

BC Provincial Renal Agency – Approach to Managing Antibiotic Resistant Organisms (AROs) in British Columbia Hemodialysis Units

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Introduction

In Canada, antibiotic resistant organisms (AROs) are becoming more common — and more virulent. The most commonly identified antimicrobial-resistant pathogen, Methicillin-resistant *Staphylococcus aureus* (MRSA), now makes up 5-10% of all *Staphylococcus aureus* isolates in Canada and 25-50% of all isolates in the United States.¹ Community-acquired MRSA has also emerged as an important pathogen, dispelling the initial belief that MRSA was only a nosocomially-transmitted infection. Although Vancomycin resistant *enterococcus* (VRE) is less prevalent, rates are also on the rise.

It is well known that patients who are infected or colonized with AROs can transmit the organism to others, especially when sharing close quarters such as inpatient hospital rooms. In addition, the rooms, equipment, and hands and protective equipment of the health care workers that care for patients harboring these organisms are often contaminated with the AROs^{2,3}

Infections are the second leading cause of death among hemodialysis (HD) patients. Many of these infections are gram-positive cocci due to hemodialysis catheter infections. There is an increasing incidence of bacteremia due to MRSA and VRE. Thus, in addition to the infection control strategies that will be outlined in this document, efforts must also continue to be directed towards avoiding the use of HD catheters for long-term vascular access as this will also improve patient outcomes and potentially reduce the incidence of ARO infections in hemodialysis patients.

Objectives

The ultimate goal of ARO¹ screening and interventions is to eliminate the transmission of AROs in health care settings including within and between hemodialysis (HD) units. However, there is substantial variation in British Columbia with respect to how hemodialysis (HD) patients with AROs are managed. As a result, patients may be initially denied access to the HD unit most convenient for them based on ARO status. This often results in patients spending more time in an in-centre unit and less time in a community unit, leading to inconvenience for patients and their families, and increased cost to the health care system.

* In this document, ARO refers to Methicillin Resistant *Staphylococcus aureus* (MRSA) and Vancomycin Resistant *Enterococcus* (VRE) as they are currently the most important AROs.

The following document attempts to provide a set of recommendations and guidelines to support evidence-based, effective and efficient management of all patients in HD units in BC with respect to ARO prevention and management.

This document will:

- (1) Provide a brief review of the danger of AROs and the risk of transmission in the HD setting
- (2) Review the current recommendations and guidelines for hemodialysis patients with AROs
- (3) Suggest a framework for provincial tracking of
 - a. ARO status and transmission
 - b. Adherence to guidelines (and need for deviation, if appropriate)
 - c. Other opportunities for research.

Although it is important that the renal community is vigilant in preventing ARO transmission, the BC Renal Agency also recognizes the burden that this may place on all of our patients. The position of the BC Renal Agency, as outlined by the provincial infection control network (PICNet) ⁴ is that:

Admission to ANY hemodialysis unit should not be denied to any BC resident on the basis of ARO status.

Background

Methicillin-resistant *Staphylococcus aureus* (MRSA)

MRSA can be acquired in the hospital (HA-MRSA) or in the community (CA-MRSA). The strains of MRSA found in patients who are infected in the community are usually genetically distinct from those acquired in the hospital. However, it is now recognized that community-type MRSA strains can be transmitted in hospitals and hospital-type MRSA strains can be transmitted in the community. ^{5,6}

Both CA-MRSA and HA-MRSA can result in serious infection in patients with chronic kidney disease. In fact, CA-MRSA is now the leading cause of skin and soft-tissue infections seen in emergency rooms in the United States.⁷ Specific “high” risk factors that may often apply to dialysis patients include:

- Increased age
- Extended stay in acute care facility
- Previous or recurrent hospitalizations
- Presence of central lines
- Recurrent antibiotic use
- Presence of chronic ulcers or wounds
- Immunosuppression

Colonization with MRSA in HD patients has been shown to be related to demographic (age, gender, duration on HD), comorbidity (diabetes, malignancy) and exposure to health care (dialysis staff, hospitalization).⁸

The primary mode of transmission of MRSA from one patient to another is **through the contaminated hands of a health care worker.**

MRSA in hemodialysis patients

There is a high rate of colonization with MRSA among HD patients. In 2005, the incidence of invasive MRSA infection among dialysis patients in the United States was 45.2 cases per 1,000 population, compared with the general population, in which rates of invasive MRSA have ranged from 0.2 to 0.4 infections per 1,000 population.⁹ The increased rate of invasive MRSA in dialysis patients underscores the need for vigilance in this population.

In one study, MRSA colonization was present in 5.6% and VRE colonization in 3.14%. Univariate analyses revealed that prior exposure (defined as infection/colonization) with MRSA, hospitalization, and low serum albumin was associated with MRSA colonization. VRE colonization was associated with hospitalization, prior VRE or MRSA exposure, low serum albumin, and low ferritin.⁸

Several studies have shown that HD patients are being colonized with both CA-MRSA strains and HA-MRSA strains.¹⁰ Hemodialysis (HD) patients with either CA-MRSA or HA-MRSA infections face high morbidity and mortality.¹¹⁻¹⁵ Infections due to MRSA also cost twice as much to treat than those due to methicillin-susceptible strains¹⁶

Vancomycin-Resistant Enterococci (VRE)

Vancomycin-resistant enterococci (VRE) are increasing in prevalence at many institutions, and are often reported in dialysis patients. One study in Iran found that 6.2% of dialysis patients were positive for VRE.¹⁷ The most important risk factors for a VRE-positive culture were "antimicrobial receipt within 2 months before culture" and "hospitalization during previous year."

Although VRE colonization results in an invasive infection requiring treatment less frequently, as illustrated by Humphreys et al.,¹⁸ mortality and inpatient stay was greater in VRE-positive compared with VRE-negative hemodialysis patients (50% versus 10%),

Recommendations

The BC Renal Agency supports the recently released Provincial Infection Control Network (PICNet) Infection Control Guidelines for Hemodialysis Patients with AROs (November 2008).⁴ PICNet is a provincial organization whose mandate is to maximize coordination and integration of activities related to health care associated infection, prevention, surveillance and control for BC. The HD guidelines were based on work done by the Vancouver Coastal Health Renal program, which has adopted virtually similar guidelines.¹⁹

The PICNet guideline can be found online at:
<http://picnetbc2.xplorex.com/guidelines.htm> (Refer to section 6.15-6.23, pages 44-49.)

It is suggested that:

- Each health care region develops ARO infection control policies and procedures based on these guidelines, ensuring a consistent approach within a provincial framework that supports best practices in infection control and surveillance, while also supporting equitable patient access to care. Ongoing tracking and review of practices and infection rates will be an important component of quality, patient safety and research initiatives across programs.
- Modifications may be needed to accommodate the specific circumstances of the region,

But

- Major deviations should be discussed through the established provincial mechanisms.

The PICNet guideline reinforces that:

Admission to any hemodialysis unit should not be denied to any BC resident on the basis of ARO status.

The document covers the following:

- ARO screening culture sites for hemodialysis patients
- Screening indications for:
 - Patients not known to be ARO positive
 - Long-term care patients receiving hemodialysis
 - Incoming visiting patients
 - Outgoing traveling patients
- Prevalence screening recommendations
- Appropriate signage recommendations
- Isolation requirements*
- Recommendations for visitors to a hemodialysis unit
- Off-unit diagnostic tests or procedures

- Education of staff, patients, family and visitors
- Care of patient care equipment and hemodialysis machines

*With respect to isolation requirements, the following points deserve mention:

- A private or cohort room is **preferred** for dialysis of ARO positive patients.
- If these rooms are not available, patients with AROs may be placed on **contact precautions** in their dialysis station.
- Detailed criteria for a “cohort area” are provided in the PICNet document.

Evidence for the Recommendations

There are a number of studies that verify the benefit of hand hygiene, environmental cleaning, barrier precautions and screening in reducing the prevalence of MRSA and VRE.²⁰ However, these interventions are often used together, so the individual value of each of the interventions is hard to quantify.

The most controversial recommendation is that of barrier precautions, or “contact precautions,” which includes the use of gowns, gloves and masks as well as grouping patients with like bacteria together. Obviously, this recommendation has a large effect on the operations of a HD unit. The Public Health Agency of Canada notes that the evidence to support the use of contact precautions to prevent ARO cross-transmission is not strong.²¹ However, countries such as the Netherlands and Australia who have used these techniques quite rigorously have achieved rates of MRSA of <1%.²⁰

Although the approach that maximizes effectiveness and efficiency in each setting has not yet been worked out, most acute care centers in Canada have taken quite an aggressive approach. Given the multiple risk factors that render the HD population vulnerable to these infections, and the emergence of CA-MRSA as an important pathogen, the approach in HD units should also be rigorous. Through tracking of interventions and outcomes in our population, more refined, evidence-based approaches to these interventions can be developed over time.

Quality Improvement Initiatives and Research Opportunities

Although all hemodialysis units participate in some surveillance for MRSA and VRE, surveillance methodologies are often inconsistent. In addition, significant variation in data collection and reporting often exists.

The BC Renal Agency is committed to patient safety and quality improvement initiatives. Though provincial tracking of ARO data, the renal community will be able to set appropriate benchmarks to help apply a prioritized set of infection

control interventions. The resources required to implement these interventions can also be estimated.

Suggested data that may be tracked includes:

- The prevalence of MRSA and VRE in hemodialysis patients
- The number of dialysis patients who convert to MRSA or VRE positive status and risk factors for conversion
- Surveillance for infections due to MRSA, VRE and their associated effect on patient morbidity and mortality
- Infection control practices in each dialysis unit, adherence to guidelines and need for deviation
- Barriers to implementation of infection control strategies.

This data, complemented by information in the PROMIS database, will be available for quality improvement initiatives to help maximize patient safety, minimize costs, and ultimately provide information that will help inform policy in the area of AROs in dialysis patients in Canada and worldwide.

Conclusion

Hemodialysis patients are at increased risk of both colonization and infection with AROs compared to the general population. However, infection control practices should not restrict a patient from dialyzing in the HD centre most appropriate for them. Current practice patterns in British Columbia hemodialysis units do not provide a consistent approach to preventing and managing these organisms.

All health authorities should develop their own ARO strategy, modeled after the PICNet recommendations for ARO prevention and control in hemodialysis units. This will ensure a consistent approach within a provincial framework that will both support best practices in infection control and surveillance, while also supporting equitable access to care.

Provincial collaboration is required to develop a research framework to ensure appropriate tracking of ARO prevalence and adherence to guidelines. In addition, it is critical to determine the precautions and screening practices that offer the greatest benefit for the least risk to patients and that are the most cost effective for the health care system.

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