
TITLE: PHARMACIST MANAGED PHARMACOKINETIC MONITORING AND DOSING OF VANCOMYCIN AND AMINOGLYCOSIDES

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APPLICABILITY: Acute Care

RELATED POLICIES: 1-20-6-4-090: [Medication Adaptation](#)
1-20-6-1-020: [Health Record Documentation: Pharmacist](#)
1-20-06-1-030: [Pharmaceutical Care: Pharmacist](#)

DEFINITIONS: **Responsible pharmacist:** Pharmacist assigned primary commitment for following patient's serum levels, clinical status and/or adjusting doses as required. This pharmacist may be dispensary-based, ward-based or off-site providing remote verification coverage.

COMPETENCY REQUIREMENTS: Complete training with Professional Practice Leader, Antimicrobial Stewardship Program Coordinator or designate as part of new hire orientation or as part of in-house professional development. Pharmacists who receive this training are required to review with the Professional Practice Leader / Antimicrobial Stewardship Program Coordinator, three patient cases with SOAP notes.

DOCUMENT QUICK LINKS

- [Active Therapeutic Drug Monitoring Tracking Form](#) (10-110-7025)
- [Therapeutic Antibiotic Monitoring Form](#) (10-110-7024)

KEY POINTS

- To ensure that all inpatients and outpatients receiving vancomycin and aminoglycoside antibiotics are being monitored and dosed by an appropriately trained pharmacist
- To ensure that this monitoring is continuous through weekends, holidays, sick days, and changes to availability of pharmacy service
- To facilitate appropriate use of these antibiotics to achieve optimal management of infections, minimize adverse events and reduce risk of microbe resistance
- To ensure provision of this service is consistent across all Northern Health sites with pharmacist coverage

- **Pharmacists** are authorized to give telephone orders to nursing staff or fax orders to ward, if pharmacist not on site.

POLICY STATEMENT (ALL STAFF MUST COMPLY)

Responsible pharmacist will assess and dose all orders for vancomycin intravenous and/or aminoglycosides intravenous (gentamicin, tobramycin and amikacin). Responsible pharmacist will order serum drug levels and serum creatinine and adjust dose as appropriate. Serum drug levels and serum creatinine are imperative for adjusting doses. Dosage adjustments for pediatric and neonatal patients must be discussed with most responsible pediatrician prior to carrying out changes.

CLINICAL PRACTICE STANDARD (ALWAYS USE PROFESSIONAL JUDGEMENT AND DOCUMENT ANY DEVIATION FROM THE STANDARD)

Pharmacist General:

- For sites with multiple patients on vancomycin, gentamicin, tobramycin and amikacin, the pharmacist verifying the patient's order:
 1. Enters the patient onto the Active Therapeutic Drug Monitoring Tracking Form in the clinical binder at UHNBC, or associate the tracking form under 'Tracking Sheet' on ScanRx at end of each work day for non-UHNBC sites.
 2. Move to the 'monitored orders' section in ScanRx to assist with remote coverage follow up.

Responsible pharmacist(s):

1. Reviews orders for appropriate dosing and adjusts doses if needed.
2. Commences an appropriate patient-specific Therapeutic Drug Monitoring Form (at UHNBC this can be done by either dispensary or clinical pharmacist).
3. Places in clinical binder at UHNBC or associated under patient's name on ScanRx in the 'monitored orders' section at end of each work for non-UHNBC sites day to assist with remote coverage.
 - a. Ensures hand writing is legible.
4. Orders serum drug levels as appropriate to the clinical situation.
5. Orders serum creatinine at least three times weekly for inpatients or two times weekly for outpatients.
 - a. May order more frequently if increased monitoring required (e.g., acute renal injury).

6. Monitors all serum drug levels, including those ordered by other practitioners and make adjustments to dosing as required.

7. Reviews and assesses results of all relevant lab work, including: cultures, serum levels, serum creatinine, C-reactive protein, white blood cells and relevant imaging (Magnetic Resonance Imaging, Computed Tomography, bone scan, WBC scan, etc.).

NOTE: If the original responsible pharmacist has to transfer monitoring of patient to another pharmacist (either on site or remote), the new responsible pharmacist follows the procedures outlined in this policy.

Weekdays:

- For non-UHNBC sites, the responsible pharmacist stores patient-specific monitoring forms in a monitoring binder and update daily during the week. Upload and associate form(s) in ScanRx in the 'monitored orders' section at the end of each work day. This may be delegated to a pharmacy technician at the pharmacist's discretion.
 - At UHNBC the patient-specific forms are kept in the general clinical binder located in the dispensary and if removed during a shift, be return at the end of work day. Ensure hand writing is legible.
- Responsible pharmacist follows up with serum drug levels **as soon as available**, ideally this is prior to the next dose being due, however this time frame differs due to differences in lab turn-around time for results.
- Responsible pharmacist uses best clinical judgement to minimize ordering of drug level(s) after hours or on weekends/stat holidays (when pharmacist and lab coverage is reduced).
- If the original responsible pharmacist has to transfer monitoring of patient to another pharmacist (either on site or remote), the new responsible pharmacist follows the above procedure.

After-hours/weekends/stat holidays (Non-UHNBC sites):

- To facilitate continuity of care, the responsible pharmacist arranges for management of levels and dosing locally when feasible.
- If local after-hours pharmacy support unavailable and serum drug levels are needed outside operating hours and require assessment prior to next business day, upload and associate the patient monitoring forms in ScanRx – monitored section. The responsible pharmacist contacts the UHNBC dispensary (250-565-2317) to arrange monitoring of this level by the weekend, evening or on-call pharmacist (fax patient monitoring form if require on-call pharmacist support). Ensure the monitoring form contains

clear and concise contact information for the relevant ward/nursing station. Ensure hand writing is legible.

- If site pharmacists are able to continue managing/dosing outside their work hours then they are required to update the patient monitoring form and clearly state this with their contact number. Add this updated form to the ScanRx dashboard in the 'monitored orders' section at end of work day or next work day if updated after hours.
- If the original responsible pharmacist has to transfer monitoring of patient to another pharmacist (either on site or remote), the new responsible pharmacist follows the procedure above.

After-hours/weekends/stat holidays (UHNBC):

- Follow same procedure as weekdays, if levels require handling by on-call pharmacist ensure that pharmacist is notified before end of their work day to ensure appropriate hand over of information.
- Weekend/Stat coverage or on-call pharmacists may be requested to follow up on off-site patient levels.

DOCUMENTATION

- **Responsible pharmacist:**
 - Writes orders in **physician order section** of patient chart to either continue same dose if no change needed or adjust dose and/or order new level collection time if a dose adjustment is required.
 - Write orders before the next dose is due.
 - When known, include the dosing times and stop dates in all orders.
- **Pharmacists:**
 - Document assessment of antibiotics, serum levels and any required dose adjustments using the [SOAP note format](#).
 - Place SOAP notes in the physician progress note section or if unavailable in the interdisciplinary note section of patient's chart whenever orders are written.
 - If orders are given while pharmacist is monitoring after hours, write a note as soon as pharmacist is on site or during their next working hours.
 - If located off site, fax a progress note to the ward for inclusion in the patient's chart.

REFERENCES

Cipolle, R., Strand, L. & Morley, P. (2012). *Pharmaceutical Care Practice: The Patient Centered Approach to Medication Management*, 3rd ed.

College of Pharmacists of BC. (2010, June). *Hospital Pharmacy Standards of Practice 5079 HPA Bylaws Hospital*. Retrieved December 18, 2015 from URL: http://library.bcpharmacists.org/6_Resources/6-1_Provincial_Legislation/5079-HPA_Bylaws_Hospital.pdf

National Association of Pharmacy Regulatory Authorities (NAPRA). (2009). *Model Standards of Practice for Canadian Pharmacists*. Retrieved December 7, 2015 from URL: http://napra.ca/sites/default/files/2017-09/Model_Standards_of_Prac_for_Cdn_Pharm_March09_layout2017_Final.pdf

KEYWORDS

vancomycin, aminoglycoside, pharmacokinetic monitoring, drug levels, serum levels, pharmacist, pharmacy, medication management, drug therapy problems, pharmaceutical care

EXAMPLE ANTIBIOTIC PROGRESS (SOAP) NOTES

Essential components of note:

Heading: Date, time, identification of pharmacy note, one phrase overview of reason for note

Subjective: Generally what the patient tells you

Objective: Include only information directly pertaining to assessment. For example, (in this order) pertinent:

- Vitals
- Physical exam
- Labs
- Micro
- Imaging/diagnostic tests
- Current drug therapy

Assessment: Clear identification of problem and reasonable goals of therapy

Plan: One recommendation clearly stated (drug, dose, route, frequency, duration)

Closing: Legible signature, degree, contact number

Gentamicin (example focusing on math)**[Date, Time] Clinical Pharmacist Note Re: Gentamicin**

Baby boy 2 days old, born at gestational age 36 weeks, birth weight 2.5kg, day 2 ampicillin 125 mg IV q8h & gentamicin 10 mg IV q24h for empiric treatment pneumonia, respiratory distress at birth.

S: Breathing improved (no nasal flaring, off oxygen), and 6 consistently wet diapers/24 hours via RN

O:

- Tmax 37, BP 70/50, HR 140, RR 30
- Gentamicin levels around 2nd dose: peak 9.8 mg/L, trough 2.3 mg/L
- Blood cultures pending

A: Calculated values based on lab draw times: Cmax: 10.11 (goal 6 to 12), Cmin: 2.23 (goal less than 1.5)

P:

- Will (depending on your practice this may say “suggest”) change gentamicin 11 mg IV q36h to achieve a predicted Cmax of 9.48 and Cmin 0.96
- Will (depending on your practice this may say “suggest”) order and follow up on more levels around 3rd dose (pre 30 min prior to infusion, post 30 min after the end of infusion) of new regimen. Will align with other blood work to prevent excess retrieval of blood from infant.

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Tobramycin (example focusing on appropriateness)**[Date, Time] Clinical Pharmacist Note Re: Antibiotics**

60 y old female admitted for sepsis unknown source

S: Patient reports ongoing cough with purulent sputum; less shortness of breath

O:

- Tmax 38, BP 140/89, HR 65, RR 20
- P/E: Chest sounds wet via RN
- Labs:
 - WBC = 12, Neut = 7.4, Scr = 66, eGFR = 95
 - Tobramycin level prior to 3rd dose 0.9 mg/L
- Micro: Sputum grew Strep pneumonia sensitive to penicillin, urine negative, Blood 2/2 negative
- Imaging: CXR consolidation left lower lobe
- Currently day 3 piperacillin/tazobactam 3.375 g IV q6h and tobramycin 340 mg IV q24h

A: As discussed with MD: Strep pneumonia CAP, target/narrow antibiotics.

P:

- discontinue pip/taz, discontinue tobra
- start Penicillin G 4 million units IV q4h x 7 days
- Will monitor for possible IV to PO conversion depending on clinical improvement.

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Vancomycin (example assessing appropriateness and adjusting dose based on level)**[Date, Time] Clinical Pharmacist Note Re: Vancomycin**

30 y male w Hx IVDU admitted for tricuspid valve endocarditis.

S: Patient reports ongoing malaise, and night sweats

O:

- Tmax 38.1, BP 130/80, HR 70, RR 16
- P/E: new murmur via MD, Janeway lesions, Osler's nodes
- WBC = 10, Neut = 7 , Scr = 60 , eGFR = 100
 - Vancomycin level prior to 3rd dose 12 mg/L
- Micro: Blood 2/2 grew MRSA, Urine negative
- Imaging: TTE tricuspid growth
- Currently receiving Vancomycin 1g IV q8h, day 2

A: Vancomycin efficacy goal trough greater than 15.

P:

- Will increase vancomycin to 1250 mg IV q8h x 42 days *[include stop date]*
- Will order and follow up on trough prior to 3rd dose of new regimen
- Will discuss w MRP possible PICC insertion

Legible signature, BScPharm, contact number