NEPHROLOGY

Nephrology **24** (2019) 951–957

Original Article

Kidney Health Australia - Caring for Australasians with Renal Impairment guideline recommendations for infection control for haemodialysis units

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KEY WORDS:
infectious disease, haemodialysis, practice guideline, blood borne virus, multidrug resistant organism.

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Accepted for publication 4 October 2018.
Accepted manuscript online 17 October 2018.

doi: 10.1111/nep.13511

SUMMARY AT A GLANCE

This report provides the KHA-CARI guideline recommendations for infection control for hemodialysis units in Australia and New Zealand, addressing issues relevant to the screening of infectious disease and the use of personal protective equipment and environmental controls, and focusing especially on blood-borne viruses and multiresistant organism.

ABSTRACT:

Aim: **There is no national consensus on infection control in haemodialysis units in Australia and New Zealand. The primary aim of this guideline was to provide recommendations on screening for blood-borne viruses and multi-resistant organisms for dialysis units based on the available evidence.**

Methods: **The Kidney Health Australia Caring for Australasians with Renal Impairment guidelines, overall approach to guideline development follows the GRADE framework. A facilitated workshop was conducted to ensure that patient and caregiver concerns were considered. The evidence from relevant medical databases on the impact of screening on detection and transmission rates, hospitalization, mortality and psychosocial care, was reviewed and critically appraised. The guideline group made recommendations from the evidence available.**

Results: **The main guideline recommendations are:**

- **Dialysis units adopt a comprehensive approach that encompasses standard infection control precautions.**
- **Conduct routine surveillance for key blood-borne viruses and methicillin-resistant *Staphylococcus aureus*.**
- **Conduct routine surveillance of individual levels of protection against hepatitis B for patients on haemodialysis. Use dedicated dialysis machines for HBV-infected patients.**

The evidence in totality was not found to support routine surveillance of vancomycin-resistant *Enterococci* . Enhanced surveillance in light of the local risk of transmittable infectious agents should be considered by dialysis units. Very few studies have reported on the potential adverse effects of screening and associated practices.

Conclusions: **Future research should focus on the potential benefits and adverse effects of screening and associated practices on clinical outcomes including infections prevented and health service delivery, and psychosocial domains for patients. Given the results of trials in the critical setting, the effectiveness of methicillin-resistant *Staphylococcus aureus* decolonization in people receiving dialysis therapy warrants further research.**

For a full text version of the guideline, readers need to go to the KHA-CARI website (go to the Guidelines section (www.cari.org.au)).

BACKGROUND

The introduction of penicillin for the treatment of *Staphylococcus aureus* in the 1940s is widely recognized as one of the greatest medical achievements of the 20th century. Within a few short years, penicillin-resistant *S. aureus* had appeared and, although not recognized at the time, so also had methicillin-resistant *S. aureus* (MRSA),[1] ready to rapidly propagate once the use of methicillin became widespread nearly two decades later. MRSA outbreaks were treated with multi-pronged interventions with common themes including the screening and subsequent isolation of asymptomatic patients, and the use of contact precautions. The observational reports of management of these acute outbreaks, informed the development of guidelines.

The next substantive development in efforts to prevent the transmission of infectious agents came in the wake of the AIDS epidemic. Concern about the reliability and timeliness of diagnosing blood-borne viruses (BBV) led to the development of the practice of 'universal precautions'.

In the current era, the utility of screening and screening-dependent health interventions is again being scrutinized, driven by unexpected results from recent large randomized studies conducted in critical care settings. A series of well-conducted, large cluster randomized trials suggest screening may not be effective in improving clinical outcomes, have raised the possibility that contact precautions have little or no benefit, but have found that decolonization procedures reduce blood-stream infections. In details, these individual trials found that: (i) the role of screening and subsequent barrier nursing to reduce MRSA and vancomycin-resistant *Enterococci* (VRE) colonization or infections is unclear[2,3]; (ii) universal decolonization is more effective at reducing MRSA colonization and any subsequent blood-stream infection[4] than either screening alone or screening-directed decolonization; (iii) universal contact precautions do not reduce the combination of MRSA and VRE acquisition in ICUs (although separately reduce 3 MRSA acquisitions/1000 patient days, at the cost of one less healthcare worker room-entry/h)[5]; and (iv) routine decolonization reduces multi-resistant organism (MRO) colonization and any blood-stream infection even in the presence of routine screening and contact precautions.[6]

Patients requiring haemodialysis are at an increased risk of invasive infections due to the immune-compromised state associated with end-stage kidney disease, proximity with other patients, prolonged contact with healthcare services and the need for ongoing vascular access. Efforts to stem the healthcare-associated transmission of BBV infections and colonization with MRO in haemodialysis patients in Australia have arisen from a desire to prevent the associated poor clinical outcomes[7] and increased healthcare costs.[8]

Currently, there is no national consensus on the prevention of infectious diseases in haemodialysis units. As a result, there is variation in the screening of infectious diseases, as well as the isolation and cohorting practices of haemodialysis units in Australia. The primary aim of this guideline was to provide recommendations on screening for BBV and MRO for dialysis units in Australia and New Zealand based on the available evidence on the potential benefits and harms of screening.

Future directions

The critical care randomized trials on methods to prevent healthcare-associated disease transmission have implications for other health-care settings as they provide high quality evidence in an area where such evidence has been lacking. Hopefully, these completed trials will inform the development of randomized trials in the haemodialysis setting, particularly trials testing decolonization measures, which were efficacious in the critical care setting. The guideline group noted that even observational evidence on the effect of screening outside the outbreak setting in haemodialysis settings was scarce, particularly screening for more than one organism. The guideline group also noted that despite active seeking, little evidence was identified on the impact on clinical care delivery for people screening positive in the haemodialysis setting[7] and the psychosocial impacts of a positive diagnosis. The guideline group felt strongly that evidence on both potential benefits and harms is needed for infection control measures in the non-epidemic setting as these are the settings in which these guidelines would be most often applied.

Scope of the guideline

This guideline addresses issues relevant to the screening of infectious disease and the use of personal protective equipment and environmental controls in the haemodialysis unit.

METHODS

Informative literature on the epidemiology of BBV and MRO in haemodialysis populations in Australia and New Zealand with evidence on both the benefits and harms of screening for BBV and MRO was actively sought. Evidence was specifically sought on the impact of screening on detection and transmission rates, impact on hospitalization frequency and duration and mortality, as well as psychosocial impacts including the experience of stigma and social isolation, impact on quality of life and the impact on clinical contact, decision making and delivered services.

The guideline group has made recommendations on the basis of the evidence available. Like other dialysis infection control guidelines around the world, the current recommendations are based on evidence drawn largely from

Table 1 Final grade for overall quality of evidence, and nomenclature and description for grading recommendations

Overall evidence Grade	Description
A	High quality of evidence. We are confident that the true effect lies close to that of the estimate of the effect.
B	Moderate quality of evidence. The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
C	Low quality of evidence. The true effect may be substantially different from the estimate of the effect.
D	Very low quality of evidence. The estimate of effect is very uncertain, and often will be far from the truth.

Nomenclature and description for grading recommendations

Grade	Implications		
	Patients	Clinicians	Policy
Level 1 'we recommend'	Most people in your situation would want the recommended course of action and only a small proportion would not	Most patients should receive the recommended course of action	The recommendation can be adopted as a policy in most situations
Level 2 'we suggest'	The majority of people in your situation would want the recommended course of action, but many would not	Different choices will be appropriate for different patients. Each patient needs help to arrive at a management decision consistent with her or his values and preferences	The recommendation is likely to require debate and involvement of stakeholders before policy can be determined

The evidence and recommendations in this KHA-CARI guideline have been evaluated and graded following the approach detailed by the GRADE working group (www.gradeworkinggroup.org). A description of the grades and levels assigned to recommendations is provided in Table 1.

observational reports of the management of acute outbreaks of single agents.

Guideline development process

The overall approach to guideline development followed by KHA-CARI follows the GRADE framework as detailed in the KHA-CARI Development Manual (www.cari.org.au). In brief guideline, development follows a five-stage process.

Stage 1: Scoping and identification of sub-topics.

Stage 2: Systematic literature review, evidence summaries and writing of draft guideline.

- A full reference list has been made available in the Appendix S1, Supporting Information and is discussed at length in the full guideline available at www.cari.org.au.

Stage 3: External peer review, consumer review and nephrology community comment.

Stage 4: KHA-CARI Steering Committee review and approval.

Stage 5: Publication of summary guideline in a peer reviewed journal and posting of complete guideline on the KHA-CARI guidelines website.

The nomenclature and meaning of the grade of evidence quality and the strength of a recommendation is detailed in Table 1.

Patient and caregiver involvement in guideline development

Integrating patient and caregiver input into guideline development is widely advocated to ensure that clinical practice guidelines address the expectations, priorities and needs of patients and caregivers.[9] A facilitated workshop with 11 participants (patients (n = 8), caregivers (n = 3)) was conducted to identify and discuss potential topics for inclusion in the guidelines. The full methodology and results of patient involvement in the development of this guideline have been published separately.[10]

RECOMMENDATIONS

1. Infection control standard precautions

a. We recommend that dialysis staff receive education in the implementation of standard precautions, in particular hand hygiene and aseptic technique and that adherence be routinely audited in centres undertaking haemodialysis (1C).
b. We recommend that dialysis units adopt a comprehensive approach that addresses the promotion of hand hygiene, environmental hygiene, staff access to personal protection equipment, reduction of opportunities for cross-contamination through modification of the environment and care practices, reduction of burden of disease in the patient population and reduction of susceptibility of patients to become colonized or infected if exposed to the infectious agent (1D).

2. Routine surveillance screening

a. We recommend that all patients be screened for hepatitis B virus and hepatitis C virus prior to commencement of dialysis or when transferring from another dialysis facility. The serological screening panel should include

serology for hepatitis B (HBsAg, anti-HBc, anti-HBs), and hepatitis C (anti-HCV) together with baseline liver function tests (1B).

b. We recommend that patients to be screened for human immunodeficiency virus (HIV) if they are identified as having risk factors for HIV acquisition or have serological evidence of either hepatitis B or hepatitis C infection (1B).
c. We recommend that patients who are hepatitis B-vaccinated with anti-HBs ≥10 mIU/mL have anti-HBs titres rechecked annually (1C).
d. We recommend patients with anti-HBs titres <10 mIU/mL have HBsAg checked every 6 months (1C).
e. We suggest more frequent (every 3 months) HBsAg testing of non-immune patients in dialysis settings with a high hepatitis B prevalence (2C).
f. We recommend patients who are seronegative for hepatitis C have anti-HCV rechecked every 6 months. (1C).
g. We suggest screening for MRSA in inpatient haemodialysis patients (2D) and subsequent infection control interventions including transmission based precautions in centres with infections related to MRSA or more than a very low MRSA colonization rate.
h. We suggest screening for MRSA in outpatient haemodialysis patients (2D) and subsequent infection control interventions including transmission based precautions in centres with infections related to MRSA or more than a very low MRSA colonization rate.
i. When the historical risk of infection is low, screening for VRE in inpatient haemodialysis patients (2C) and subsequent infection control interventions are not suggested.
j. When the historical risk of infection is low, screening for VRE in outpatient haemodialysis patients (2C) or subsequent infection control interventions including transmission based precautions are not suggested.
k. We do not suggest routine screening in inpatient haemodialysis patients for multidrug resistant Gram-negative organisms (MDRGN) other than carbapenem-producing *Enterobacteriaceae* (CPE) (2D) or subsequent infection control interventions including transmission based precautions unless the unit has had infections related to MDRGN.
l. We do not suggest routine screening in outpatient haemodialysis patients for MDRGN other than CPE (2D) nor subsequent infection control interventions unless the unit has had infections related to MDRGN.

3. Enhanced surveillance screening

a. We suggest that it may be appropriate for haemodialysis units to modify policies on screening, cohorting, clinical management, cleaning and the use of personal protective equipment in light of local risk as assessed by the prevalence, infectivity and pathogenicity of transmittable infectious agents (2C).
b. We recommend that the local incidence and prevalence data for hepatitis B and hepatitis C be considered in determining the frequency of testing for aminotransferases (ALT/AST) (1C).
c. We recommend that all patients negative for hepatitis B receiving in-centre haemodialysis are rescreened for hepatitis B (HBsAg, anti-HBc and anti-HBs) if there has been a notification of a seroconversion of hepatitis B (HBSAg negative to positive) within the dialysis population. All patients who are non-immune should have repeated screening every 2 weeks for 3 months (1C).
d. We recommend that all patients associated with a dialysis centre undergo rescreening for hepatitis C (anti-HCV, HCV RNA) if there has been a seroconversion of hepatitis C (anti-HCV negative to positive) within the dialysis population, thence repeat screening every 2 weeks for 3 months (1C).
e. We recommend that all patients returning from haemodialysis at an alternative facility where the endemic rates of blood-borne viruses are high and/or adherence to standard infection control precautions is uncertain, be serologically screened on re-entry for hepatitis B (HBsAg, anti-HBc and anti-HBs), hepatitis C (anti-HCV, HCV PCR), and HIV (HIV Ag/Ab) and again at 6 weeks (1C).
f. We suggest consideration of enhanced screening and transmission based precautions for VRE if a haemodialysis unit has a high prevalence of VRE colonization (>10% prevalence), has had patients with infections relating to VRE or a patient is known to be colonized with VRE and is faecally incontinent (2D).

4. Management of patients with positive results for blood-borne virus in the dialysis unit

a. We recommend that hepatitis B non-immune haemodialysis patients receive a course of hepatitis B vaccination that is compliant with National Immunization Guidelines (1B).
b. We suggest that HBsAg positive patients be dialyzed in isolation or in an area separate to where patients who are HBsAg negative receive dialysis (2C).
c. We suggest that HBsAg positive patients use a dedicated dialysis machine, and single use dialysers. When dialysers are to be reused, they should be decontaminated and disinfected (2C).
d. We suggest that in a routine setting, patients who are known to be positive for HIV or anti-HCV need not be dialyzed in isolation, nor require a dedicated machine (2C).
e. We suggest that in a high prevalence setting (seroprevalence >15%) or where an outbreak of hepatitis C has not been possible to contain, it may be beneficial to dialyse patients who are known to be positive for anti-HCV in isolation and with a dedicated machine (2C).

5. Equipment

General

a. We recommend patient-dedicated equipment or single-use items wherever practical in accordance with National Health and Medical Research Council (NHMRC) guidelines. Single-use items should be disposed of after use (1D).
b. We recommend, where common use of equipment for multiple patients is unavoidable, re-usable items should be disinfected between patient use where practical. If disinfection is not possible (e.g., blood pressure cuffs) then these devices should be cleaned and allowed to dry in accordance with NHMRC Australian guidelines for prevention and control of infection in healthcare (1D).
c. We recommend physiological monitoring equipment such as thermometers, sphygmomanometers and scales to be dedicated for use for each patient, when disinfection is not possible between uses, in accordance with NHMRC Australian guidelines for prevention and control of infection in healthcare (1D).
d. We recommend medications and supplies should not be moved between patients. Multi-dose medications should be prepared in a central designated area, and then dispensed to individual patients. No drugs or materials from the dialysis station should be returned to the preparation area (1C).
e. We recommend needles be dispensed into a sharps container. Containers should be designed to allow for non-touch technique (1D).
f. We recommend that external circuits, once removed, be transported from the dialysis station in a leak-proof bag to a designated clinical waste area. If components require reprocessing or the circuit needs to be drained, then this should be undertaken in a dedicated area separate to treatment areas or areas used for the preparation of medications (1C).
g. We recommend that dialysis machine should be fitted with an external transducer protector to the pressure lines of external circuitry. The fit to the pressure monitor should be tight to minimize risk of wetting. If wetting occurs then the transducer should be replaced (1D).
h. We recommend that if fluid is evident on the machine side of the filter then the machine should be taken out of service, the internal filter changed and the internal housing disinfected (1D).
i. We recommend that after cannulation the table and dialysis screen are cleaned immediately, and the dialysis bay is cleaned after each haemodialysis session (1D).

6. Environmental and equipment cleaning

a. We recommend haemodialysis units follow NHMRC and Centre for Disease Control (CDC) guidelines for environmental cleaning (1D).
b. We recommend haemodialysis units follow the NHMRC Australian Guidelines for the prevention and control of infection in healthcare settings (1D).
c. We recommend that Therapeutic Goods Administration-approved cleaning agents/disinfectants/devices are used and staff follow manufacturer's instructions (type of disinfectant, contact time and concentration) (1D).

7. Staff personal protective equipment

a. We recommend that haemodialysis units have an adequate supply of personal protective equipment (variety of medical gloves accommodating allergies and size variations, aprons, gowns, protective eyewear and masks/face shields) available at the point of use. (1D)
b. We recommend that gloves, gown and protective eyewear be used, and face mask/shield be considered when the risk of exposure to blood or other potentially contaminated body fluids is high (1D).
c. We recommend that sterile gloves, apron/gown, face masks and goggles or face shield be worn when inserting or manipulating central venous dialysis catheters using aseptic technique. (1D)

Ungraded suggestions for clinical care

Patient centred care

- Staff training should include education about maintaining and respecting patients' privacy in the dialysis unit where possible, to protect confidentiality surrounding the diagnosis of a blood-borne virus.
- Patients should receive counselling where appropriate, particularly following a positive diagnosis with a blood-borne virus.
- In order to help reduce fear/confusion and alleviate possible stigmatization associated with a blood-borne virus, education should be provided to patients and their carers regarding the level of risk of BBVs, and the purpose of the practice of isolation and cohorting in the management of blood-borne viruses in the dialysis unit.

Surveillance in the haemodialysis unit

- Patients with a high viral load for hepatitis B, hepatitis C or HIV may present a greater transmission risk. For patients with poorly controlled disease, initiation of antiviral therapy is important for reducing this risk. For patients with active hepatitis C or HIV viral infections and high viral load, consideration can be given to managing these patients as per hepatitis B (in isolation, on a dedicated machine).
- Patients or staff who have a high-risk exposure with a potential risk of transmission, should be assessed for post-exposure prophylaxis for hepatitis B and HIV where

appropriate, and referred for hepatitis B, hepatitis C and HIV monitoring.
- Patients with chronic hepatitis C who have undergone hepatitis C treatment and achieved a test of cure (sustained virological response) should be managed the same as non-HCV infected patients in the dialysis setting. For patients with ongoing risks factors for hepatitis C infection in the community, more frequent testing may be required. Anti-HCV is unlikely to be a marker of reinfection in patients who have been cured of their disease, therefore use of hepatitis C PCR tests should be routine in the long-term surveillance of these patients.
- Patients with occult HBV* (most commonly recognized by serologically undetectable HBsAg positive + anti-HBc, ± anti-HBs) should be routinely monitored for evidence of HBV reactivation using six monthly assessments of aminotransferases (ALT/AST), and six monthly assessments of anti-HBs titres and HBsAg.
- As an additional precaution, patients who do not consent to blood-borne virus surveillance should be dialysed in a separate area unless prior hepatitis B immunity is confirmed (anti-HBs ≥ 10 mIU/ml). If patients who are known to be hepatitis B immune, and decline other blood borne virus surveillance, then they should be managed in the same way as patients with hepatitis C infection.
- Haemodialysis patients with chronic hepatitis B, hepatitis C or HIV infection should be referred to an appropriate specialist for staging of their diseases and assessment for treatment.
- Hepatitis A vaccination is recommended in non-immune patients with chronic hepatitis B and hepatitis C. This is based on anecdotal reports of fulminant hepatitis A infection in those with pre-existing hepatitis C or hepatitis B.
- Decolonization of MRSA should be considered for colonized chronic haemodialysis patients who have had MRSA related infections.
- Decolonization of MRSA should be considered for colonized haemodialysis patients who have central venous haemodialysis catheters as dialysis access.
- Screening with rectal swabs or faeces for carbapenem resistant Enterobacteriaceae (CRE)/carbapenemase-producing Enterobacteriaceae (CPE) is recommended in dialysis patients who have been admitted to a hospital overseas, had treatment in an overseas dialysis facility, or been in contact with a person with CRE.
- Staff working with dialysis patients should have HBV vaccination if they have no evidence of pre-existing immunity from infection or prior vaccination
- Staff who are non-immune to hepatitis B, including vaccine non-responders, should not be assigned to the care of patients who are HBsAg positive.

*In some rarer circumstances occult HBV may be indicated by:
1. A past infection indicated only by the presence of hepatitis B surface antibody (anti-HBs) without anti-HBc;
2. Chronic hepatitis where there is a surface gene escape mutant that is not recognized by conventional assays;
3. Where all seromarkers of hepatitis B infection are negative (seronegative occult HBV), but there are low levels of circulating HBV DNA.

Enhanced surveillance

- In the event of an outbreak of infections due to a multiresistant organism (MRO) or identification of a high prevalence of a MRO we suggest review of these guidelines for the local context and consideration of enhanced infection control procedures.
- Enhanced screening and transmission-based precautions should be undertaken if a haemodialysis unit has a high prevalence of MDRGN colonization or has had patients with infections relating to MDRGN including CRE.

Environmental cleaning in haemodialysis units

- Patient waiting areas should be cleaned regularly.
- Detergent or disinfectant based wipes should be used on frequently touch sites near the patient environment within the haemodialysis unit.

ACKNOWLEDGEMENTS

KHA-CARI guidelines are supported by Kidney Health Australia, the Australian and New Zealand Society of Nephrology, NHMRC Program Grant (APP1092957) – BEAT-CKD. Guideline members were not remunerated for their work.

DISCLOSURE

We have no conflict of interest to report.

For a full text version of the guideline, readers need to go to the KHA-CARI website [go to the guidelines section (www.cari.org.au)].

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at the publisher's website: