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ISMP Canada Safety Bulletin

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Gaps in Transition: Management of Intravenous Vancomycin Therapy in the Home and Community Settings

- *All patients needing continuation of parenteral medications (via infusion or injection) outside the hospital must have an assessment prior to discharge that includes the following elements:*
  - *reviewing the prescribed treatment to confirm that oral alternatives (or alternatives that do not require laboratory monitoring) are NOT available/appropriate*
  - *determining the feasibility/safety of carrying out the treatment and care plans*
  - *communicating the treatment and care plans to community providers and patients/caregivers*
  - *scheduling all necessary follow-up tests and appointments*
  - *educating the patients/caregivers on the signs, symptoms, and concerns to report and/or act on*
- *Together, hospitals and regional health authorities should create appropriate infrastructure to support safe medication management plans in the home and community settings.*

As a result of changes in healthcare delivery, patients are increasingly receiving medical treatment in the home and community setting, instead of as inpatients in a hospital. Patients receiving prolonged parenteral antibiotic therapy are among potential suitable candidates to continue treatment outside the hospital setting. However, outpatient management of these individuals, particularly those receiving antibiotics that require therapeutic drug and adverse effect monitoring (e.g., aminoglycosides, vancomycin) can pose serious safety concerns. As part of an ongoing collaboration with a provincial death investigation service, ISMP Canada received a report of the death of an individual who was being treated at home with parenteral vancomycin. This safety bulletin focuses on the potential for serious harm to patients, as well as the challenges faced by practitioners, when antimicrobial therapy requiring therapeutic drug monitoring (TDM) is delivered in the community at home.

Medication Incident

An adult with type 2 diabetes mellitus was admitted to hospital for treatment of a persistent diabetic foot infection. Treatment was initiated with intravenous (IV) vancomycin, oral ciprofloxacin, and metronidazole. The patient remained in hospital for more than 1 week, during which time his serum creatinine was stable and serum trough levels of vancomycin were monitored to achieve a target level

of 15–20 mg/L. Upon discharge, the patient's serum creatinine was within the normal range, and the serum trough level of vancomycin was 20 mg/L. Medications to be continued at home included ramipril and hydrochlorothiazide. Weekly monitoring of serum vancomycin was ordered, beginning 3 days after discharge. However, no blood samples for vancomycin monitoring were drawn after he returned home, mainly because of an incomplete laboratory requisition.

By the fourth day after discharge, the patient noticed a rash on his body, which prompted him to go to the emergency department. Laboratory testing showed significantly increased serum creatinine, thrombocytopenia, and random (not trough) vancomycin level almost 4 times the level at discharge. It is unknown when the most recent vancomycin dose had been administered. The vancomycin was held, as were ramipril and hydrochlorothiazide. The patient was admitted and was given IV fluids and platelet transfusions, but there was no improvement in serum creatinine or platelet count. Two days after the readmission, the patient became hypertensive, and an episode of epistaxis occurred, along with mental status changes that progressed to obtundation. Urgent computed tomography of the brain revealed acute intracerebral hemorrhage, and the patient was transferred to intensive care. In light of his condition and prognosis, care was withdrawn, and the patient died.

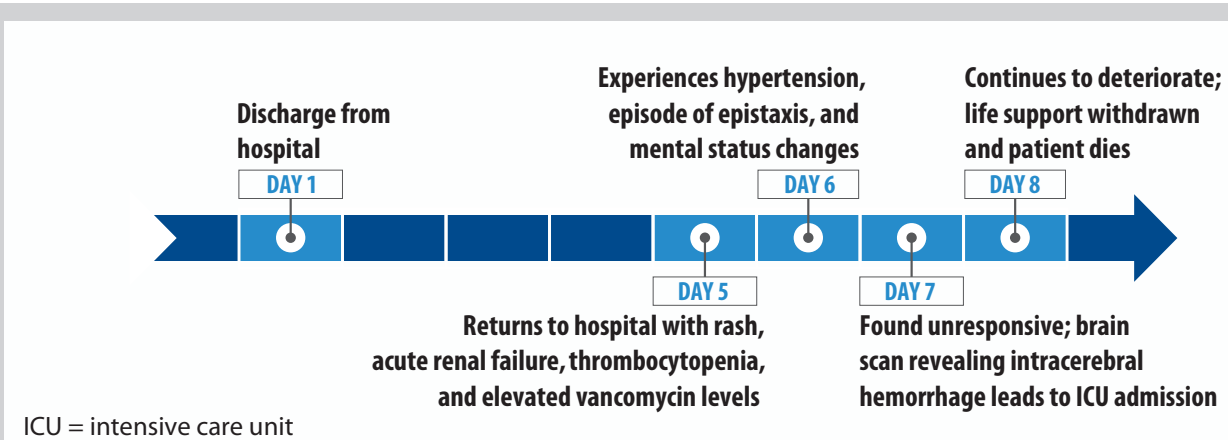
Background

Diabetic foot infections represent a common clinical problem that ranges in severity from mild infection of the skin and subcutaneous tissue, through more serious infection of deeper structures causing osteomyelitis, to severe infection leading to sepsis.[1] Antibiotics are invariably part of the treatment regimen for these infections, and long-term therapy may require administration of these drugs outside the acute care setting.[1,2]

Vancomycin is one of many parenteral antibiotics prescribed in the home and community settings to manage diabetic foot infections. For complicated infections, high serum trough levels of vancomycin (i.e., 15–20 mg/L) are recommended to improve penetration into the infected tissues and to achieve optimal concentrations and clinical outcomes.[3,4] However, higher daily doses and elevated target trough levels increase the risk of vancomycin-induced kidney injury, especially if concomitant nephrotoxins (such as aminoglycosides) are being administered.[5,6] As a result, timely TDM is important, both to ensure adequate concentrations for therapeutic intent and to prevent adverse drug events such as nephrotoxicity.

Perhaps less well appreciated is that vancomycin may cause substantial thrombocytopenia via vancomycin-dependent platelet-reactive antibodies.[7] This adverse

Figure 1. Timeline of events from the patient's initial hospital discharge to his death



ICU = intensive care unit

effect, which can be severe and refractory to platelet transfusion, often resolves after drug cessation, although recovery can take longer for patients with renal failure.[7]

Discussion

This case highlights the potential for harm associated with delivery of IV antimicrobial therapy in the home and community settings to patients who require TDM. Safe administration of IV vancomycin outside the hospital can be complicated. The timing of drawing blood samples is critical. Accurate interpretation of trough levels may necessitate additional bloodwork (e.g., potassium and creatinine levels), and urgent admission to acute care may be required. Planning for outpatient testing of serum vancomycin levels alone is insufficient. Follow-up must be assigned to monitor test results and to develop an appropriate action plan based the findings. In the case described here, the patient experienced acute kidney injury within a few days of discharge, despite stable creatinine levels during the initial hospital stay. Monitoring of vancomycin levels might not have prevented this injury; however, earlier detection of elevated levels might have mitigated the harm. Whether earlier detection would have prevented the severe thrombocytopenia that led to fatal intracranial bleeding is unknown. ISMP Canada has received reports of other incidents in which poor infrastructure for outpatient monitoring of drug levels and subsequent management of test results have placed patients at risk.

Recommendations

The following recommendations are offered for the safe administration of IV vancomycin in the home and community settings; these recommendations are generally applicable for other parenteral medications requiring TDM.

Regional Health Authorities and Home and Community Organizations

- Review existing systems for management of IV medications in the home and community settings.
- For patients discharged on home infusion therapy, provide a nursing assessment within 24 hours after discharge from hospital, including a review of all discharge orders (e.g., medications and any required monitoring).
- Provide appropriate supports and processes (agreed upon by all care providers) to ensure:
  - blood samples will be drawn at appropriate times/frequency following discharge and drug levels will be reported to, interpreted by, and acted upon (in a timely fashion) by individuals on the healthcare team with clearly assigned responsibilities for follow-up; and
  - medication administration schedules can be altered appropriately, according to clinical and/or laboratory evidence.

Hospitals and Discharge Planners

- Ensure that, *before leaving the hospital*, every patient who is to be cared for in the home and community settings has bloodwork scheduled, understands the importance of this bloodwork, and is able to have it done. The Hospital to Home: Facilitating Medication Safety at Transitions Toolkit and Checklist identifies this requirement and can be used to support the transition process.
- Enlist hospital pharmacists, particularly those involved in TDM, to support the transition and to relay information to the next care provider (e.g., infusion pharmacy provider, family physician). The hospital pharmacist should link the infusion pharmacy provider and the patient's community pharmacist to strengthen the communication between these partners.
- Educate and inform patients about situations that require prompt medical attention, such as infusion reactions and adverse effects.

Prescribers

- Review the discharge treatment plan to determine whether oral alternatives (or IV alternatives that do not require TDM) can be prescribed.
- Determine that outpatient therapy is safe and feasible for both the patient and the care team. For patients residing in areas with limited services, the prescriber should confirm that the community and home sector is able to support TDM. This includes addressing scenarios that will require prompt action, such as abnormal serum levels and severe

adverse reactions. IV administration of vancomycin carries unique risks, such as infusion intolerance (e.g., "red man" syndrome), acute kidney injury (particularly with higher doses and prolonged therapy), and thrombocytopenia.
- Liaise with the most responsible health care provider who will be responsible for ongoing monitoring and assessment of the patient in the community prior to the patient's discharge, and provide copies of any laboratory requisitions and special instructions. If a care plan cannot be implemented right away (e.g., due to timing on the weekend or lack of a primary care provider), consider referring to an outpatient clinic for follow-up, scheduling bloodwork in the hospital, or admitting/keeping the patient.
- Include most recent laboratory results and scheduled bloodwork in prescriptions written for IV medications that require TDM. Ensure lab requisitions are completed and sent to the most appropriate care provider. If possible, avoid scheduling bloodwork on Fridays, because weekends or holidays may delay the interpretation of test results.
- Review the patient's concomitant medications to identify those with nephrotoxic potential (e.g., diuretics, nonsteroidal anti-inflammatory agents, angiotensin-converting enzyme inhibitors) and to evaluate whether any of these medications should be held for the duration of antimicrobial treatment.

Home and Community Care Nurses

- Review the treatment plan and TDM requirements with the patient/caregivers.
- Reinforce and educate and inform patients about situations that require prompt medical attention, such as infusion reactions and adverse effects.
- Monitor and report any signs or symptoms of adverse effects or other concerns to the prescriber or practitioner assigned for follow-up. Drug- specific monitoring parameters can be found in monographs (available at www.ismp-canada.org/SafeHomeInfusion/) developed for the most commonly administered IV medications in this setting.
- Review that blood work is ordered with the patient/substitute decision maker, and scheduled appropriately. Review the importance of the laboratory testing as required.
- Before administering each dose, review the latest bloodwork.
- Educate patients about what symptoms and concerns they should report and how to contact their healthcare team.

Infusion Pharmacy Providers

- Drug information support should be available to help identify the need for bloodwork and monitoring of adverse effects. The infusion pharmacy provider is a resource for home and community care nurses. Pharmacists and nurses can also consult a drug information centre or access monographs (including one for vancomycin) for the most commonly administered IV medications in the home and the community settings found on the ISMP Canada website at: www.ismp-canada.org/SafeHomeInfusion/. This information is intended for front-line care providers to ensure appropriate ordering, administration, and monitoring of these medications in the home environment.
- Liaise with the patient's community pharmacist to identify potential drug interactions between IV medications and oral home medications.
- If practical, dispense only enough medication to last the patient until TDM results are available. Ideally, release of the next set of doses should be contingent on the TDM results, in case dose adjustment or reassessment is required.

Conclusion

Complicated treatment plans to be carried out by home and community care services, such as those for IV antibiotics requiring TDM, require standardized processes in which patients, caregivers, and the healthcare team understand their respective roles. In addition, these stakeholders must recognize the protocols, systems and partners that exist to support them. ISMP Canada has received reports of incidents showing evidence of a complex, non-integrated system which was developed without a clear strategy to evaluate the potential for errors, and which resulted in patient harm. Without concrete changes to the current approach, situations like the one described in this bulletin will continue to recur, leading to patient harm or death.

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References

1. Lipsky BA, Berendt AR, Cornia PB, Pile JC, Peters EJ, Armstrong DG, et al.; Infectious Diseases Society of America. 2012 Infectious Diseases Society of America clinical practice guideline for the diagnosis and treatment of diabetic foot infections. Clin Infect Dis. 2012;54(12):e132-e173.
2. Gemechu FW, Seemant F, Curley CA. Diabetic foot infections. Am Fam Physician. 2013;88(3):177-184.
3. Rybak MJ, Lomaestro BM, Rotschafer JC, Moellering RC, Craig WA, Billeter M, et al. Vancomycin therapeutic guidelines: a summary of consensus recommendation from the Infectious Diseases Society of America, the American Society of Health-System Pharmacists, and the Society of Infectious Diseases Pharmacists. Clin Infect Dis. 2009;49(3):325-327.
4. Rybak M, Lomaestro B, Rotschafer JC, Moellering R Jr, Craig W, Billeter M, et al. Therapeutic monitoring of vancomycin in adult patients: a consensus review of the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, and the Society of Infectious Diseases Pharmacists. Am J Health Syst Pharm. 2009;66:82-98. Erratum in: Am J Health Syst Pharm. 2009;66(10):887.
5. van Hal SJ, Paterson DL, Lodise TP. Systematic review and meta-analysis of vancomycin-induced nephrotoxicity associated with dosing schedules that maintain troughs between 15 and 20 milligrams per liter. Antimicrob Agents Chemother. 2013;57(2):734-744.
6. Hermsen ED, Hanson M, Sankaranarayanan J, Stoner JA, Florescu MC, Rupp ME. Clinical outcomes and nephrotoxicity associated with vancomycin trough concentrations during treatment of deep-seated infections. Expert Opin Drug Saf. 2010;(1):9-14.
7. Von Drygalski A, Curtis BR, Bougie DW, McFarland JG, Ahl S, Limbu I, et al. Vancomycin-induced immune thrombocytopenia. N Engl J Med. 2007;356(9):904-910.

This segment of the bulletin describes a recent SafeMedicationUse.ca publication from ISMP Canada's Consumer Program.

April 2016 - Newsletter:

Reminder: Contact Lens Cleaning Solutions with Hydrogen Peroxide May Cause Eye Injury

In the past, SafeMedicationUse.ca and Health Canada have warned consumers that incorrect use of products containing hydrogen peroxide can cause painful eye injuries.

Our previous alerts described incidents with the product Clear Care, which contains 3% hydrogen peroxide. Recently, we received a report from a consumer who had soaked his lenses in a store-brand contact lens cleaning solution that contained hydrogen peroxide.

The product was Life Brand Lens Care System, which contains 3.3% hydrogen peroxide. To safely use this product, the contact lenses must be placed in a special case containing a disk that neutralizes the hydrogen peroxide. However, the consumer who reported the incident did not follow this procedure. As a result, he experienced painful burning and watering of the eyes after inserting his contact lenses. The consumer knew he was not using the product as directed, but felt that the warnings printed on the package were inadequate. Fortunately, he did not experience any lasting harm to his eyes.

Tips for Practitioners:

- Before selling or recommending a hydrogen peroxide–based contact lens cleaning solution, confirm the intended use of the product and educate consumers about proper use.
- Do not display hydrogen peroxide–based contact lens cleaning solutions beside multipurpose solutions.
- In community pharmacies, consider storing hydrogen peroxide–based solutions behind the counter.
- Share this SafeMedicationUse.ca alert with consumers and patients. Consider posting a copy of the alert near displays of hydrogen peroxide–based lens cleaning solutions.

Tips to Share with Consumers

- Don't assume that all contact lens cleaning solutions are the same. Several products containing hydrogen peroxide are now available in Canada. These products can look a lot like multipurpose contact lens solutions.
- Before purchasing or using any product for your contact lenses or your eyes, read the package labels and inserts carefully and follow the directions. Even products that are available without a prescription can cause serious harm if not used as directed.
- To avoid mix-ups at home, keep lens-cleaning solutions containing hydrogen peroxide in a location separate from where you keep solutions for rinsing or moisturizing your lenses.

To find out more, read the full newsletter.
http://safemedicationuse.ca/newsletter/newsletter_ContactLensEyeInjury.html

Consumers Can Help Prevent Harmful Medication Incidents **SafeMedicationUse.ca**

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The Canadian Medication Incident Reporting and Prevention System (CMIRPS) is a collaborative pan-Canadian program of Health Canada, the Canadian Institute for Health Information (CIHI), the Institute for Safe Medication Practices Canada (ISMP Canada) and the Canadian Patient Safety Institute (CPSI). The goal of CMIRPS is to reduce and prevent harmful medication incidents in Canada.

HIROC

The Healthcare Insurance Reciprocal of Canada (HIROC) provides support for the bulletin and is a member owned expert provider of professional and general liability coverage and risk management support.

ISMP CANADA

The Institute for Safe Medication Practices Canada (ISMP Canada) is an independent national not-for-profit organization committed to the advancement of medication safety in all healthcare settings. ISMP Canada's mandate includes analyzing medication incidents, making recommendations for the prevention of harmful medication incidents, and facilitating quality improvement initiatives.

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