</p> <p>If the bedside nurse is called, he or she should refrain from hanging further vancomycin doses until discussing the situation with the prescriber. Nurses can provide an invaluable resource in informing prescribers if they notice concerning decreases in urine output or elevations in serum creatinine that may correlate with vancomycin-associated nephrotoxicity.</p>	<p><b>Slide 18</b></p> <p>How Do You Reduce the Risk of the Negative Contributing Factors Happening Again?</p> <p><b>Negative Contributing Factors</b></p> <ul style="list-style-type: none"> <li>• No mechanism in place for laboratory to notify prescribers and/or bedside nurse when vancomycin troughs are supratherapeutic</li> <li>• Establish parameters for supratherapeutic vancomycin troughs for the laboratory to call prescribers or bedside nurse</li> <li>• If prescriber is called, should notify bedside nurse immediately to hold off on administering further vancomycin doses</li> <li>• If bedside nurse is called, he/she should refrain from hanging further vancomycin bags until discussing the situation with the prescriber</li> </ul> 



Slide Title and Commentary	Slide Number and Slide
<p><b>What Should You Do When You Identify an Antibiotic-Associated Adverse Event?</b></p> <p>SAY:</p> <p>Once an antibiotic-associated adverse event (in this case AKI) is identified, bring together a multidisciplinary team (including your antibiotic stewardship team) to identify contributing factors and to develop potential solutions. It might be necessary to bring in other members as needed. For example, if the adverse event was severe rash, it may be helpful to involve dermatology.</p> <p>It is important to avoid assigning blame to individual people but rather to systems or health care worker roles, as we all make mistakes, and it rare that a health care worker intentionally tries to cause harm to a patient.</p> <p>Seek input from a senior executive, as needed, for systems issues—those related to institutional factors. When potential solutions are identified, they should be clear to everyone who is charged with implementing them (or making sure the proposed changes that have been identified are made).</p> <p>To hold people accountable to their tasks, develop deadlines for when people are responsible for reporting back to the group. Determine if something can be measured (without being overly resource-intensive) to demonstrate that the incidence of the adverse event has been successfully reduced.</p>	<p><b>Slide 19</b></p> <p><b>Responding to an Antibiotic-Associated Adverse Event</b></p> <ul style="list-style-type: none"> <li>• Form a multidisciplinary team to develop potential solutions</li> <li>• Seek input from a senior executive, as needed</li> <li>• When potential solutions are identified, make it clear who is charged with implementing them</li> <li>• Develop “deadlines” for when people are responsible for reporting back to the group</li> <li>• Determine if something can be measured to demonstrate that incidence of the adverse event has been reduced</li> </ul>  <p><small>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</small></p> <p><small>Making Effective Changes 19</small></p>

Slide Title and Commentary	Slide Number and Slide
<p><b>Make Sure Risks Are Being Reduced</b></p> <p>SAY:</p> <p>Follow up in several weeks or months to make sure the potential solution has been successfully implemented and that it has not led to unforeseen negative consequences. Check to see if your staff understands the changes that were implemented. Ask them if the knowledge has been disseminated. Assess whether the relevant clinical staff believe risks were reduced because of the changes made or if they have ongoing concerns.</p>	<p><b>Slide 20</b></p> <p><b>Make Sure Risks Are Being Reduced</b></p> <ul style="list-style-type: none"> <li>• Follow-up <ul style="list-style-type: none"> <li>– Do staff know about the adverse event and proposed changes to reduce the likelihood of the adverse event happening again?</li> <li>– Do staff believe risks were reduced?</li> <li>– Can something be measured to evaluate compliance with the new practices?</li> <li>– Do staff have ongoing concerns?</li> </ul> </li> </ul>  <p style="text-align: right;">19</p>
<p><b>Summary</b></p> <p>In summary, adverse events related to antibiotics should be evaluated to determine areas for improvement.</p> <p>When performing these evaluations, identify negative and positive contributing factors as well as the category of each factor-- patient factor, technical factor, health care worker factor, team factor, or institutional factor. Listing and categorizing factors can help guide determining the best way to solve a problem.</p> <p>Work with all relevant team members to determine solutions to prevent future harm and follow up to ensure that solutions are implemented and harm is reduced.</p>	<p><b>Slide 21</b></p> <p><b>Summary</b></p> <ol style="list-style-type: none"> <li>1. Adverse events related to antibiotics should be evaluated to determine areas for improvement.</li> <li>2. When performing these evaluations, identify negative and positive contributing factors as well as the category of factor.</li> <li>3. Work with all relevant team members to determine solutions to prevent future harm.</li> <li>4. Follow up to ensure that solutions are implemented and harm is reduced.</li> </ol> <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>Making Effective Changes 21</p>

Slide Title and Commentary	Slide Number and Slide
<p><b>Disclaimer</b></p> <p>SAY:</p> <p>The findings and recommendations in this presentation are those of the authors, who are responsible for its content, and do not necessarily represent the views of AHRQ or of the U.S. Department of Health and Human Services. No statement in this presentation should be construed as an official position of AHRQ or of the U.S. Department of Health and Human Services.</p> <p>Any practice described in this presentation must be applied by health care practitioners in accordance with professional judgement and standards of care in regard to the unique circumstances that may apply in each situation they encounter. These practices are offered as helpful options for consideration by health care practitioners, not as guidelines.</p>	<p><b>Slide 22</b></p> <p style="text-align: center;"><b>Disclaimer</b></p> <ul style="list-style-type: none"> <li>• The findings and recommendations in this presentation are those of the authors, who are responsible for its content, and do not necessarily represent the views of AHRQ. No statement in this presentation should be construed as an official position of AHRQ or of the U.S. Department of Health and Human Services.</li> <li>• Any practice described in this presentation must be applied by health care practitioners in accordance with professional judgment and standards of care in regard to the unique circumstances that may apply in each situation they encounter. These practices are offered as helpful options for consideration by health care practitioners, not as guidelines.</li> </ul> 