Pharmacist-Managed Pharmacokinetics Service

The recommendations in this guide are meant to serve as treatment guidelines for use at Michigan Medicine facilities. If you are an individual experiencing a medical emergency, call 911 immediately. These guidelines should not replace a provider’s professional medical advice based on clinical judgment, or be used in lieu of an Infectious Diseases consultation when necessary. As a result of ongoing research, practice guidelines may from time to time change. The authors of these guidelines have made all attempts to ensure the accuracy based on current information, however, due to ongoing research, users of these guidelines are strongly encouraged to confirm the information contained within them through an independent source.

If obtained from a source other than med.umich.edu/asp, please visit the webpage for the most up-to-date document.”
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New vancomycin or AG order entered by team

Order reviewed by verifying pharmacist

Order deemed appropriate?

- Yes
  - Verifying pharmacist verifies order and enters Intermittent Dosing order if needed
    - Full assessment and scoring tool documentation* to be done by Clinical Covering Pharmacist

- No
  - Page covering clinical pharmacist or change dose/clarify by verifying pharmacist?
    - Page covering clinical pharmacist when there is a reasonable expectation that they have (either/both)
      1) More detailed knowledge of the patient and/or the clinical situation
      2) More available time

  - Verifying pharmacist contacts covering pharmacist AND enters order clarification I-vent
    - Consider entering and dispensing one-time order for STAT orders to ensure timely medication delivery despite need for clarification

  - Covering clinical pharmacist shall:
    - Change the dose* and auto-verify ("sign", NOT "sign and verify")
      - OR
      - Verify the dose as ordered if deemed appropriate
        - OR
      - Clarify unclear orders with prescriber
        - AND
      - Complete all documentation* as needed for situation

  - Change by verifying pharmacist

Verifying pharmacist shall:
  - Change the dose and auto-verify ("sign", NOT "sign and verify")
  - OR
  - Verify the dose as ordered if deemed appropriate
  - OR
  - Clarify unclear orders with prescriber
  - AND
  - Complete all documentation* as needed for situation
New Orders Workflow Cont’d - Covering Clinical Pharmacist Responsibility for Verification of Pharmacist-Managed Orders

- When assessing a new therapy (based on a “red dot” or “pencil and paper” icon on the scoring tool)
  - If the dose is appropriate as ordered, check to see if the order is already verified or not.
    - If not yet verified, verify the order
      - Indicator that the order is NOT verified is denoted next to the medication name in the scoring tool report
      - Box in scoring tool is highlighted light blue
  - If you change the order, the new order will auto-verify (sign, do not “sign and verify”)

![Scoring Tool Screenshot]

- [Image of Scoring Tool]
New Orders Workflow Cont’d-

Documentation Requirements (slide 3 footnote a)

• In patient list, “PK Review” column, new orders will appear as a “red dot”
  o Pharmacist must document the following in the sticky note: 1) indication for therapy and 2) goal for therapy. If duration of therapy is known, inclusion of this information is recommended.
  o DAILY documentation is also required in the “Kinetics Monitoring” field. Then, mark as reviewed—the ‘red dot’ will turn to a ‘green checkmark’.
  o Note: for vancomycin; documentation in “Restricted Abx” section additionally required

• Ensure that appropriate vancomycin and/or aminoglycoside serum concentrations are ordered (lab order)
  o If already ordered, assess ordered levels for appropriateness (if changes needed, enter appropriate order)
  o If not already ordered, enter order as appropriate

• Initiate Rx Follow-Up or Day Shift Follow-up iVent, as appropriate

• Documentation of initial PK care plan viewable to multidisciplinary team required:
  o Whenever the pharmacist makes a recommendation for changes in therapy (e.g., dose change on initiation of therapy, dose changes based on serum concentrations, “PRN” dosing)
  o When the pharmacist makes a recommendation to clarify an inaccurate level (e.g., trough drawn at incorrect time)
  o When the pharmacist believes a clarification or other documentation is needed
  o NOTE: For patients on pediatric service lines, ALL levels must be documented in the patient chart
  o NOTE: Communication with providers (in person, via phone or via paging system) is expected when clarification is required
Pharmacist-Managed PK Dosing and Monitoring
Assessment of New Serum Concentrations, Dose Adjustments, and Documentation

*Complete by end of shift and/or sign out to next shift*

*Must be completed within 24 hours*

Assessment of Serum Concentrations, Dose Adjustments, Documentation, and Follow-Up

1. In Clinical Scoring Tool, daily documentation is required in the “Kinetics Monitoring” field
   *Note: New levels will stay on the scoring tool for 12 hours. Critical levels will stay on the scoring tool for 24 hours or until a new level that is no longer critical comes back.*

2. Assess serum concentration and revise PK Care Plan, as appropriate
   a. If dose change is necessary, discontinue currently ordered dose and write order for appropriate new dose

3. Documentation to multidisciplinary team is required using approved PK template for new levels meeting these indications:
   a. Whenever the pharmacist makes a recommendation for changes in therapy (e.g., dose change on initiation of therapy, dose changes based on serum concentrations, "PRN" dosing)
   b. When the pharmacist makes a recommendation to clarify an inaccurate level (e.g., trough drawn at incorrect time)
      i. Note type should be “Medication Management”. F2 will bring up “Kinetics Note Templates” option, which will guide you to appropriate template
      ii. Remember that documentation is also required (DAILY) in the Clinical Scoring Tool, which can either be the copied note or a shortened version.
      iii. When the pharmacist believes a clarification or other documentation is needed
      iv. NOTE: For patients on pediatric service lines, ALL levels must be documented in the patient chart

4. Ensure that appropriate follow-up vancomycin and/or aminoglycoside serum concentrations are ordered
   a. If already ordered, assess ordered levels for appropriateness (if changes needed, enter appropriate order)
   b. If not already ordered, enter order as appropriate

5. If previous Rx Follow-Up or Day Shift Follow-Up iVent started and the intervention has been completed (above), close iVent

6. Initiate new Rx Follow-Up or Day Shift Follow-Up iVent, as appropriate, for future follow up

*NOTE: Communication with providers (in person, via phone or via paging system) is expected when clarification is required.*
Documentation Expectations- Review

• When do you need to write a note in the EMR (medication management note)?
  – Whenever the pharmacist makes a recommendation for changes in therapy (e.g., dose change on initiation of therapy, dose changes based on serum concentrations, “PRN” dosing)
  – When the pharmacist makes a recommendation to clarify an inaccurate level (e.g., level drawn at incorrect time)
  – When the pharmacist believes a clarification or other documentation is needed
  – NOTE: For pediatric patients, ALL levels must be documented in the patient chart

Per UMHHC Policy 07-01-019
Documentation Expectations

• Examples for when to write notes in the EMR:
  – Patient receiving PRN dosing because on renal replacement therapy → write a note every time a dose is entered or level ordered and needs clarification
  – “Dosing by levels” due to poor renal function → write a note every time a dose is entered or level ordered and needs clarification
  – Level comes back and you recommend dose adjustment to team → write a note reflecting recommendation
  – Medical team documents “pharmacist managing vancomycine in progress note” → if changes are made or clarification is needed, you are responsible for entering medication management note
Documentation Expectations

- What about I-vent vs. scoring tool vs. PK sticky note?

**I-Vent**

**Day Shift**
- Hand-off communication:
  - Pending levels
  - Any actionable follow-up items that must be addressed next day

**Rx Follow Up**
- Hand-off communication:
  - Pending levels for CE/midnight
  - Any actionable follow-up items that must be addressed for CE/midnight

**Scoring Tool**
- “No follow-up levels necessary unless XXX”
- “FYI” hand-off communication (does not require specific action)
- Documentation of levels/dose changes
- Daily assessment of dosing, renal function, and clinical status

**PK Sticky Note**
- Indication
- Goal
“Intermittent Dosing” Order

• Replaces “pharmacist to manage” order, which was frequently misunderstood.

• Purpose of placing the order is to indicate active therapy in a patient requiring “PRN dosing” so MiChart knows to fire for review every day

• Only pharmacists can order! So, pharmacists MUST be attuned to whether order needs to be placed.
  – The order instructs physicians to discontinue the order to let pharmacy know that the team does not want to continue therapy.
"Intermittent Dosing" Order (Vancomycin Example)

<table>
<thead>
<tr>
<th>Orders</th>
<th>Signed &amp; Held</th>
<th>Home Meds</th>
<th>Cosign</th>
<th>Order History</th>
<th>TPN</th>
<th>Recurring Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sort by: Order Type</td>
<td>Go to: Scheduled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **fluconazole (DIFLUCAN) 400 mg/200 mL IVPB 800 mg**
  - 800 mg, Intravenous; EVERY 24 HOURS
  - Recommended INF time: 2 hrs
  - First dose on Tue 8/14/18 at 1445

- **furosemide (LASIX) oral solution 20 mg**
  - 20 mg, Oral, DAILY
  - For Oral Use Only
  - First dose on Sat 8/4/18 at 0600, Until Discontinued

- **lisinopril (ZESTRIL) tablet 20 mg**
  - 20 mg, Oral, ONCE DAILY
  - First dose on Fri 8/10/18 at 1115, Until Discontinued

- **vancomycin intermittent dosing**
  - Intravenous, See Admin Instructions, Starting Tue 8/28/18 at 0945, Until Discontinued
  - The patient is actively receiving non-scheduled vancomycin therapy (i.e. "dose by levels" for patients with AKI, on intermittent HD, etc.) - Discontinue this order if you do not want the patient to receive the medication any further.
“Intermittent Dosing” Order Physician Communication

Vancomycin/Aminoglycoside orders require physicians to answer the following to enhance communication to pharmacy:

Interpretation of possible order combinations by pharmacist:

- Yes, scheduled order – verify or change as appropriate
- No, scheduled order – clarify with prescriber
- Yes, once – verify and enter “Intermittent Dosing” order if appropriate for dosing by levels – or change to scheduled dosing if appropriate based on renal function (and write note)
- No, once – Verify and dispense single dose
- “Per Peri-operative prophylaxis guidelines” will be defaulted in perioperative order sets
“Intermittent Dosing” Order
Pharmacist Order Entry

• BPA in order verification activity (see screenshot next slide) will remind pharmacist that “Intermittent Dosing” order is needed if all 3 of the following conditions exist:
  – Order question is answered “Yes”
  – Frequency is “Once”
  – There is not an active “Intermittent Dosing” order

• If appropriate for dosing by levels (not appropriate for scheduled dosing), verifying pharmacist should enter order the “Intermittent Dosing” order

• If appropriate dosing unclear, verifying pharmacist may page clinical covering pharmacist per our pharmacist managed order clarification communication guidance (link)
“Intermittent Dosing” Order Verification Screen BPA
“Intermittent Dosing” Order

Other FAQs

• What if I have a newly admitted or ED patient with missing information about renal function, weight, etc.?
  o Enter (or verify and dispense) one-time dose for first dose (no chart note needed at this point)
  o Enter “intermittent dosing order,” and place an iVent stating one-time dose given, waiting for labs to determine ongoing dosing. If the expectation is that this follow-up and determination will be done by a different pharmacist than the one placing the iVent, also page that pharmacist to notify them of follow-up needed.
  o Once labs return:
    ▪ If appropriate for scheduled dosing: pharmacist will schedule doses and d/c the intermittent order, write note and document in scoring tool. OR
    ▪ If appropriate for dosing by levels: pharmacist will determine appropriate follow-up level timing and order level or handoff via iVent and/or scoring tool depending on timing of level needed

• What if a prescriber needs to change a patient from scheduled dosing to dosing by levels due to acute change in renal function?
  o They will need to contact a pharmacist to enter the “Intermittent Dosing” order

• Separate order is needed for each drug: vancomycin, amikacin, tobramycin, gentamicin, streptomycin
Sticky Notes

• **Kinetics Indication and Goal**: ONLY include indication and goal here as this information will be pulled into medication management note.
  – Utilize dot phrases (.rxvanco and .rxamino)

• **Miscellaneous Kinetics Documentation**: pharmacist to pharmacist communication
Click comment next to the “Kinetics Indication and Goal” sticky note. Type “.rxvanco” (or “.rxamino” for aminoglycosides).

A drop down for vancomycin indication and goal (trough or AUC) are included:
Once you have selected an appropriate indication and goal, the text will populate in the sticky note:

For aminoglycosides (using .rxamino), you can select multiple goal levels for peak/trough, etc.: 
PK Note Templates

• Once the sticky notes in the scoring tool have been completed, indication and goal will be automatically pulled into the medication management note as seen below.
For administration, you can choose if you want to include doses given in the last 24 hours, 48 hours, or 72 hours.
PEDIATRIC ONLY: select the nephrotoxic medications the patient is currently receiving
Note: IV contrast and amphotericin count as 7 day exposures.

Select all nephrotoxic medications the patient is currently receiving
Example of the full “vancomycin medication management note” template.

Automated from sticky note in scoring tool

Dosing weight OR Actual Body Weight

Automated for last 72 hours

Select administration in last 24 hours, 48 hours, or 72 hours

Drop down options for assessment/plan
Example of the full “aminoglycoside medication management note” template. Similar to vancomycin template.

- **Patient:** Storytwo Davis
- **Current Medication:** (aminoglycoside 24265)

### Aminoglycoside Indication and Goal
- **Indication:** Bacteremia
- **Vancomycin goal trough:** 10-15 mcg/ml

### Renal Replacement Therapy
- **Type:** (Renal Replacement Therapy: 304025030)

### Weight
- **Options:** (304025056)

### Scr (mg/dL)
- **Creatinine**
  - **Date:** 12/23/2015
  - **Value:** 1.0
  - **Status:** Final
  - **Range:** 0.5 - 1 mg/dL
- **Date:** 12/23/2015
  - **Value:** 1
  - **Status:** Final
  - **Range:** 0.5 - 1 mg/dL

### Aminoglycoside administrations
- **RX Aminoglycoside Administrations:** 304025075

### Serum concentrations
- No results found for: TOBR, TOBPK, TOBTR, AMIKR, AMIKPK, AMIKTR, STREPM, CENTR, CENTPK, CENTR

### Calculated kinetic parameters
- **Ke:** ***
- **T 1/2:** ***
- **Cpeak:** ***
- **Ctrough:** ***
- **VD:** ***

### Assessment/Plan
1. Assessment: [aminoglycoside 24265] peak is (RX Level Goal: 304025033) and trough is (RX Level Goal: 304025033). Renal function is (RX Renal Function: 304025034)
2. Plan: (RX Aminoglycoside Plan: 304025072) Next level will be ordered ***
3. Pharmacist will continue to monitor [aminoglycoside: 24265] therapy. Please page with questions.

### Pharmacist
- **RX Pager:** 304025030
- **Date:** 6/28/2016
- **Time:** 3:15 PM
Example of the full “vancomycin AND aminoglycoside medication management note” template. Similar to vancomycin template.
Example of the full “pediatric vancomycin medication management note” template (similar to other pediatric PK templates)

<table>
<thead>
<tr>
<th>Date</th>
<th>Value</th>
<th>Set Range</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/6/2018</td>
<td>&lt;0.10</td>
<td>mg/dL</td>
<td>Final</td>
</tr>
<tr>
<td>10/6/2018</td>
<td>0.11</td>
<td>mg/dL</td>
<td>Final</td>
</tr>
<tr>
<td>10/7/2018</td>
<td>&lt;0.10</td>
<td>mg/dL</td>
<td>Final</td>
</tr>
</tbody>
</table>

Patient is receiving (Peds Renal Replacement Therapy: 304025192)

Patient is currently receiving the following medications which may contribute to nephrotoxicity:
- (RXNEPHRO 304025189)

Vancomycin Therapy:
Vancomycin administrations:
- (RX Vanco Administrations 304025060)

Serum concentrations:

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Date/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>VANCOTR</td>
<td>8.0</td>
<td>10/8/2018 11:52</td>
</tr>
<tr>
<td>VANCOTR</td>
<td>7.4</td>
<td>10/7/2018 12:14</td>
</tr>
</tbody>
</table>

Assessment/Plan:
1. Vanco trough was drawn [304025203] *** hours after dose and [39046] represent a steady state level.
2. (RX Peds Vanco Plan: 304025196)
3. (RX Peds Kinetic Monitoring: 304025201)
4. Pharmacist will continue to monitor vancomycin therapy and order vancomycin level appropriately.

Please page with questions.

Nicholas Dillman
Pager #***
10/9/2018

Automated from sticky note in scoring tool
Dosing weight OR Actual Body Weight
Select all nephrotoxic medications the patient is currently receiving
Select administration in last 24 hours, 48 hours, or 72 hours
Automated for last 72 hours
Drop down options for assessment/plan
Vancomycin Workflow Updates

- As of 3/3/2012, vancomycin will be removed from tier II workflow
- Avoid obtaining levels in first 48-72 hours, unless significant changes to renal function, septic shock, morbid obesity
- For patients that need therapy beyond 48-72 hours, target AUC of 400-600. Order random level and trough, then use AUC calculator
- Document vancomycin-specific iVent following vancomycin monitoring
- Document goal AUC and personalized trough range in the notes. The trough range will be used when transitioning to home therapy
EPIC Kinetics Dashboard Updates

- **New banner that appears when vancomycin has been administered > 72 hours**
- **Location for documenting miscellaneous notes including appropriateness of therapy. Pharmacists are expected to assess daily if vancomycin is indicated. If vancomycin is deemed inappropriate, pharmacists should communicate need for discontinuation with the primary team. Pharmacists may page the antimicrobial approval pager (30780) of stewardship pharmacists for assistance in discontinuing vancomycin, when needed**
- **Link to I-Vent documentation (see page 33)**

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**Kinetics Indication and Goal:**

- Vancomycin duration > 72 hours

**Appropriateness / Miscellaneous Kinetic Documentation:**

**Kinetics Monitoring:**

- Kinetics: 15 points (Up 15 points since last review) - [Last updated: 02/15/21 1553]
- Patient received a score of 15 points: 5 points for each aminoglycoside or vancomycin order, 10 points if any aminoglycoside or vancomycin trough > 30 mcg/mL, gent/tobramycin trough > 2 mcg/mL, or amikacin trough > 10 mcg/mL.
- Vancomycin: (from admission, onward)
  - Start: 02/15/21 1313
  - Vancomycin (VANCOCIN) 750 mg in sodium chloride, 750 mg

**Antibiotic Monitoring**

- Antibiotics: vancomycin (g) (g)
  - 03/14: 09.04, 09.06, 09.12, 12.16, 16.20, 20.00
  - 03/16: 09.04, 09.06, 09.12, 12.16, 16.20, 20.00

Link: AUC Vancomycin Calculator
Adult Vancomycin Monitoring Recommendations **within 72 hours of Vancomycin Initiation**

**Monitoring within 72 hours of Vancomycin Initiation**

Vancomycin levels should be unnecessary if therapy not anticipated to exceed 72 hours. Recommend discontinuation of vancomycin 48-72 hours after initiation if there is no indication to continue therapy. Approximately 90% of patients will have vancomycin discontinued within 48-72 hours and do not require levels.

Do not check vancomycin concentrations within the first 72 hours except in the following situations:

<table>
<thead>
<tr>
<th>Clinical Situation</th>
<th>Monitoring Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documented gram positive infection requiring vancomycin</td>
<td>• Obtain 2 vancomycin levels at steady state and calculate AUC to achieve goal AUC of 400-600</td>
</tr>
<tr>
<td>Septic shock</td>
<td>• Obtain a random level ~4 hours post-infusion and a trough prior to the next dose for most patients</td>
</tr>
<tr>
<td>Weight &gt; 150 kg</td>
<td>• Obtain a vancomycin level and dose per level</td>
</tr>
<tr>
<td>Significant acute changes in renal function, AKI, or CrCl &lt; 25 ml/min</td>
<td>• Monitor random levels in patients and re-dose when level &lt; 15 mcg/mL</td>
</tr>
</tbody>
</table>

AUC is the preferred method of vancomycin monitoring, with daily goal AUC of 400-600 regardless of MIC. Trough-based monitoring should not be routinely used, unless dosing by levels within the first 72 hours.
Adult Vancomycin Monitoring Recommendations after 72 hours of Vancomycin Initiation

Monitoring after 72 hours of Vancomycin Initiation

Recommend discontinuation of vancomycin 48-72 hours after initiation if there is no indication to continue therapy. Consider ID consult in patients with confirmed MRSA infection who do not improve on vancomycin. ID consult should be ordered for all patients with MRSA bacteremia.

Use the following table to guide monitoring of vancomycin based on the patient’s clinical status:

<table>
<thead>
<tr>
<th>Clinical Situation</th>
<th>Monitoring Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with stable renal function (including patients with CKD and receiving CRRT)</td>
<td>- Obtain 2 vancomycin levels after the first dose and calculate AUC to achieve goal AUC of 400-600</td>
</tr>
<tr>
<td></td>
<td>- Obtain a random level ~4 hours post-infusion and a trough prior to the next dose for most patients to calculate AUC</td>
</tr>
<tr>
<td></td>
<td>- Document individualized trough range that corresponds to AUC of 400-600 for that patient</td>
</tr>
<tr>
<td>Patients on conventional dialysis</td>
<td>- Check pre-HD level (preferred for floor patients) or 3-hr post-HD level (preferred for ICU patients)</td>
</tr>
<tr>
<td></td>
<td>- Target pre-HD levels of 15-20 mcg/mL, or post-HD level of 10-15 mcg/mL</td>
</tr>
<tr>
<td>Patients who have fluctuating fluid and/or renal status</td>
<td>- Use clinical judgement to determine monitoring strategy</td>
</tr>
<tr>
<td></td>
<td>- It is reasonable to perform AUC or trough based monitoring. The instability of renal clearance or volume of distribution should be taken into account when evaluating levels and subsequent dosing</td>
</tr>
</tbody>
</table>

Frequency of Vancomycin Levels and Monitoring

- Serum Creatinine should be monitored at least every 48 hours
- Subsequent levels should be obtained:
  - Every 1-3 days if significant changes to vancomycin dose, renal function or fluid status
  - Every 3-5 days if on a stable dose with multiple AUCs of 400-600 and stable fluid status and renal function
- Avoid evening and overnight levels if clinically stable
Pediatric Vancomycin Monitoring Recommendations within 48 hours of Vancomycin Initiation

<table>
<thead>
<tr>
<th>Clinical Situation</th>
<th>Monitoring Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximately 90% of patients will have vancomycin discontinued within 48-72 hours and most patients do not require levels</td>
<td>• Obtain 2 vancomycin levels at steady state and calculate AUC to achieve goal AUC of 400-600</td>
</tr>
<tr>
<td>Documented gram positive infection</td>
<td>• Obtain a random level ~2 hours post-infusion and a trough prior to the next dose for most patients</td>
</tr>
<tr>
<td>Septic shock</td>
<td></td>
</tr>
<tr>
<td>Weight &gt; 100 kg</td>
<td></td>
</tr>
<tr>
<td>Children with low muscle mass (e.g. muscular dystrophy, cerebral palsy, spinal muscular atrophy)</td>
<td>• Obtain a vancomycin level and dose per level</td>
</tr>
<tr>
<td>Significant acute changes in renal function, CrCl &lt;30 mL/min, therapeutic hypothermia, ECMO, AKI, or neonates &lt;72 hours old whose mothers received peri-partum vancomycin</td>
<td>• Monitor random levels in patients and re-dose when level &lt;15 mcg/mL</td>
</tr>
</tbody>
</table>
Pediatric Vancomycin Monitoring Recommendations after 48 hours of Vancomycin Initiation

### Monitoring after 48 hours of starting vancomycin:
1. Use the following table to guide monitoring of vancomycin based on the patient's clinical status:

<table>
<thead>
<tr>
<th>Clinical Situation</th>
<th>Monitoring Recommendation</th>
</tr>
</thead>
</table>
| Patients with stable renal function (including patients with CKD and receiving CRRT) | • Obtain 2 vancomycin levels at steady state and calculate AUC to achieve goal AUC of 400-600  
  • Obtain a random level ~2 hours post-infusion and a trough prior to the next dose for most patients to calculate AUC  
  • Document individualized trough range that corresponds to AUC of 400-600 for that patient  |
| Patients on conventional dialysis                       | • Check pre-HD level  
  • Target pre-HD levels of <15                                                        |
| CHC patients within 72 hours of surgery                 | • Check trough concentration  
  • Redose for trough <10                                                               |
| Patients who have fluctuating fluid and/or renal status | • Use clinical judgement to determine monitoring strategy  
  • It is reasonable to perform AUC or trough-based monitoring. The instability of renal clearance or volume of distribution should be taken into account when evaluating levels and subsequent dosing |

2. Dose should not exceed 100 mg/kg/day at any point in therapy.
3. Consider ID consult in patients with confirmed MRSA infection who do not improve on vancomycin. ID consult should be ordered for all patients with MRSA bacteremia.
4. Refer to the following table for recommendations on frequency of ordering vancomycin levels and serum creatinine:

<table>
<thead>
<tr>
<th>Clinical Situation</th>
<th>Monitoring Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsequent levels should be drawn every 1-7 days, and serum creatinine should be monitored at least every 48 hours during entire course of vancomycin therapy. Avoid evening and overnight levels if clinically stable.</td>
<td></td>
</tr>
</tbody>
</table>
| Patients with changing fluid status or renal function   | • Obtain levels every 1-3 days  
  • Monitor 2 vancomycin levels to facilitate AUC calculation, when possible  
  • In patients receiving one-time doses (i.e., dosing by level), monitor random levels and re-dose when level <15 mcg/mL |
| Patients with stable fluid status and renal function requiring long-term therapy | • Obtain levels every 5-7 days, after initial level(s) are therapeutic  
  • Once a patient is on a stable dose with an AUC between 400 and 600, monitoring of vancomycin troughs may be acceptable in patients with stable fluid status and renal function |
Vancomycin AUC Calculator

- Posted on stewardship website, pharmacy website, and linked from pharmacy EPIC PK tab
- https://www.med.umich.edu/asp/misc/UMich_PK_Calculator.xlsx
Vancomycin I-Vents

• To be completed upon evaluation of level(s) (i.e., after trough and two levels for AUC calculations)
• Select “Vancomycin Monitoring” as Type and the correct response (as seen on image) as subtype
Personalized Trough Range

- Use AUC calculator to determine personalized trough range
- Personalized trough range should be documented in PK notes
- Trough range will be used when transitioning to trough-based monitoring for home therapy