



Infection control guidelines in hemodialysis facilities

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Healthcare-associated infections are a major risk to patient and staff safety. Hemodialysis (HD) patients, as well as dialysis staff, are vulnerable to healthcare-associated infections due to frequent and prolonged exposures to many possible contaminants in the HD environment. The increased risk is mainly due to 1) the immune-compromised status of dialysis patients, 2) frequent and prolonged blood exposure during HD treatments through vascular access (mainly catheters) and extracorporeal circuit (with many ports and connections), 3) close proximity to other patients during treatment in the HD facility, 4) frequent contact with healthcare workers, who frequently move between patients and between machines, 5) frequent hospitalization and surgery, and, most importantly 6) non-adherence or breaks in implementation of recommended practices.

Infection is the first cause of hospitalization and the second most common cause of mortality among HD patients. Infection control in dialysis units remains the most important measure to maintain a healthy environment and to prevent and avoid dissemination of infection among immunocompromised patients. HD patients are exposed to different types of infections including bloodstream infections and localized infections of vascular access; blood-borne infections with hepatitis B virus, hepatitis C virus, and/or human immunodeficiency virus; and airborne infections. Sources of infections include

contaminated water, equipment, environmental surfaces, and infected patients. Contaminated healthcare worker hands are among the most common modes of transmission of healthcare-associated infections [1]. In fact, hand hygiene is singled out as the most important intervention to prevent infections (Table 1). The evident increased potential for transmission of infections in the HD setting led to the creation and implementation of specific and stricter infection prevention and control measures in addition to the usual standard precautions [2].

Different international organizations have generated guidelines and recommendations on infection prevention and control for implementation in the HD setting. These include the Centers for Disease Control and Prevention (CDC), the Association of Professionals in Infection Control (APIC), the Kidney Disease Outcomes Quality Initiative (K/DOQI), the European Best Practice Guidelines/European Renal Best Practice (EBPG/ERBP), and the Kidney Disease: Improving Global Outcomes (KDIGO) [3]. In this issue of *Kidney Research and Clinical Practice*, Park et al [4] established the “*Korean clinical practice guidelines for preventing the transmission of infections in hemodialysis facilities.*” These key recommendations were focused on adult end-stage renal disease patients over 18 years old who receive hemodialysis therapy in dialysis units. These guidelines were based on an expert group composed of nephrologists and infection control specialists and covered different important aspects of infection control, including standard precautions, isolation strategy, vascular access, water treatment, procedures of cleaning, disinfection and sterilization, waste management, environmental control, and vaccination. Each recommendation is categorized as either Category I (strong recommendation) or Category II (weak recommendation) based on evidence levels (high, moderate, low, and very low), benefits and risks, and clinical applicability in the medical field. The

Received January 29, 2018; **Revised** January 31, 2018;

Accepted January 31, 2018

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Table 1. Estimated minimum number of times where hand hygiene is required per dialysis session per patient (regardless of glove use)

SN	Activity	Before	After	Total
1	Accessing supplies from common clean storage area	1	—	1
2	Preparing/setting-up the HD machine	*	1	1
3	Preparing/administering medications (including for anticoagulation)	1	1	2
4	Pre-dialysis: measuring vital signs/weighing	*	1	1
5	Preparing trolley/tray for cannulation	*	1	1
6	Palpating clean cannulation sites	*	1	1
7	Skin preparation & cannulation of arteriovenous access (AVF, AVG)	*	1	1
8	Preparing trolley for catheter dressing [†]	*	1	1
9	Removing old dressing over catheter site [†]	—	1	1
10	Catheter exit site dressing [†]	*	1	1
11	Connection for HD	1	1	2
12	Handling blood samples and other specimens	—	1	Minimum 1
13	Checking blood pressure (every 1/2–1 hour for 4 hours)	1	1	Minimum 8
14	Catheter/blood line manipulation	1	1	Minimum 2
15	Adjusting machine parameters and/or attending machine alarms	—	1	Minimum 1
16	Attending to patient incidents/assisting patient	1	1	Minimum 2
17	Prepare trolley for dialysis disconnection	1	—	1
18	Disconnection of HD	1	1	2
19	Post-dialysis: measuring vital signs/weighing	*	1	1
20	Cleaning/disinfection of dialysis equipment	*	1	1
21	Leaving the dialysis unit	1	—	1
Total estimated minimum number of times hand hygiene is required per dialysis per patient				~30

AVF, arteriovenous fistula; AVG, arteriovenous graft; HD, hemodialysis; SN, serial number.

*Most of the time, the activity is recently preceded by hand hygiene performed at the end of one procedure/activity (between two different activities). Therefore, repetition of hand hygiene prior to an activity (wherein performance of hand hygiene is indicated per recommendation) is unnecessary.

[†]Not included for patients with permanent arteriovenous access.

categorized recommendations were adjusted when the performance level of the recommendation was expected to be low even though the level of evidence was high. In addition, some recommendations that have not fully reflected the domestic medical situation and have caused conflicts of interest have not been graded and have been classified as unresolved issues.

The established Korean infection control guidelines are evidence-based, well-designed, concise, and with clear instructions. These guidelines/recommendations should not only support all practicing national dialysis units, but should help to standardize and unify the implemented policies and procedures of infection control. This should be supported by quality improvement projects to ensure reliable, consistent, and strict implementation of infection control policies and procedures. A specialized committee or at least one designated person with training in infection control and epidemiology should be respon-

sible for oversight of the program as well as the education of staff and patients on infection prevention and control. These measures should help patients be dialyzed safely in any national dialysis unit when moving and/or traveling between different parts of the country.

The Korean guidelines should help dialysis units to establish their own infection control policies and procedures and to regularly survey and update them per the local incidence and prevalence of any type of infection. However, strict implementation of these policies and procedures remains the cornerstone in infection control in dialysis units. In addition, regular education, training (especially for newly appointed staff), and monitoring are essential to ensure proper implementation. Full knowledge of infection control policies and procedures should be provided to all healthcare workers, and awareness campaigns should be regularly performed. The patient and/or caregiver should also be educated on hand

Table 2 Key areas for patient education

Patients with catheters		Patients with permanent arteriovenous access	
1	Hand hygiene	1	Hand hygiene
2	General access care at home (e.g., bathing with a catheter)	2	Washing the access site prior to treatment
3	Signs and symptoms of infection	3	General access care at home (e.g., do not scratch or pick at the site)
4	How to respond if problems with the catheter develop outside of the dialysis center	4	Signs and symptoms of infection
5	Risks associated with catheters / importance of permanent access	5	How to respond if problems with access develop outside of the dialysis center
6	Basic infection control practices during catheter access process (as a mean to engage patients)	6	Basic infection control practices during cannulation process (as a mean to engage patients)

Content source: Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases (NCEZID), Division of Healthcare Quality Promotion (DHQP).

hygiene and care of new vascular access (Table 2). Equally important is the continuous need of regular revision, feedback, and update of the implemented policies and procedures. Lastly, it is essential to preclude any break in these policies and procedures. The following factors, which can be avoided and prevented, will inevitably lead to a break in the implementation of recommended practices: 1) understaffing with poor nurse-to-patient ratio [5], 2) frequent turn-over of nursing staff [6], 3) lack or inadequate training and lower level of competency among HD staff, 4) inadequate or lack of patient/family education, 5) inadequate provision of necessary supplies/equipment, 6) poor design of HD unit layout (congested and inadequate segregation/isolation) [7], and 7) urgency associated with dialysis complications (sometimes life-threatening situation) may sacrifice adherence to standard precautions [8].

In conclusion, international guidelines are of great value in supporting worldwide infection control programs in hemodialysis facilities. However, it is important for national/local dialysis facilities to establish their own guidelines and applicable recommendations. These local guidelines should be prepared in collaboration with expert nephrologists, epidemiologists, infection control specialists, and occupational health specialists, and implementation should be monitored regularly. These guidelines should be designed to meet local requirements and based on local risk assessment, survey results, and practical experience. Regular clinical audit of the recommendations in these guidelines should form an integral part of good practice and of an HD facility's contribution to local clinical governance initiatives.

Conflicts of interest

The author has no conflicts of interest to declare.

References

- [1] Pittet D, Dharan S, Touveneau S, Sauvan V, Perneger TV. Bacterial contamination of the hands of hospital staff during routine patient care. *Arch Intern Med* 159:821-826, 1999
- [2] Karkar A. Hand hygiene in haemodialysis units. *OALib* 3:e2953, 2016
- [3] Karkar A, Bouhaha BM, Dammang ML. Infection control in hemodialysis units: a quick access to essential elements. *Saudi J Kidney Dis Transpl* 25:496-519, 2014
- [4] Park HC, Lee YK, Yoo KD, et al. Korean clinical practice guidelines for preventing the transmission of infections in hemodialysis facilities. *Kidney Res Clin Pract* 37:8-19, 2018
- [5] Fridkin SK, Pear SM, Williamson TH, Galgiani JN, Jarvis WR. The role of understaffing in central venous catheter-associated bloodstream infections. *Infect Control Hosp Epidemiol* 17:150-158, 1996
- [6] Cimiotti JP, Aiken LH, Sloane DM, Wu ES. Nurse staffing, burnout, and health care-associated infection. *Am J Infect Control* 40:486-490, 2012
- [7] Zingg W, Holmes A, Dettenkofer M, et al. Hospital organisation, management, and structure for prevention of health-care-associated infection: a systematic review and expert consensus. *Lancet Infect Dis* 15:212-224, 2015
- [8] Kelen GD, DiGiovanna TA, Celentano DD, et al. Adherence to universal (barrier) precautions during interventions on critically ill and injured emergency department patients. *J Acquir Immune Defic Syndr* 3:987-994, 1990