THE NATIONAL

INFECTION PREVENTION AND CONTROL GUIDELINES

FOR OUTPATIENT DIALYSIS CENTRES

2020

FOREWORD

The National Infection Prevention and Control Committee (NIPC) was appointed by the Singapore Ministry of Health in 2014 and charged with a number of tasks including consolidation of national guidelines to guide healthcare facilities in developing policies to meet national standards.

It is with pleasure that we present this first edition of 'National Infection Prevention and Control Guidelines for Outpatient Dialysis Centres'. The intent of this document is to provide evidence-based guidance for the prevention of healthcare-associated infections in all outpatient haemodialysis settings. This set of guidelines was designed for use by those responsible for infection prevention in the outpatient dialysis centres e.g. infection preventionist, clinical manager, nurses.

The recommendations in this guidelines were developed by reviewing best available evidences and consulting with specialists in the field. One of the key recommendations in this guideline is the practice of standard precautions for all patients including patients with known MDROs. This is because efforts at transmission control need to be a part of practice and not targeted toward any individual or organism. Furthermore, there is no routine active surveillance in outpatient settings (nor is it feasible).

We welcome any feedback that will help improve the guideline moving forward. For any comments or feedback, please reach out to NIPC_Sec@moh.gov.sg.

Yours sincerely,
Prof Dale Fisher
Chairperson
National Infection Prevention and Control Committee (NIPC)

ACKNOWLEDGEMENT

The National Infection and Prevention Guidelines for Outpatient Dialysis Centres has been endorsed by the National Infection Prevention and Control Committee (NIPC). The composition of the NIPC is provided in Table 0.1.

Table 0.1: Composition of NIPC

S/N	Name	Role	Designation
NIPC members			
1	Prof Dale Fisher (Chairperson)	Chairperson	Senior Consultant, Division of Infectious Diseases, University Medicine Cluster, NUH
2	Adj A/Prof Brenda Ang	Member	Senior Consultant, Department of Infectious Diseases, TTSH
3	Ms Foo Meow Ling	Member	Nurse Clinician, Department of Nursing, KTPH
4	Dr Kala Kanagasabai	Member	Director, Clinical Quality, Ren Ci Community Hospital
6	Dr Kalisvar Marimuthu	Member	Senior Consultant, Department of Infectious Diseases, NCID
5	Dr Ling Moi Lin	Member	Senior Consultant, Director of Infection Prevention & Epidemiology, SGH
7	Adj Asst Prof Surinder Pada	Member	Director and Senior Consultant, Infectious Diseases, NTFGH
8	A/Prof Thoon Koh Cheng	Member	Head and Senior consultant, Infectious Disease Service and Infection Control Committee Chair, KKH
MOH Representative and NIPC Secretariat			
9	Dr Adelina Young	MOH Representative	Deputy Director, Patient Safety and Quality Improvement Branch, Clinical Quality, Performance and Value Division, MOH
10	Dr Felicia Hong	Secretariat *(Former)*	Senior Assistant Director, Patient Safety and Quality Improvement Branch, Clinical Quality, Performance and Value Division, MOH
11	Ms Luisa Tan	Secretariat	Assistant Director, Patient Safety and Quality Improvement Branch, Clinical Quality, Performance and Value Division, MOH
12	Ms Ong Xin Yi	Secretariat	Senior Manager, Patient Safety and Quality Improvement Branch, Clinical Quality, Performance and Value Division, MOH

The MOH would like to acknowledge Dr Ling Moi Lin (Director, Infection Prevention and Epidemiology, Singapore General Hospital) for leading the group of experts in the writing of the guidelines. The members of the expert workgroup who contributed in their individual capacity to the drafting of the National Infection Prevention and Control Guidelines for Outpatient Dialysis Centres are listed in Table 0.2.

Table 0.2: Composition of the Expert Workgroup (in alphabetical order)

Name	Designation
A/Prof Choong Hui Lin	Senior Consultant, Renal Medicine, Singapore General Hospital
Ms Chua Chor Guek	Assistant Director, Nursing (Nursing Administration), The National Kidney Foundation
Ms Jamilah Bte Jantan	Senior Clinical Nurse Manager (Nursing Administration), The National Kidney Foundation
Dr Ling Moi Lin	Senior Consultant, Director of Infection Prevention & Epidemiology, SGH
Ms Petra Chong Yin Ting	Acting Head, Clinical Services, Kidney Dialysis Foundation
Ms Suzie Burford	Senior Clinical Country Manager, Fresenius Medical Care

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ABBREVIATIONS AND GLOSSARY

ABHR	Alcohol Based Hand Rub
APIC	Association for Professionals in Infection Control and Epidemiology
CDC	Centers for Disease Control and Prevention
CP-CRE	Carbapenemase Producing Carbapenem Resistant *Enterobacteriace*
DORSCON	Disease Outbreak Response, System Condition
FTE	Full-time Equivalent
HAI	Healthcare-associated infection
HCW	Healthcare Workers
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HEPA	High Efficiency Particulate Air
HIV	Human Immunodeficiency Virus
HVAC	Heating, Ventilation and Air Conditioning
ICRA	Infection Control Risk Assessment
IPC	Infection Prevention and Control
KDIGO	Kidney Disease Improving Global Outcomes
MDRO	Multi-Drug Resistant Organism
MMR	Measles, Mumps, Rubella
MOH	Ministry of Health, Singapore
MRSA	Methicillin-resistant *Staphylococcus aureus*
NIPC	National Infection Prevention and Control Committee
NSI	Needle-Stick Injury
PEP	Post Exposure Prophylaxis
PPE	Personal Protective Equipment
QUATs	Quaternary Ammonium Compounds
TB	Tuberculosis
VRE	Vancomycin-resistant *Enterococcus*

CHAPTER 1 GOVERNANCE AND MANAGEMENT

Haemodialysis places patients at high risk for infection because of patient comorbidities and numerous human, environmental, and procedural factors. Establishing an infection prevention and control programme which includes a bundle of strategies and interventions that are consistently performed will reduce the infection risk for both staff and patients.

1.1 Structure and Components of an Infection Prevention & Control Programme

An Infection Prevention & Control (IPC) programme should include basic surveillance for infections, an outbreak control programme, formation and review of policies and procedures, education of employees in infection prevention, an employee health programme, and monitoring of patient care practises. In addition, other aspects of the programme should also include quality improvement, environmental hygiene, product evaluation, pandemic preparedness planning, and reporting of diseases to the Ministry of Health. Centres belonging to a cluster should have an integrated IPC program with harmonised IPC practices in various centres.

The IPC Personnel (IPCP) or IPC Nurse (IPCN) is an essential component of an effective infection control programme and is the person designated by the facility to be responsible for IPC. The IPCP is usually a staff with nursing background, which will be necessary for assessment and chart review of the residents. Owing to the size and staffing limitations, he/she may have other duties, though the time needed to carry out IPC duties should be clearly set out. If a nurse is not available, a trained healthcare worker can fulfil the role of an IPCP.

The IPC team comprising a medical doctor and the IPCP/IPCN should be appointed responsibility to run the IPC programme. This team will review the needs of the facility (possibly using a risk assessment matrix) that will assist in strategic planning of the IPC programme. A budget for the IPC programme is planned annually to help manage the key components of the IPC programme e.g. surveillance, training, audit and outbreak management. It is recommended that the IPC team meets regularly e.g. weekly to review and manage current issues. This team reports to the director of the centre as part of the governance structure.

The IPC Committee comprising representatives from the centre is the workgroup that supports the implementation of the IPC programme. The IPC Committee should meet regularly (e.g. at least six monthly) to review IPC data, review policies, and monitor programme goals and activities. In a small centre, the IPC Committee may share role with the Quality Committee.

Documentation and written records of these meetings should be kept and readily available for inspection by the accreditation authorities.

1.2 Infection Prevention Control personnel (IPCP)

The dialysis unit should have nominated staff accountable for IPC in their centre/programme. All healthcare facilities must have trained IPC personnel and resources to implement the IPC programme that are proportional to the size, complexity, case mix and estimated risk of the populations served by the health care facility. The Infection Prevention Committee should include lead IPCP as well as representatives from the clinical area.

These staff would be responsible for the overall monitoring and reporting of IPC in the programme, development and review of IPC related work instructions (WI)/policies and staff training related to IPC and related patient safety as key areas of accountability. Further areas of responsibility include:

- Surveillance to assess risk and guide quality improvement/risk reduction projects
- Assessment of compliance with best practice infection prevention standards in alignment with legislation and MOH requirements for IPC safety
- Undertake IPC competency assessments of staff and adherence in practice
- Monitor targeted IPC outcomes using surveillance for healthcare-associated infections in high risk populations
- Ensure communication network with members of the dialysis team/programme; patient/family, nurses, biomedical engineers, doctors, operation managers, environmental agency and MOH

The IPCPs are also responsible for discussing plans/risk analyses that require economic and HR planning with the dialysis programme governance/management committees/personnel. Overall, they are responsible for ensuring patient safety related to IPC and ensure Healthcare-associated Infection (HAI) surveillance is undertaken utilising standardized collection methodologies and definitions of infections, for early identification and management.

1.3 Staff training

In supporting the IPCP they should be afforded comprehensive education and training to prepare them for their role and function that includes a clear job description, access to

measurement tools and data collection related to IPC, surveillance and emergency preparedness. Examples of training include the Asia Pacfic Society of Infection Control (APSIC) Course in Infection Control, etc. Teaching, learning and change theory may also be beneficial attributes to develop in the IPCP.

All healthcare professionals require training and education on the importance of IPC in the dialysis setting. The aim of IPC education/training of staff is to promote IPC safety culture, ensure staff utilise measures of safety to reduce healthcare associated infection (HAI) risk and endorse IPC safe environment for all. These training sessions should be conducted:

- During orientation of new staff
- Annual IPC updates and competency review

The training should cover topics such as epidemiology of infections in dialysis populations, modes of transmission for BBV, pathogenic bacteria and other organisms; standard precautions and guidelines for dialysis/haemodialysis units; use of PPE (personnel protective equipment); hand hygiene and 5 moments (WHO) and linking the IPC work instructions/policies and Singapore MOH IPC guidelines. Special attention should address aseptic technique for care of patient's vascular access; methods to clean and disinfect equipment and environmental surfaces; monitoring for water and fluid for dialysis (dialysate) quality; biohazard waste management and where applicable dialyser reprocessing.

1.3.1 Training Delivery methods

A range of resources are available through WHO (www.who.int/gpsc/en) and CDC (https://www.cdc.gov/dialysis/clinician/CE/infection-prevent-outpatient-hemo) linked to Hand Hygiene and IPC in the dialysis environment. Training can be provided internally or externally using a variety of formats, including:

- Face-to-face training programmes
- Short sessions (continuing education)
- Peer review, mentoring and supervised practice
- Self-directed programmes and Online learning modules
- Audio or video content
- Competency-based assessments
- Conferences and seminars

To further support the training, posters reminding HCWs in the workplace about IPC (especially Hand Hygiene) are available and help to advocate good IPC practices. Patients and visitors can also be informed of the importance of HH care and care expectation from HCWs.

1.4 Evaluation and Evidence (Record Keeping)

The IPCP should ensure there are records of attendance of all IPC training, which would also include the resources/materials used in the training. Compiling a folder of resources for orientation of new staff would be useful. Undertake skills appraisals and records of IPC competencies for all members of the workforce, including Medical and auxiliary (cleaners/assistants).

IPC audit results of the staff adherence to WI with completed performance reviews should be used as evidence of training effectiveness or training schedule. All training should be evaluated and information gathered used to continuously improve the programme.

Staff should receive information regarding the mandatory training requirements and training calendar.

1.5 Recommendations

RECOMMENDATIONS:

1) Dialysis Centres must evaluate their IPC needs and implement an IPC programme suited to those needs.
2) Periodic review of the IPC programme must be carried out to evaluate the centre's needs and determine the elements required to meet the goals of the IPC programme.
3) Leadership and the IPC committee support should be sought for the implementation and execution of the IPC programme.
4) Each dialysis centre should have a multi-disciplinary IPC committee whose responsibilities include annual goal-setting, programme evaluation and ensuring that the IPC programme meets current legislated standards and requirements as well as the needs of the facility.
5) Dialysis Centres should monitor targeted IPC processes with regular audits of practises.
6) Dialysis Centres should monitor targeted IPC outcomes using surveillance for healthcare-associated infections in high risk populations.
7) Healthcare-associated Infection surveillance must be undertaken with standardised collection methodologies using written definitions of infections, identification of risk population, methods of measurement, description of data sources and benchmarks used for comparison.
8) Results of process and outcome surveillance must be analysed and reviewed in a timely manner; a plan for improvement, including organizational accountability, must be developed by the targeted area in conjunction with IPC staff based on the results of surveillance.
9) Education in IPC must span the entire setting and all clinical staff.
10) An IPC component should be part of the orientation programme for all new staff.

11) All health care facilities must have trained IPC personnel and resources to implement the IPC programme that are proportional to the size, complexity, case mix and estimated risk of the populations served by the health care facility.

1.6 References

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CHAPTER 2 STAFF HEALTH

Health care workers (HCW) in the dialysis setting need to adhere to strict standard precautions and understand their crucial role in reducing BBV risk. As part of this risk reduction management, all dialysis units should have policies and procedures to provide clear instructions regarding staff vaccination programmes and HCWs' HBV immunisation status.

An employee health programme is a core component of the IPC and constitutes several key preventive and management strategies including:

- Pre-employment health screening
- Periodic reassessment of employee health status
- Evaluation of ill employees who may transmit infections to others
- Immunization programme
- Policy and procedures
- Collaboration with stakeholders
- Exposure management from a variety of communicable diseases.

Employees include physicians, nurses, dietitians, occupational therapists, exercise specialists, medical social workers, operation assistants, and cleaners and other potential groups. These persons are accountable to protect and prevent transmission of infections to themselves, patients and colleagues and should have access to an immunization programme and IPC Training and Education.

The immunization programme will:

- *improve s*afety within the environment of the dialysis centre;
- *maintain* the overall health and well-being of the employees thus reducingreducing absenteeism;
- *prevent* outbreaks; and
- *reduce* or eliminateeliminate harm, morbidity, and mortality.

2.1 Pre-employment

All new employees shall undergo mandatory pre-employment health screening that includes immunisation if non-immune before or soon after any placement in the dialysis centre. The minimum requirement for healthcare worker's welfare includes:

- Past medical history and allergy status
- Medical examination, current illness, infection, medications/treatments
- Immunisation status
- Laboratory and radiological tests:
  a) Chest x-ray; and
  b) Hepatitis B surface antigen (HBsAg), Hepatitis B antibody (anti-HBs).

2.2 Immunisation programme

An employee immunisation programme addresses employee health and work-related concerns that protects them against vaccine preventable diseases in accordance with Ministry of Health (MOH) immunisation policy for healthcare workers. These include but are not limited to immunisation against Hepatitis B disease; whenever appropriate, the dialysis centre's medical director shall consider other immunizations for their employees based on recommendations from MOH or other international guidelines.

The immunisation programme shall:

- Maintain proper and updated immunisation records of their employees either centrally or by individual dialysis centre's manager;
- Track immunisation coverage and immune status of their employees;
- Undertake periodic reviews of the need for booster doses or other immunisations;
- Make sure documented serological or non-response evidence is available with stated action plan.

2.2.1 Hepatitis B vaccination

All HCWs who do not have evidence of immunity (i.e. documented proof of vaccine series and post-vaccination serological evidence of immunity with anti-HBs concentration of ≥10mIU/mL) should be vaccinated with a primary 3-dose vaccination series, followed by post-vaccination serology test (anti-HBs testing) within 1-2 months after completion of the primary 3-dose vaccination series to determine the level of protective antibodies (i.e. anti-HBs ≥10mIU/mL).

If an immune response is not mounted after the HCW has received two 3-dose vaccination series, the vaccine non-responder should be referred to an Occupational Health physician for further counselling on the risk and susceptibility to acquiring HBV infection if they were to practise exposure prone procedures (EPPs). Note that connecting a patient and overseeing dialysis is NOT an EPP.

For HCWs who have had documented immune response post vaccination (i.e. anti-HBs≥10mIU/mL), further periodic serology testing to monitor antibody concentrations and booster doses of hepatitis B vaccine for anti-HBs<10mIU/ml are not required. (Refer to MOH Circular No. 41/2018)

2.2.2 Other vaccinations

- Influenza: at least annual vaccination is recommended for all HCWs.
- VZV/MMR: HCWs are to be immunised to MMR if no documented evidence of past vaccination and also for VZV if no serologic evidence of immunity or past vaccination evidence.
- Tetanus, Diphtheria and Pertussis (Tdap): Refer to MOH Circular MH:26/6 (April 2015 or updated)

2.3 Exposure management

Potential exposure to blood and contaminated fluid may occur in the dialysis setting. All employees should be familiar with reporting exposure, the immediate management and follow-up actions in the dialysis centre.

To protect employees after an exposure, the following should be implemented:

1. Develop policy for managing occupational exposure which covers:
    a) The immediate first aid; wash affected area with soap and flush with running water;
    b) Reporting incident; nurse in-charge/IPCP/ICPN;
    c) Consult doctor and seek treatment immediately e.g. designated hospital or clinic during office hours or Hospital Accident and Emergency (A & E) Department after office hours; baseline blood tests if needed
    d) Risk assessment and counselling
    e) Follow up with relevant post-exposure prophylaxis and blood test follow up;
    f) Collaborate with Human Resource (HR) for Workers Compensation related matters.

The best practice for mitigating risk of transmission to and from HCWs involves:

- Vaccinations to prevent BBV infections; Hepatitis B vaccine;
- Staff should be advised to cover cuts/ abrasions with waterproof dressings;
- Provide and use appropriately PPE (Personal Protective Equipment) when potentially exposed to blood and body fluids as part of standard precautions; apron/gowns, gloves, visor/face shield;
- Hand hygiene after handling blood or body fluids;
- Safe handling of sharps, safer techniques, use of needless devices, sharp box.

- Promotion of a safety culture;
- The use of established lines of communication between HCWs and their managers and local staff health services; and
- Suitable management of escalation process.

Managers and staff health services also are responsible for minimising the risk of infection to HCWs. HCWs should be made aware of infection risks related to their delivery of care and at-risk procedures and trained to use the required precaution measures. Education and training to all employees on basic infection prevention and control measures such as standard and transmission-based precautions and ongoing IPC competency assessments. (*See section 1.3 IPC Training)*

2.4 Recommendations

RECOMMENDATIONS:

1) Health screening for vaccine preventable diseases should be provided by the Healthcare institution in line with MOH guidelines, including Hep B, Measles, Mumps, Rubella, Tdap, Influenza and Chickenpox.
2) Immunisation programmesprogrammes for staff working in dialysis units should be provided as per MOH's recommendations (Refer to MOH Circular No. 41/2018).
3) Policy and work instructions for managing an occupational exposure should be available and followed.

2.5 References

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CHAPTER 3 PATIENT CARE

3.1 Infection Prevention and Control Precautions

3.1.1 Chain of infection

The chain of infection represents the transmission of microorganisms and infections in the healthcare setting.

Note: Please refer to the '*National IPC Guidelines for Acute Healthcare Facilities'* for the Six Elements to the Chain of Infection.

3.2 Standard Precautions

Standard Precautions should be applied to all patients' care in the setting of outpatient diaysis centres, and this include MDROs regardless of their suspected or confirmed infection (or colonisation). It is based on the principle that all blood, body fluids, secretions, excretions (except sweat), non-intact skin, and mucous membranes may contain transmissible infectious agents. They are designed to protect both patients and HCWs.

Standard Precautions include:

a) Hand hygiene,
b) Use of personal protective equipment (e.g., gloves, gowns, masks) when a risk is assessed,
c) Safe injection practices,
d) Safe handling of potentially contaminated equipment or surfaces in the patient environment, and
e) Respiratory hygiene/cough etiquette, distancing.

3.3 Hand Hygiene

Contaminated hands of HCWs are among the most common modes of transmission of healthcare-associated infections. Hand hygiene is the most important and effective procedure to prevent and control the spread of hospital associated infections (HAIs). It is the responsibility of all HCWs to carry this out at the right moments during patient care.

Microbial transmission may occur via contaminated hands during healthcare delivery e.g.

i) Pathogens shed by infected patients can contaminate surrounding environments,

ii) HCW's hands get contaminated by contact with patient skin or surrounding environment,
iii) Pathogen remains viable on the HCW's hands for at least several minutes
iv) HCWs may omit hand decontamination or use inappropriate product or procedure,
v) HCW's contaminated hands can either transfer the pathogen directly to another patient or indirectly on a medical device or objects within the patient's immediate vicinity.

Hand hygiene compliance can be improved by ensuring sufficient number of sinks with soap dispensers, single-useuse paper towels and hand lotions are available at each sink. Alcohol-based hand rub should be available facility widewide at point of carecare and healthcare workers require regular feedback of hand hygiene surveillance results. Education and training to ensure full awareness of infection control policies and procedures should be provided to all HCWs and be repeated periodically. The patient and/or caregiver should also be educated on hand hygiene and the care of new vascular access

3.3.1 Methods of Hand hygiene

Effective hand hygiene removes transient bacteria which can cause infection. The following two standard hygiene methods can be done using:

a) Alcohol-based hand rubs (ABHRs)

Use of ABHR is the preferred method for cleaning hands, unless hands are visibly soiled. The solution contains either isopropyl alcohol, ethanol, or n-propanol or a combination. Using ABHRs is less time-consuming than hand washing with soap and water. It takes 20-30 seconds to perform a complete hand rub (Refer to Figure 3.2).Alcohol-based hand rub is the gold standard for hand hygiene and is recommended by the US Centres for Disease Control and Prevention (CDC) and the World Health Organization (WHO), because it increases hand hygiene compliance with its faster process.

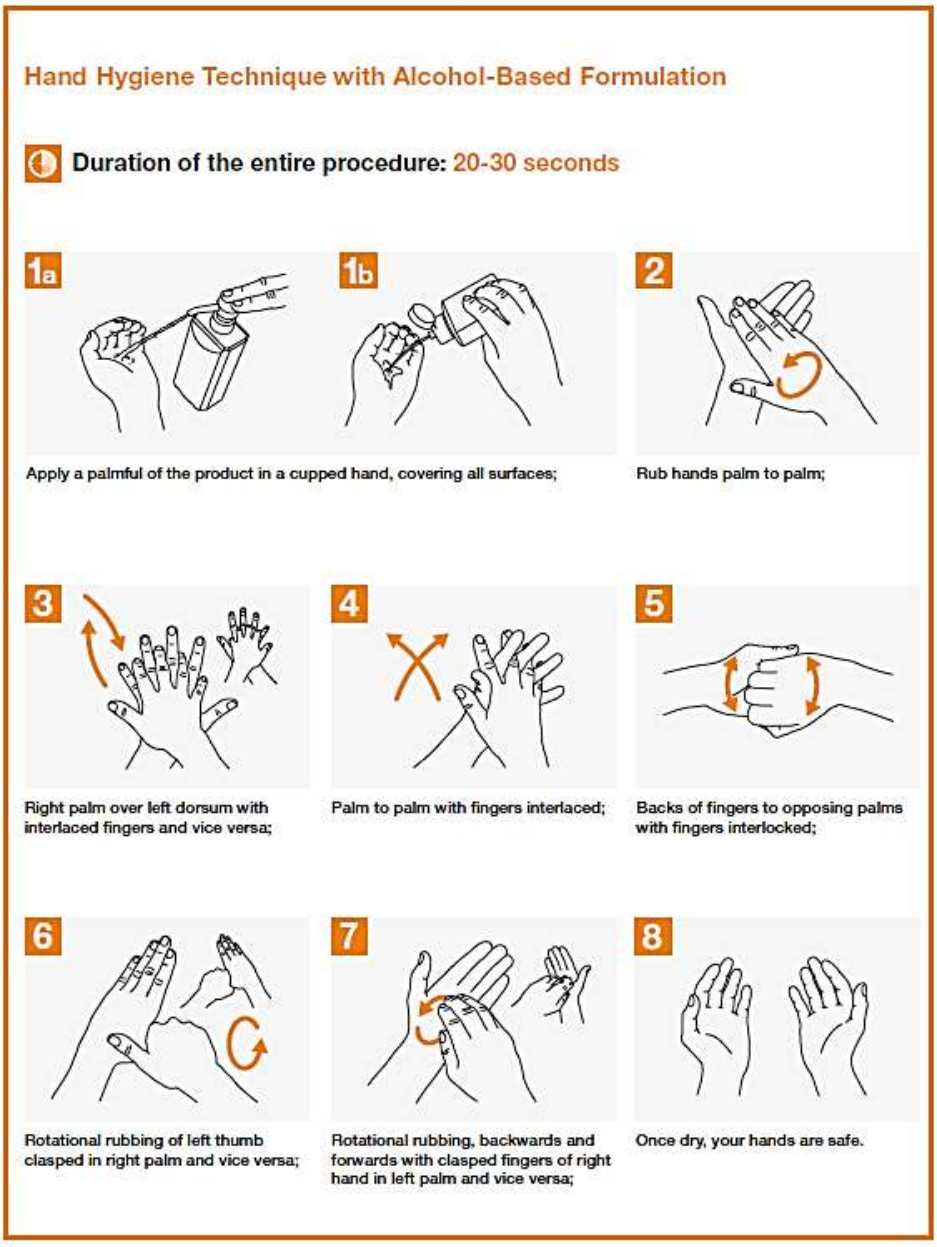
b) Hand washing using soap and water

The mechanical action of washing, rinsing and drying is the most important contributor to the removal of transient bacteria that might be present. This method takes about 40-60 seconds. It is an essential technique to ensure every part of the hands gets washed. (Refer to Figure 3.3). The use of soap and water is recommended when hands are visibly soiled (e.g. blood and/or body fluids), or before commencing or after concluding patient on dialysis treatment. An antimicrobial soap is recommended prior to clinical and surgical procedures where it is important to reduce bacterial counts as low as possible.

3.3.2 Indications for hand hygiene

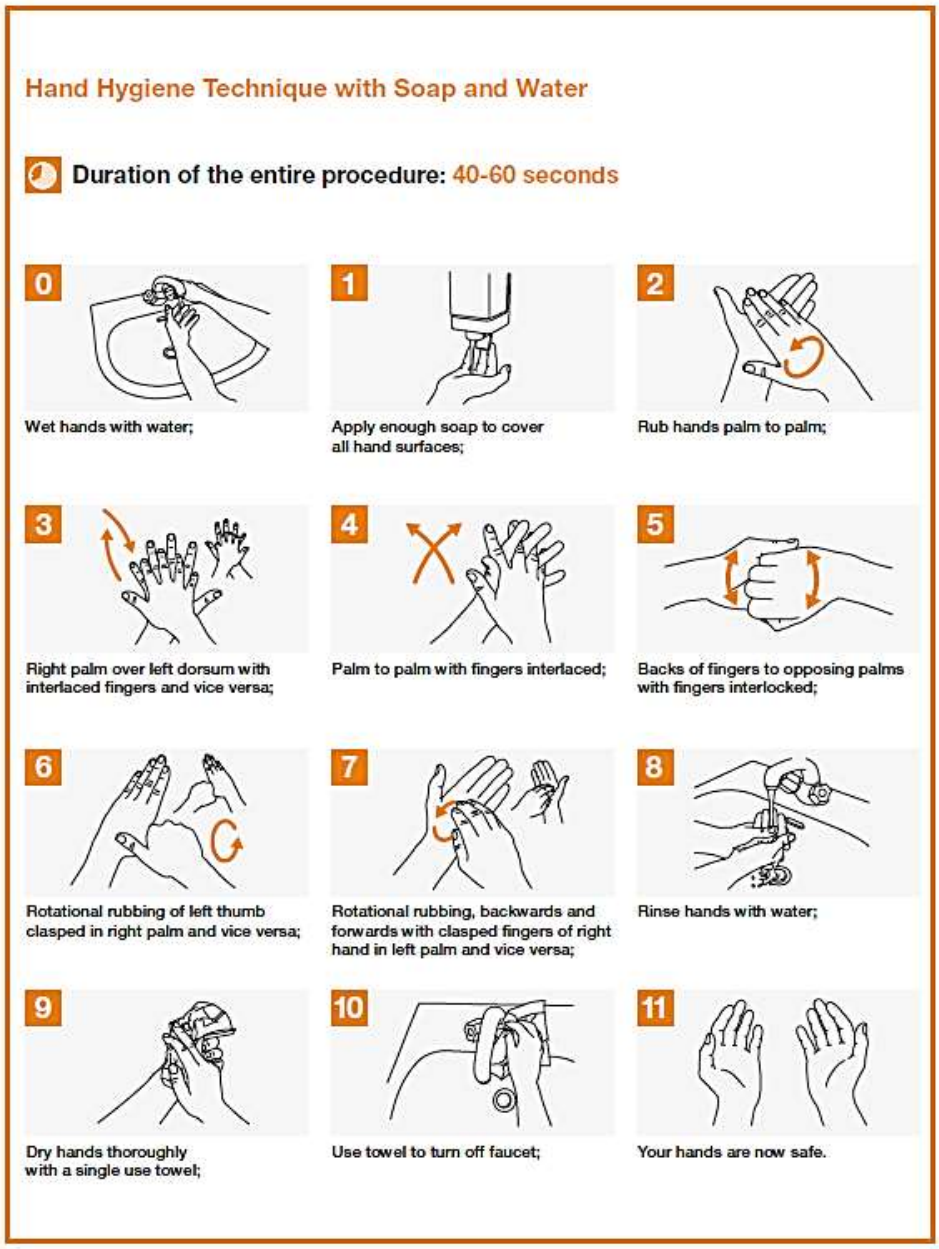
The 5 Moments for Hand Hygiene approach is the key to protect the patient, the HCW and the health-care environment against the spread of pathogens and thus reduce HAIs (refer to Figure 3.4 for 5 moments of hand hygiene and Table 3.1 for examples of moments).

Figure 3.2: Hand hygiene technique with alcohol-based formulation



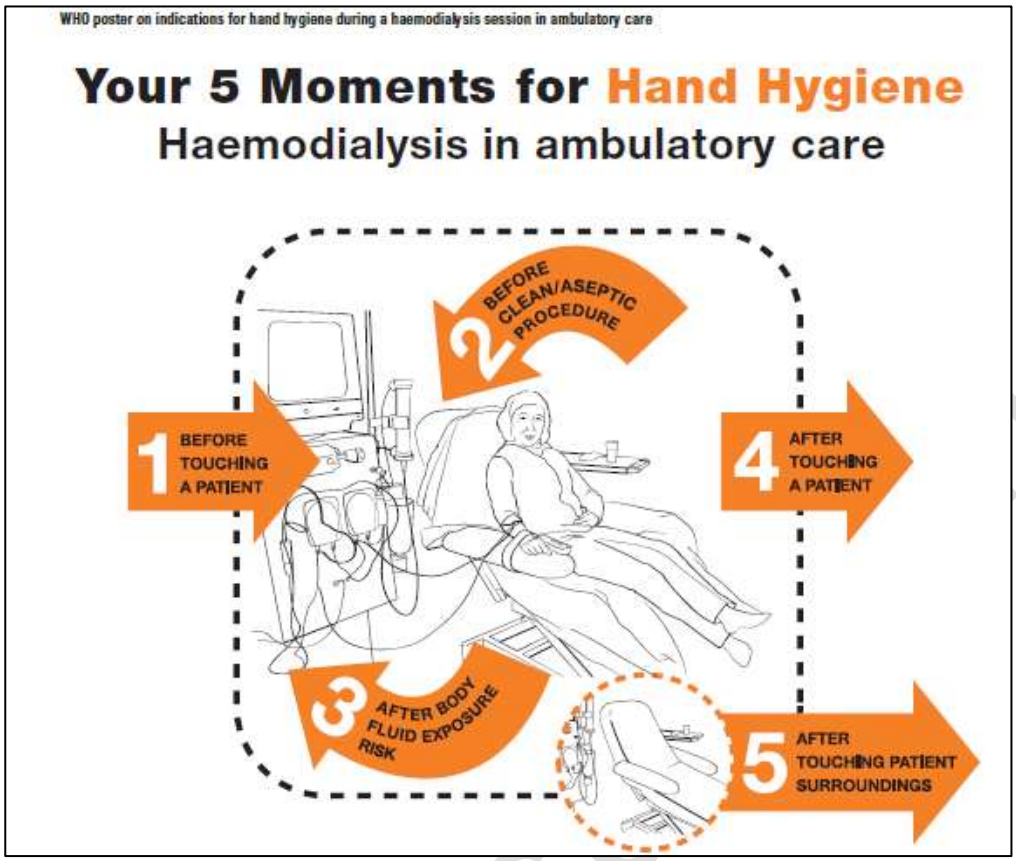
Reference image: World Health Organisation

Figure 3.3: Hand hygiene technique with soap and water



Reference image: World Health Organisation

<u>Figure 3.4</u>: Moments for Hand Hygiene During Haemodialysis in Ambulatory Care



1	BEFORE TOUCHING A PATIENT	WHEN?	Clean your hands before touching a patient.
		WHY?	To protect the patient against harmful germs carried on your hands.
2	BEFORE CLEAN/ ASEPTIC PROCEDURE	WHEN?	Clean your hands immediately before performing a clean/aseptic procedure.
		WHY?	To protect the patient against harmful germs, including the patient's own, from entering his/her body.
3	AFTER BODY FLUID EXPOSURE RISK	WHEN?	Clean your hands immediately after a procedure involving exposure risk to body fluids (and after glove removal).
		WHY?	To protect yourself and the environment from harmful patient germs.
4	AFTER TOUCHING A PATIENT	WHEN?	Clean your hands after touching the patient at the end of the encounter or when the encounter is interrupted.
		WHY?	To protect yourself and the environment from harmful patient germs.

Reference image: World Health Organisation

Table 3.1: Moments in Hand Hygiene - Examples

Moment 1	Before touching a patient	Examples: Before taking blood pressure, attending to patient.
Moment 2	Before clean/aseptic procedure	Examples: Cannulation, wound dressing, cleaning catheter dressing.
Moment 3	After body fluid exposure risk	Examples: After cannulation, after doing a catheter procedure and blood taking
Moment 4	After touching a patient	Examples: Checking blood pressure, after attending to patient
Moment 5	After touching patient surroundings	Examples: Feeding, attending to patient, after touching the machine.

3.4 Hand Hygiene Programme

Dialysis centres should allocate resources to plan and implement an ongoing programme promoting excellent hand hygiene practices by staff, patients and visitors. WHO Hand Hygiene Self-Assessment Framework has recommended a multimodal strategy that includes the following:

a) System change
b) Training / education
c) Evaluation and feedback
d) Reminders in the workplace
e) Institutional safety climate

a) System change

System change ensures that the dialysis centre has the necessary infrastructure (equipment and facilities) in place to allow HCWs to perform hand hygiene.

Criteria for system change:

i) Health-care facility have access to a safe, continuous water supply .
ii) Readily accessible alcohol-based hand rub at the point of care (products should be accessible without having to leave the patient zone).
iii) The recommended sink:patient-bed ratio is at least 1:10.
iv) Soap and single-use paper towels are available at each sink.
v) Dedicated sink for hand hygiene
vi) Budget for the purchase of hand hygiene products (e.g. ABHR, single-use paper towels).

Note: Improvements tools for system change can be obtained from World Health Organization (WHO) website at www.who.int/gpsc/en

b) Training / education

Education is an important and critical factor that represents one of the cornerstones for improvement of hand hygiene practices. All HCWs are require to attend training on the importance of hand hygiene at least annually. There should be a system within the facility for recording of training attendance, healthcare workers should have access to WHO hand hygiene guidelines as well as facility policy on hand hygiene. Designated facility trainer for hand hygiene should have adequate skills for conducting hand hygiene training.

Hand hygiene training should include the following :

i) Definition, impact and burden of HAI; major patterns of transmission of HAI pathogens with a particular focus on hand transmission
ii) Basic concepts including why, when, and how to perform hand hygiene according to the WHO Guidelines.
iii) My 5 moments of hand hygiene concepts
iv) Correct technique for hand hygiene (e.g. antimicrobial handwash/hand soap & handrub)

Training can be conducted with the different methods, some recommended methods and tools are:

v) discussion groups, problem-solving approaches, experiential and interactive learning, flip charts, videos, and buddy systems (i.e. HCWs are paired together for peer support and asked to observe each other and give feedback to their colleague on his/her practices).
vi) WHO hand hygiene training films or video and other valuable ready-to-use support for the practical training of appropriate techniques.
vii) Checking on the competence of all HCWs who have received hand hygiene - training must assess on HH competency at least annually.
viii) Glove use information leaflet
ix) Sustaining improvement – additional activities for consideration by healthcare facilities

Note: Improvenment tools can be obtained from WHO website at www.who.int/gpsc/en.

c) Evaluation and feedback

Under the WHO multimodal hand hygiene improvement strategy, the evaluation and feedback component focused on 3 broad categories: indirect monitoring of hand hygiene compliance, direct monitoring of hand hygiene compliance and feedback.

Tools for evaluation and feedback include:

i) Hand hygiene policy manual
ii) Hand hygiene knowledge questionnaire for healthcare professionals

iii) Antimicrobial soap /hand rub consumption survey
iv) Audit tools: on observation and compliance calculation form
v) Data entry analysis and data summary report framework
vi) Protocol on product evaluation

Note: Improvement tools can be obtained from WHO website at www.who.int/gpsc/en

d) Reminders in the workplace

Reminders in the workplace are key tools to prompt and remind HCWs about the importance of hand hygiene. Patients and visitors are also informed of the standard hand hygiene care that they should expect from their HCWs. Poster on educating the visitors to perform hand hygiene before entering and after leaving the dialysis center should be made available.

Posters as reminders in the workplace include:

i) How to hand rub poster
ii) How to hand wash poster
iii) WHO 5 Moments for hand hygiene
iv) Reminder to perform hand hygiene at the entrance of the dialysis center

Note: Tools can be obtained from WHO website at www.who.int/gpsc/en

e) Institutional safety climate

The dialysis center must create an environment and perceptions that facilitate awareness about patient safety with hand hygiene as a high priority at all levels.

In particular, it includes:

i) Active participation at both the institutional and individual levels;
ii) Awareness of individual and institutional capacity to change and improve (self-efficacy)
iii) Partnership with patients and patient organizations.

Tools for institutional safety climate include:

i) Slides for managers to advocate hand hygiene
ii) Hand hygiene initiatives for managers
iii) Patient education check list
iv) Sustaining improvement – additional activities for consideration by healthcare facilities
v) Save lives: clean your hands promotional video

Note: Tools can be obtained from WHO website at www.who.int/gpsc/en

3.5 Evaluation of hand hygiene programme

It is important to evaluate the effectiveness of the hand hygiene programme in order to drive improvement and compliance. WHO 'Hand Hygiene Self-Assessment Framework' tool provides a set of indicators that can be scored to give a situation analysis of hand hygiene promotion and practices within a healthcare facility. The Framework will allow documentation of hand hygiene programme and the progression with time.

Note: Tools can be obtained from WHO website at www.who.int/gpsc/en or http://www.who.int/gpsc/country_work/hhsa_framework_October_2010.pdf?ua=1.

3.6 Personal Protective Equipment (PPE)

PPE is intended to protect HCWs from exposure to or contact with infectious agents. These include gloves, gowns, facemasks, respirators, goggles and face shields. The selection of PPE is based on the nature of the patient interaction and relies on the HCW's assessment of the likely risk of coming into contact with blood, body fluids, non-intact skin, mucous membranes, or items that have been contact with these.

3.6.1 Apron / gowns

An apron may be worn where full coverage is not required. It is worn when:

a) There is likelihood of blood contact, especially when initiating and removing patients from dialysis treatment.
b) There is a likelihood of body fluid contact especially with diarrhoea illnesses, uncontrolled secretions, draining wounds, and stool incontinence.

A long-sleeved, fluid-barrier (impervious) gown should be worn if exposed areas of the body e.g. arms, body front, are likely to be contaminated by blood (reprocessing procedure), body fluids, or airborne cases.

Aprons and gowns should be removed and discarded immediately after each use, followed by hand hygiene to avoid transfer of micro-organisms to other patients or environment.

3.6.2 Gloves

In the haemodialysis setting, gloves are recommended to be worn when it is anticipated that the hands will be in contact with body fluids, such as via mucous membranes, non-intact skin, tissue, blood, secretions, excretions or equipment and environmental surfaces that are contaminated with body fluids.

They are not required for routine healthcare activities in which contact is limited to intact skin of the client/patient (e.g. taking blood pressure and dressing the client/patient). While hand hygiene should be universal for all patient contact, the use of gloves should be task specific:

a) Hand hygiene shall be done before wearing and after removing gloves.
b) Gloves should be discarded after completion of the task.
c) Gloves shall be worn whenever exposure to the following:
    - Handling laboratory specimens or used dialyzers.
    - Cleaning machines, cleaning stations, or wiping up blood or other body fluid spills.
    - During cannulation and removal of fistula needles and connection of dialysis catheters.
d) Gloves should be changed when:
    - Moving from one patient or machine to another
    - Moving from a dirty to a clean site/task on the same patient
    - After touching the haemodialysis machine, prior to touching the same patient's vascular access
    - After cannulation procedure
e) Sterile gloves must be used during procedures requiring sterile aseptic technique, such as performing dialysis catheter exit site dressing and cannulation.

3.6.3 Mask, eye protection and face shield

Mask

Mask, eye protection and face shield shall be used to protect the mucous membranes of the nose and mouth, when it is anticipated that a procedure or care activity is likely to generate splashes or sprays of body fluids.

Masks come in various shapes, sizes, filtration efficiency, and method of attachment (e.g. ties, elastic, ear loops). Different types of masks may need to be supplied based on individual HCW needs.

A mask shall be used:

a) When performing central line procedure to protect the sterile field.
b) When experiencing mild cold or cough/ illness. (cough etiquette).
c) When within 2 metres of an unmasked coughing patient. It should be discarded after use, or changed when moist or soiled.

Eye/face protection

Face protection (face shields / goggles / visors) is required when performing at-risk procedures that may generate splashes or sprays of blood or body fluids.

a) Wear during initiation and discontinuation of dialysis treatment
b) Wear during reprocessing dialyzers or cleaning equipment in a sink.
c) They should allow peripheral vision, be adjustable to ensure a secure fit, and incorporate indirect air flow properties to reduce fogging.

d) Hand hygiene should be done before wearing and after removal of mask/eye protection/face shield.
e) Discard between patients or if reusable, clean and disinfect between uses.

3.7 Injection safety

Injection safety includes practices intended to prevent transmission of infectious diseases between one patient and another, or between a patient and healthcare provider during preparation and administration of parenteral medications.

Unsafe practices have led to patient harm; therefore, injection safety includes:

- Use single-dose vials:
- Visually inspect injection vial for any signs of contamination, e.g. visible dust particles.
- Disinfect the rubber septum of the medication vial/ampoule with 70% alcohol and allow it to dry, before puncturing it with a sterile needle to draw medication from the vial/ampoule.
- Use a sterile, single-use, disposable needle and syringe for each withdrawal of medication.
- If use of multiple-dose vial is required, it should be dedicated for a single patient use to reduce the risk of contamination e.g. Heparin.
- Use of single dose vial/ampoule and intravenous solution (bag/bottle) e.g. Venover, Vitamin D and Erythropoietin:
    - A single dose medication vial/ampoule or intravenous solution (bag, bottle or otherwise) shall be used for one patient only.
- Do not combine or pool leftover contents for later use.
- Do not store used single-dose vial/ampoule and intravenous solution (bag, bottle or otherwise) for later use
- If trays are used to deliver medications to individual patients, they must be cleaned between patients.
- Clean areas should be clearly designated for the preparation, handling and storage of medications and unused supplies and equipment.
- Do not handle and store medications /clean supplies in the same or adjacent area that used equipment or blood samples are handled.

3.7.1 Sharps management

Prevention of contamination of injection equipment and medication can prevent an outbreak. HCW should practise strict adherence to basic principles of aseptic technique for the preparation and administration of parenteral medications and these include:

- Where possible the use of needles and other sharps should be eliminated or reduced, e.g. introduction of devices with an integrated sharps injury prevention feature, alternate routes for medication delivery, and reviewing specimen collection procedures.
- Sharps containers shall be located as close as possible to the point of care practice;
- All sharps, including those with safety features, shall be disposed into an approved sharps container and be disposed via a approved vendor.
- Sharps disposal containers should be large enough to accommodate the different types of devices used.

3.8 Respiratory hygiene/cough etiquette

To prevent the transmission of respiratory infections in haemodialysis settings, the following measures should be implemented at the first point of contact with a coughing or potentially infected person.

- Cover nose/mouth when coughing or sneezing with tissues or masks to contain respiratory secretions and dispose of them in the nearest waste receptacle after use.
- Persons unable or unwilling to use tissue or wear a mask should be spatially separated from other patients by at least 2 metres.
- HCWs who care for individuals who are coughing or have a respiratory illness should don a mask when within 2 metres of the individual. In addition, HCWs are advised to don eye protection when performing procedures where splashing or spraying of body fluids may occur.
- Use tissue to contain respiratory secretions and dispose in a non-touch disposal bin (e.g. bin with foot pedal-operated lid).
- Patients and HCWs should perform hand hygiene after having contact with respiratory secretions and contaminated objects/materials.
- Post visual alerts (in appropriate languages) at the entrance of the facilities instructing patients and visitors to inform healthcare personnel of symptoms of a respiratory infection and to practice Respiratory Hygiene/Cough Etiquette.

3.9 Environmental issues including equipment and consumables

There is a risk of transferring infectious material between patients when moving equipment or disposables from patient station to station. Therefore, it is recommended:

a) Any single-use disposable item must be used for only one patient and discarded.
b) Items such as adhesive tape should be dedicated for use on a single patient and discarded.
c) Blood pressure cuffs should be made or covered with a material that can be cleaned and disinfected between patient uses.

d) Patients bringing items such as pillows and blankets from home to the unit for each treatment must take them home afterwards to prevent use by other patients.
e) Unused medications or supplies (e.g., syringes, alcohol swabs) taken to the patient's station should not be returned to a common clean area or used on other patients.
f) Minimise storage of equipment close to dialysis machines and patients.
g) Designate regularly used equipment for each patient, including tourniquets, blood pressure cuffs, clamps and adhesive tape where possible.
h) Dialysis machines should be internally disinfected, externally cleaned (and disinfected if indicated), and allowed to dry after each patient treatment.
i) Special attention should be given to cleaning control panels on the dialysis machines and other surfaces that are frequently touched and potentially contaminated with patients' blood.
j) Cleaning of non-critical surfaces (e.g. dialysis bed or chair, countertops, external surfaces of dialysis machines and equipment) should be done with disinfectant e.g. alcohol wipe after each patient treatment.
k) If the surface/item is visibly contaminated with blood or after each Blood Borne Virus - infected patient's dialysis session:
    i. Pour chlorine based disinfectant (e.g. NaDCC granules or solution) of at least 10,000ppm chlorine over body fluid spills.
    ii. Wear gloves and use disposable paper towels to clean up body fluids spills.
    iii. Dispose them into a biohazard bag and mop the area with institution recommended disinfectant.
l) Communal equipment including weighing scales should be cleaned after use with detergent and water (or detergent-impregnated wipes), if there is any prolonged, direct contact between the patient's skin and equipment surfaces OR if visibly soiled and at least daily.
m) Clinical Waste
    i. A waste bin must be kept in the room and used according to the waste disposal policy.
    ii. Waste bins must be foot operated and have a covered lid.
    iii. Treat all wastes as Biohazard and disposed as per licensing and regulatory requirements to ensure that waste is properly collected, treated and disposed via approved vendors.

3.10 Aseptic technique

Aseptic technique refers to practices designed to render and maintain objects and areas as free from microorganisms as possible. Dialysis staff should be trained in asepsis to protect patient from infection.

An aseptic technique shall be used by all HCWs undertaking invasive medical procedures including insertion and access of vascular devices (haemodialysis catheters/cannulation). Assess staff on the competency level periodically.

3.11 Transmission-based precautions

Transmission-based precautions are recommended in addition to Standard Precautions by the CDC when the route(s) of transmission is (are) not completely interrupted using Standard Precautions alone.

There are three categories of Transmission-based precautions:

1. Contact Precautions,
2. Droplet Precautions, and
3. Airborne Infection Isolation Precautions.

Transmission-based precautions are usually applied for patients who are known or suspected to be infected or colonized with infectious agents, including certain epidemiologically important pathogens that require additional control measures to effectively prevent transmission.

3.11.1 Contact Precautions

Contact Precautions are used in the acute inpatient setting for patients known or suspected to be infected or colonized with epidemiologically important microorganisms that can be transmitted by direct contact with the patient (hand or skin to skin) or indirect contact with contaminated environmental surfaces or patient care items in the patient's environment. However, in ambulatory settings including outpatient dialysis centres they are not practical, effective or necessary. Instead, the use of Standard Precautions is adequate.

3.11.2 Droplet Precautions

Droplet precautions are used for patients known or suspected to be infected with microorganisms transmitted by large particle droplets (larger than 5µm in size) that can be generated by patients coughing, sneezing, and talking when performing procedures.

Transmission requires close contact between source and susceptible host because droplets do not remain suspended in air and generally travel only short distances (up to 2 metres) through the air.

3.11.3 Airborne Infection Isolation Precautions

Patient suspected to be infected with microorganisms transmitted by airborne droplet nuclei (small particle residue of 5 µm or smaller in size) of evaporated droplets that may remain suspended in

the air for long periods of time or dust particles containing the infectious agent. Microorganisms carried in this manner can be dispersed widely by air currents and may become inhaled or deposited on a susceptible host within the same room or over a long distance depending on environmental factors. These microorganisms can remain airborne for up to 2 hours.

Transmissible airborne illnesses include varicella, TB, and measles. Patient identified with a suspected airborne disease should be masked immediately and geographically separated from other patients, preferably in a single room. Arrangements should be made for haemodialysis treatments at a facility that can provide a negative pressure isolation room while the patient is infectious.

3.12 Recommendations

RECOMMENDATIONS:

1) A multifaceted hand hygiene programme must be developed with multidisciplinary inputs and implemented in all dialysis centres.
2) Each healthcare setting must have written hand hygiene policies and procedures.
3) Hand hygiene agents are to be made available at point-of-care in all healthcare settings.
4) Wash hands with soap and water if there is visible soiling with dirt, blood, body fluids or other body substances.
5) Indications where hand hygiene should be performed:
    a. Before contact with a patient.
    b. Before performing an aseptic task (e.g., insertion of IV, preparing an injection).
    c. After contact with the patient or objects in the immediate vicinity of the patient.
    d. After contact with contaminated surfaces.
    e. If hands will be moving from a contaminated-body site to a clean body site during patient care.
    f. After removal of personal protective equipment (PPE)
    g. Before wearing and after removing gloves
6) Educate healthcare professionals about:
    a. Indications for hand hygiene
    b. Factors that influence hand hygiene
    c. Hand hygiene agents
    d. Hand hygiene techniques
    e. Hand care to promote skin integrity
7) Routinely monitor hand hygiene compliance with the provision of timely feedback by using a reliable, validated observer, audit tool and training process.

8) Monitoring should assess compliance with each of the WHO moments to direct education.
9) Results of hand hygiene compliance should be regularly reviewed by the IPC Committee.
10) Other HH measures include: restriction of having long nails and wearing of artificial fingernails which harbour microorganisms.
11) Foot pedal bin lined with black plastic bag should be placed near the wash basin for disposal of paper towels.
12) Posters featuring Hand Hygiene technique and the 5 Moments are to be displayed prominently at all sink areas.
13) Dialysis centres should have a written policy describing the guideline on standard precautions and transmission based precautions.
14) A comprehensive hand hygiene programme should be established in all dialysis centres.
15) All staff should receive education on proper use of PPE.
16) Dialysis staff should be trained in dealing with blood and body fluids spills.
17) A sharps injury prevention programme should be established in all dialysis centres.
18) Facilities should establish policies and procedures for routine cleaning and disinfection of environmental surfaces as part of the infection prevention programme.

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CHAPTER 4 MANAGEMENT OF BLOOD BORNE PATHOGENS

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infection are major causes of acute and chronic liver disease (e.g. cirrhosis and hepatocellular carcinoma). Most people infected with HBV and/or HCV remain unaware of their infection and therefore may transmit infection to others. Testing and diagnosis of hepatitis B and C infection allows for prevention of transmission to others and treatment of the individual.

Blood borne viruses (BBV) are recognised as an infectious hazard in haemodialysis centres as patients maybemaybe exposed during treatment through vascular access and the extracorporeal circuit.

Viruses that present the greatest cross-infection hazard are those associated with a carrier state with persistent replication of the virus in the human host and persistent viremia. The risk of infection is directly related to the concentration of virus circulating in the blood of the source at the time of exposure. These blood borne pathogens include HBV, HCV and human immunodeficiency virus (HIV).

4.1 Hepatitis B (HBV)

HBV has been associated with outbreaks of infection in chronic dialysis centres. During an infection, there are excessive outer coats of protein (hepatitis B surface antigen), relative to the complete virus particle. Testing for HBsAg is used for screening. Patients who are either Hepatitis B surface antigen (HBsAg) positive or have large quantities of HBV DNA in their blood are (very) infectious.

Recent infection with HBV may cause acute hepatitis which is characterised by jaundice and abdominal pain. Some patients develop chronic hepatitis which may lead to liver cirrhosis and liver cancer, while some have a persistent but asymptomatic carrier state. All such patients can transmit the disease to susceptible persons.

4.1.1 Mode of transmission for Hepatitis B

HBV can persist on surfaces and equipment and remain infectious at ambient room temperature for up to 7 days. HBV is spread predominately by percutaneous or mucosal exposure to infected blood and various body fluids. Transmission of the virus may also result from accidental inoculation of minute amounts of blood during haemodialysis procedures and by equipment contaminated with infected blood. HBsAg has been detected on clamps, machine control surfaces,

doorknobs, and other surfaces in dialysis facilities. These blood-contaminated surfaces can serve as a reservoir for HBV transmission, creating the potential for contamination of healthcare personnel hands, equipment and supplies.

4.2 Hepatitis C (HCV)

HCV is less common in Singapore dialysis centres but nonetheless behaves similarly to HBV in terms of its transmission and risk of chronic liver disease (cirrhosis and cancer). The incubation period is around 2 weeks to 6 months with the screening blood test (HCV Ab) usually positive in the first month (but can take 3 months). Acute HCV infection can be asymptomatic (70%).

4.2.1 Mode of transmission for Hepatitis C

Concentrations of HCV in patients with acute HCV infection are transiently high but not sustained and are lower than HBV. Concurrent immunosuppression may increase viral replication and enhance infectivity and this may be relevant to dialysis patients. HCV can persist in an infectious state for at least 16 hours, and potentially much longer, on surfaces at room temperature.

Patients with chronic hepatitis C are infective, and HCV is most efficiently transmitted by direct percutaneous exposure to infected blood or intravenous drug use, inadequate sterilisation of medical equipment, and the transfusion of blood and blood products where HCV was not recognised (eg early infection in the donor).

In Singapore in 2015, a large cluster of HCV infections was identified in a renal ward but the source was never identified.

https://www.moh.gov.sg/docs/librariesprovider5/pressroom/current-issues/ircreport.pdf

4.3 Human Immunodeficiency Virus (HIV)

HIV can be transmitted from person to person through unprotected sexual intercourse, percutaneous exposure to HIV contaminated needles, transfusion of infected blood or blood products, exposure with infected body fluid to mucosal surfaces and non intact skin. AIDS is the advanced stage of HIV infection, when a person's immune system is severely damaged and vulnerable to opportunistic infections.

4.3.1 Mode of transmission for HIV/AIDS

High concentrations of virus are found in the blood during acute infection and late-stage disease when patient may be more infectious. Antibody to HIV is usually detectable 1 to 3 months after infection. Outbreaks of HIV infection in dialysis facilities can occur because of violations of standard practice. Patients on treatment with no detectable virus in their blood are essentially non infectious.

4.3.2 Potential risk for transmitting BBV in outpatient Dialysis Centres may occur in following situations:

- Caring for patients with contaminated hands or gloves as the healthcare workers have not properly performed hand hygiene or changed their gloves.
- Absence of physical barrier that prevents exposure to BBV positive patients.
- Blood contamination of machines and other environmental surfaces.
- Failure to clean and disinfect dialysis machines, equipment, supplies and environmental surfaces properly when they are shared between patients.
- Failure to prevent contamination of parenteral medications which are prepared on common mobile medication carts at patients' dialysis stations.
- Sharing of multi-dose vials of drugs.
- Failing to identify and isolate patients who are positive for HBV (the most contagious of the BBVs).
- No dedicated haemodialysis machines, equipment or supplies for the HBsAg positive patients.
- Failing to vaccinate susceptible patients against HBV.
- The urgency associated with dialysis complications (life-threatening situation) may sacrifice adherence to standard precautions.

4.4 Prevention of BBV transmission in Outpatient Dialysis Centre

Patients on chronic haemodialysis are at increased risk of exposure to BBV infection because accessing the bloodstream is required during the dialysis session, there is close proximity of patients and healthcare personnel have frequent contact with numerous patients and equipment.

The use of Standard Precautions applies to <u>all patients</u> in outpatient dialysis centres regardless of whether Hepatitis B, Hepatitis C and HIV status is known. It is based on the premise that blood may contain transmissible infectious agents.

In Singapore, dialysis centres should isolate those with chronic HBV infection during dialysis. The Association for Professionals in Infection Control and Epidemiology (APIC), Centres for Diseases Control (CDC) and Kidney Disease Improving Global Outcomes (KDIGO) do not recommend the segregation/ isolation of HCV positive and HIV positive patients during haemodialysis treatment. The viral titre in the infected patients' blood and the virus' viability on environmental surfaces are much less compared with HBV resulting in a much lower infection risk.

a) General Precautions

- Outpatient dialysis centre should regularly conduct a rigorous risk assessment and review of their infection control policies and practices to establish the extent of the precautionary measures necessary.
- Staff should observe standard precautions against exposure to blood and adhere strictly to infection control practices to prevent cross-infection between dialysis patients.
- Personal protective equipment (PPE) is required for initiating and discontinuing dialysis.
- Segregate contaminated supplies, contaminated equipment, lab specimens, and biohazard containers from areasareas where clean equipment/supplies are handled.
- The staffing levels and environmental conditions in dialysis units should be sufficient to permit safe working practices.
- Units should review the safety aspects of the environment at regular intervals and whenever a virus transmission has been recognised. Acquisition of a BBV in a dialysis patient is reportable to MOH and will prompt a major investigation.
- Dialysis machines should be internally disinfected, externally cleaned (and disinfected if indicated), and allowed to dry after each patient treatment.

b) Management of Hepatitis B patients

HBsAg positive or HBV DNA positive patients should be dialysed in a designated station, separated physically (e.g. portable screen) from HBV-susceptible patients (negative for HBsAg, anti-HBs, anti-HBc) in an area removed from the mainstream of activity as per CDC recommendations i.e.

- Dedicated dialysis machines and equipment used for Hepatitis B patients should not be used for treatment of any HBsAg negative patients.
- Dialysers of patients with Hepatitis B are not to be reused and are to be disposed in biohazard bags after treatment.
- Segregate supplies, equipment, laboratory specimens and biohazard containers from areas where clean equipment/suppliers are handled.

c) Management of Hepatitis C patients

- Patient who are anti-HCV positive (or HCV RNA positive) do not have to be isolated from other patients or dialyzed separately on dedicated machines.
- It is not necessary to have a dedicated machine provided that disinfection processes are properly carried out between patients according to a protocol that incorporates the manufacturers' instructions.
- Dialysis staff must adopt barrier precautions (e.g. aprons, gown, or gloves) when caring for both anti-HCV positive patients and susceptible patients during the same shift.
- Dialyser of anti-HCV positive patients can be reused if there is adherence to standard infection control procedures.

- Dialyser of anti-HCV positive patients must be washed in an area separate from that used for reprocessing of dialyser for HBsAg and anti-HCV negative patients.
- The staffing level and space between patient's dialysis station should be sufficient to allow observation of good infection control practice.

d) Management of HIV/AIDS patients

Patient with HIV/AIDS can be dialysed in outpatient dialysis centres and adhering to standard precautions.

Patients who are HIV-positive do not have to be isolated from other patients or dialyzed separately on dedicated machines provided that disinfection processes are properly carried out between patients according to a protocol that incorporates the manufacturers' instructions.

Dialysis staff must adopt barrier precautions (e.g. aprons, gown or gloves) when caring for both HIV positive patients and susceptible patients during the same shift.

4.5 Blood Borne Virus (BBV) screening

Patients who require haemodialysis at outpatient dialysis centres should be screened for Hepatitis B, Hepatitis C, HIV and alanine aminotransferase (ALT) before initiating dialysis at the centre, and thereafter at three monthly intervals for Hepatitis B, Hepatitis C, ALT and six-monthly intervals for HIV. (Refer to Table 4.1 for MOH guidelines for screening protocols) Patients who have had screening tests done within six months for HIV and three months for Hepatitis B and C prior to initiation of dialysis need not undergo repeat pre-dialysis screening. Dialysis centres should maintain records of all patients' screening results.

In case of doubtful serology results or abnormal ALT and unexplained ALT elevations, a medical practitioner should be consulted for further evaluation.

Table 4.1: Screening for Blood Borne Diseases at renal dialysis centre

Pre-Dialysis status	Before admission	3 monthly [2 – 4 monthly*]	6 monthly
All patients	Anti-HBs, HBsAg, Anti-HBc (Total)^, ALT, Anti-HCV HIV Ag-AB	ALT	
a) HBV-susceptible [i.e. i) HBsAg, anti-HBs and anti HBc (total) negative; or ii) HBsAg, anti-HBs negative, and anti HBc (total) positive and HBV DNA negative] b) HBV-immune (Anti-HBs pos. (≥10 mIU/mL) and HbsAg, anti-HBc negative; anti-HBc positive and anti-HBs >100)		HBsAg & anti-HBs	
Anti-HCV negative		Anti –HCV#	
Anti-HIV negative			HIV Ag-AB

* 2 – 4 monthly depending on operational requirements

^ Only patients tested positive for Anti-HBc (Total) before admission should be screened for HBV DNA to rule out occult HBV infection

** Patients tested positive for Anti-HCV, HBsAg and Anti-HIV on routine dialysis screenings should be referred to an appropriate clinician for further assessment and evaluation.

Patients tested positive for Anti-HCV, should be tested with EIA supplementary tests or HCV RNA to confirm Hepatitis C infection. Patients who repeatedly test positive for Anti-HCV but negative for the supplementary tests, can be considered for direct HCV RNA testing.

4.5.1 HBV Screening

Screening for HBV is required for isolating the HBV-infected (HBsAg positive or HBV DNA positive) patients, for vaccination status and monitoring through time. It is important to note that a negative HBsAg test does not preclude the presence of occult HBV infection (HBsAg negative, HBV DNA positive).

- All patients should be tested for HBsAg, anti-HBs and total anti-HBc prior to the first dialysis session or transfer to/or from the dialysis services as a baseline.
- Patient who are sero-negative (HBsAg and HBV DNA negative) should be screened three monthly for HBsAg and anti-HBs.
- Patients who are non-immune (i.e. HBsAg negative and anti-HBs < 10mlU/mL of) should be referred for immunisation. A booster dose is required if the anti-HBs level remains < 10mlU/mL.

(Refer to Table 4.2 for interpretation of HBV serology)

- Immunity to HBV infection after vaccination is characterized by the presence of only anti-HBs.
- Non responders should be referred to a Hepatologist/Gastroenterologist for evaluation.
- Patients whose only HBV serological marker is anti-HBc in the absence of acute HBV infection, need to be reviewed to discount ongoing chronic HBV infection in order to treat patients appropriately. If the anti-HBc antibody is positive (regardless of HBsAg and anti-HBs status), a HBV DNA test should be performed to rule out occult HBV infection.
- Patients who test positive for HBV serological markers or HBV should be referred to physician in-charge for evaluation and management.
- For HBV susceptible patients who are returning from travel, it is recommended that HBV testing be performed upon their return to dialysis centre, depending on the particular travel circumstances.
- HBV susceptible and immune patients who receive new therapy (i.e. immunosuppressive or chemotherapy) that may affect their immune status, should be referred to an appropriate clinician for additional screening test as necessary.

Table 4.2: Interpretation of HBV serology

HBsAg	Anti-HBS	Interpretation	Actions to take
Non-reactive	< 10 IU/L	i) If an individual did not have hepatitis B vaccination before, - Not immune to hepatitis B virus	i) Administer hepatitis B vaccination

HBsAg	Anti-HBS	Interpretation	Actions to take
		ii) If an individual had hepatitis B vaccinations before, either: a) the antibody level has waned to less than 10 IU/L, but the individual is still immune to the hepatitis virus. OR b) the individual did not develop immunity against hepatitis B virus after the primary course of hepatitis B vaccination.	ii) Offer a booster dose of hepatitis B vaccination and check anti-HBS within 3 months OR Give them another course (3 injections) of hepatitis B vaccination & recheck anti-HBs within 3 months (to discuss options with patient)
Non reactive	>10 IU/L	Immune to hepatitis B	Immunisation is not required.
Reactive	<10 IU/L	Presence of hepatitis B virus infection	Clinically assess the patient for liver disease. To repeat the HbsAg test 3 months later. If HBsAg positive 2 times, 6 months apart, chronic hepatitis B infection confirmed.

**Under rare circumstances, the emergence of hepatitis B surface mutant ('s' mutant) virus can be associated with the absence of HBsAg and a negative or low titre of anti-HBs antibody.*

4.5.1.1 Hepatitis B immunisation

Outpatient dialysis centres should not send blood for testing for HBsAg within two to three weeks after the administration of HBV vaccine, as during this time HBsAg may be detected. This is referred to as "transient antigenemia", which can lead to an erroneous diagnosis of acute HBV infection and unnecessary concern. Additionally, there is potential risk to the patient if they are inappropriately treated in an HBV isolation area.

Although sufficient time must be allowed between the vaccine administration and the testing of the surface antigen, it is imperative not to skip scheduled antigen blood draw. Ideally, the blood should be drawn immediately before giving the vaccine, which allows sufficient time to avoid transient antigenemia. Patients who do achieve the anti-HBs level of at least 10mIU/mL should be screened three monthly, since patients with ESRD tends to lose their protective level at a much higher rate than normal. A booster dose should be administered when anti-HBs levels decline to less than 10mIU/mL.

(Refer to Figure 4.1 for algorithm for Hepatitis screening and immunisation)

4.5.2 HCV screening

The majority of persons with HCV infection are asymptomatic, making screening necessary to detect infection in high-risk populations, particularly in haemodialysis patients in whom signs and symptoms of acute HCV infection are rarely recognised. Goals of screening this patient population include early detection of HCV infection, treatment of infection and to identify transmission i.e.

- All patients should be tested for anti-HCV and alanine aminotransferase (ALT) prior to the first dialysis session or transfer to/or from the dialysis services as a baseline.
- Patients should be tested for anti-HCV at three-monthly intervals.
- Patients who test positive for anti-HCV should be referred to an appropriate clinician for further evaluation and follow-up testing recommendations.
- Patients tested positive for anti-HCV, should be tested for HCV RNA to establish current infection.
- In certain patient groups (e.g. immunosuppressed patients, transplant patients, patients presenting with acute hepatitis), primary testing by RNA can be considered.
- A positive anti-HCV result indicates one of the following:
  - If HCV RNA is detected, that indicates current HCV infection.
  - If HCV RNA is not detected, that indicates past HCV infection that has resolved or false anti-HCV positivity and testing with another anti-HCV assay can be considered.

4.5.3 HIV Screening

All patients should be tested for HIV prior to the first dialysis session or transfer to/from dialysis services as a baseline and at six-monthly intervals.

4.6 Management of a new case of BBV infection in the outpatient dialysis unit

When a previously unidentified case of a BBV infection is found, the Ministry of Health is to be immediately notified under the Infectious Disease Act (Cap 137). Please refer to the MOH website for instructions on notification (www.cdlens.moh.gov.sg).

<u>In the event of a positive seroconversion or outbreak in an Outpatient Dialysis Centre:</u>

1. Ministry of Health is to be notified within 72 hours
2. Assess the severity and extent of the outbreak
   - Review the laboratory results of all patients to identify any additional case(s).
   - Testing for the respective viral infection is recommended in other patients who have a history of sharing the dialysis sessions or machines with the index patient.
3. Determination/tracking of potential sources for infection which include:

- Revision of newly infected patients' recent history of blood transfusion, invasive procedure(s) and hospitalisation.
- High risk behaviour such as history of injection drug use and sexual contacts.

4. Review standard operating procedures and IPC practices in the dialysis centre.
5. Infection Control Assessment
    a) Environmental cleaning and disinfection practices
        - Routine surfaces disinfection
        - Blood spills management
    b) Medication Practices
        - Medication vials (single-dose, multi-dose)
        - Needle and syringe use
        - Medication preparation, administration and storage
    c) Hand hygiene and gloves use compliance
6. Ensure adequate environmental cleaning and disinfection
7. Adhere to Standard Precautions for infection control
8. Strengthen the framework for supervision and monitoring of staff to ensure compliance with standard operating procedures

4.6.1 Management of a new case of Hepatitis B infection

In patient newly infected with HBV, HBsAg is the only serologic marker initially detected.

- 1 – 2 months later: Repeat HBsAg testing and test for anti-HBs (including IgM and anti-HBc).
- 3 months later: Repeat HBsAg testing and test for anti-HBs.

Susceptible patient(s) at risk of contracting HBV from a newly infected individual should be given a booster dose of vaccine and be monitored for any sero-conversion to become HBsAg positive over a period of 4 months, at intervals not longer than monthly. Hepatitis B immunoglobulin (HBIg) should be considered for those patients who do not respond to the HBV vaccine.

Newly infected HBV patient should be segregated from other patients and the centre should consider monitoring other dialysis patients in the centre for Hepatitis B infection.

4.6.2 Management of a new case of Hepatitis C infection

Diagnosis of HCV infection relies on various assays. Serological assay that detect HCV antibody (anti-HCV) are based on enzyme immunoassays or chemoluminescence immunoassays. Reactive results from HCV antibody testing cannot distinguish between person whose past HCV infection has resolved and those who are currently HCV infected. Detection of HCV viremia relies on nucleic acid testing (NAT) technologies or qualitative and quantitative HCV RNA methods which

have similar limits of detection (10-20 international units [IU]/ml). Acute hepatitis C infection is defined by either:

1. Clinical criteria and positive HCV RNA testing (including qualitative, quantitative or genotype testing); or

2. A test conversion whereby an initial documentation negative hepatitis C virus antibody (anti-HCV) or HCV RNA test result is followed within 12 months by a positive result of any of these test.

Patients at risk of contracting HCV from a newly infected individual should be monitored for indication of sero-conversion (Subsequent screening tests positive for anti-HCV-) at intervals no longer than 3 months.

The exposed cohort should be tested for HCV infection with immunoassay or NAT:

- 2 weekly intervals until 3 months after the last exposure to the identified case
- Patients with resolved HCV infection should repeat testing every 3 months using NAT to detect possible re-infection.

There is no post exposure treatment that will prevent HCV infection. When a case of HCV is identified that is likely to be dialysis-related, outpatient dialysis centre should prioritise adherence to strict infection control practice and aggressive measures be taken to improve hand hygiene (and proper glove use), injection safety and environmental cleaning and disinfection. The centre should also consider monitoring existing patients in the centre for signs of Hepatitis C infection.

4.6.3 Management of a new case of HIV infection

Patient should be tested for HIV antibody as soon as possible after exposure as a baseline and periodically for at least 3 months after the exposure. The use antiretroviral drugs after exposure may reduce the chance of HIV transmission. However, appropriate reduction of dosing for antiretroviral that are primarily renally eliminated is advised for ESRD patients, with additional doses given after dialysis for those drugs that are dialyzable.

The exposed cohort should be tested for HIV RNA by PCR at 2 weekly intervals until 3 months after the last exposure to the identified case.

4.7 Recommendations

RECOMMENDATIONS:

1) Patient Placement

- Patients who are tested positive for HBV serological marker or HBV DNA should be dialysed in a separate room or in a designated station, separated physically (e.g. portable screen) and use dedicated dialysis machines and equipment.
- Except for HBV isolation, the APIC, CDC and KDIGO do not recommend the segregation/ isolation of HCV positive and HIV positive patients during haemodialysis treatment (viral titre in the infected patients' blood and the virus' viability on environmental surfaces are much less as compared with HBV).

2) Outpatient dialysis centres are to follow the recommended screening frequency and schedules for BBV testing of dialysis patients according to MOH's requirements.
3) Outpatient dialysis centres are to follow the recommended doses and schedules of Hepatitis B vaccines for haemodialysis patients

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CHAPTER 5 ENVIRONMENTAL HYGIENE

In the outpatient dialysis setting, each 'patient station' contains a dialysis chair, the dialysis machine, and any other ancillary equipment/supplies necessary to provide treatment. The space for each patient dialysis station or seating must be considered as the patient's exclusive treatment area, and sharing of equipment between patients should be avoided. Any equipment or item used for the patient must not be shared from patient to patient without prior cleaning and disinfection.

Inanimate environments are well documented as reservoirs for microorganisms. Direct or indirect contact with patient's environment poses major risk of cross contamination and spread of nosocomial infections. Cleaning of the environmental surfaces and strict adherence to infection prevention and control guidelines are paramount in reducing the risk of transmission (*see* section on IPC precautions).

Healthcare facilities may be categorised into two components for the purposes of environmental cleaning

a) '*Hotel component'* the area of the facility not directly associated with patient care
b) '*Hospital (HealthCare) component'* relates to the facility that is involved in patient care.

Healthcare setting (*Healthcare component*) surfaces related to patient environment further divided into two groups:

a) High touch surfaces
b) Low touch surfaces

Surfaces closer to a patient pose a greater risk for transmission, with frequently touched surfaces more likely to harbour and transmit microbial pathogens. A resource-effective approach to environmental hygiene should concentrate on high risk, high touch surfaces.

Previous sections have discussed that patients undergoing dialysis are at an increased risk of exposure to infectious diseases, especially BBVs (HBV, HCV, HIV), MDROs and *Clostridium difficile* and the risk is accentuated when there is suboptimal environmental hygiene.

The outpatient haemodialysis setting presents a set of unique challenges related to environmental hygiene because of the spatial cohort of patients and the demands of multiple shifts per day. This setting is one in which patients are typically also not segregated from one another by physical barriers (e.g. walls or curtains). Other factors that that may interfere with environmental cleaning include staff-to-patient ratios, turn-around time between patients and availability of dedicated staff for cleaning.

To ensure IPC practice adherence, the dialysis programme/unit should have a suite of work instructions/policies related to environmental hygiene, and all staff should have Infection Prevention and Standard Precautions training.

5.1 Cleaning in the dialysis unit

Cleaning of the dialysis facility includes patient care areas (patient area, nurses station, dialysis equipment, toilets, weight machine, dirty utility areas) and general areas (waiting area, offices, corridors, storeroom, water treatment room and pantry). Cleaning prepares the environmental surfaces for decontamination or sterilisation. Cleaning and disinfection is essential to prevent and control the spread of environmental pathogens which must be performed between patient treatments or depending whether high or low touch area. Examples of high touch areas are those associated within the **patient zone and devices used frequently across the clinical area.**

Examples of high touch areas:

a) *Patient Zone:*
   - Haemodialysis machine
   - Dialysis chair/bed
   - Blood pressure cuff /machine
   - Cannulation/procedure/medication trolley
   - Patient folders
   - Ancillary equipment/supplies necessary to provide the treatment
   - TV/Multimedia device and/or controller
   - Table or chair used by patients or their caregivers

b) *Devices used frequently across the clinical area:*
   - Computer laptop trolley
   - Intravenous pump machine
   - Weighing scales
   - Door handles
   - Taps and sink area

- Toilet seats and switches
- Call bell
- Support ('Grab') bars

5.1.1 Patient Zone Management

The patient zone is cleaned between patients, and patient scheduling should ensure there is time for consistent cleaning and disinfection. The patient zone is cleaned with disinfectant after every patient or prior to use by the next patient:

- Haemodialysis machine
- Chair or bed (remove cushions or components of chair); attention to arm-rests
- Blood pressure cuff
- Procedure trolley and other dedicated furniture
- Patients clinical notes (medical record)
- Computer screens, TV controllers and Patient Cards (if used)
- Floor area cleaned when there is no patient in zone

Equipment shared should be cleaned using disinfectants after patient use and before removing from the patient zone and returning to general use.

Dedicated patient equipment (tourniquet and cannulation tape) should be stored in cleanable containers marked with patient name and only used for that one patient. All dedicated patient equipment must be disposed of if the patient leaves the clinic permanently.

5.2 Cleaning agents and disinfectants

The main cleaning chemicals used in the healthcare/dialysis facility should adhere to the recommendations from MOH Guidelines (*Refer to National IPC Guidelines for Acute Healthcare Facilities*).

Recommended disinfectants for environmental use in the healthcare setting include:

- **Chlorine: Sodium hypochlorite (bleach)**
- **Quaternary Ammonium Compounds (QUATs)**
- **Ethyl alcohol or isopropyl alcohol in concentrations of (60% - 90%) used to disinfect small surfaces.**

When using a disinfectant:

a) It is important that an item or surface be free from visible soil and other organic items before applying disinfectant. Their presence may reduce or eliminate the effectiveness of disinfectants.
b) Use the disinfectant according to manufacturer's instructions on dilution and contact time.
c) An environmental disinfectant may be used for equipment that only touches intact skin; examples include intravenous pumps and drip poles, blood pressure cuffs.
d) Minimize contamination levels of disinfectant solution and equipment used for cleaning by proper dilution of disinfectant, frequent changing of disinfectant solution.

e) Wear appropriate personal protective equipment. (Refer to *National IPC Guidelines for Acute Healthcare Facilities*).

5.3 Resources for environmental cleaning

There should be adequate resources to achieve optimal cleanliness in the facility. These include:

a) Assigned staff with appropriate training who are responsible for the housekeeping of facility
b) Written policies and work instructions for cleaning and disinfection of patient zone, equipment and environment that includes:
    - Defined responsibility for specific items and areas;
    - Clearly defined lines of accountability;
    - Work instructions for daily and terminal cleaning and disinfection;
    - Work instructions for cleaning in construction/renovation areas;
    - Work instructions for specific environmental microorganisms
    - Policies and work instructions for outbreak management; and
    - Cleaning and disinfection standards and frequency.
c) Adequate staffing to allow thorough and timely cleaning and disinfection;
d) Provision for additional environmental cleaning capacity during outbreaks that does not compromise other routine patient care area cleaning;
e) Training and education of staff responsible for cleaning
f) Regular monitoring of environmental cleanliness (see section 5.4.5 below)
g) If contracted staff are utilised, they require training and the contract should detail the IPC responsibilities. The contract staff should work collaboratively with IPC, nursing and OHS to ensure safety to patients, visitors and staff.

5.4 Management and frequency of environmental cleaning

Generally, the flow of cleaning should be from areas which are considered relatively clean to dirty. This means that areas/elements which are low touch or lightly soiled should be cleaned before areas/elements which are considered high touch or heavily soiled.

The criteria to determine the frequency of cleaning and disinfecting items or surfaces in the dialysis facility is dependent on whether they are high-touch items/surfaces more prone to contamination in direct patient care areas (see table 5.1).

5.4.1 Personal safety

All cleaning staff must be trained on personal protection/safety and comply with the instruction. Failure to comply with instructions will increase the risk for both cleaning and clinical staff and patients. Cleaning staff have the responsibility to co-operate with the clinical staff by working safely and efficiently. Hand hygiene should always be observed and PPE must be used according to facility's work instructions/policies.

5.4.2 Cleaning Equipment & facilities

Cleaning staff should ensure availability of necessary cleaning equipment, materials and chemicals before commencing cleaning. The cleaner's room should be equipped for safe storage of chemicals, access to water source, and hand basin. Cleaning and disinfection equipment should be well-maintained, in good repair and be cleaned and dried between use.

There should be a separate dirty utility room where soiled equipment is cleaned. Chemical cleaning agents and disinfectants should be appropriately labelled and stored in a safe manner to minimise contamination, inhalation, skin contact or personal injury. A Safety Data Sheet (SDS) must be readily available for each item in case of accidents.

5.4.3 Waste Management

To minimise infection, effective waste management is fundamental and must be strictly observed. This includes developing a policy for waste management to identify and segregate types of waste (general and biohazard wastes), handling and disposal methods to reduce cost and protect public, staff and cleaners.

Specifically, the policy would address: -

1. Identification, segregation, handling and disposal of different type of waste

   Use of: -

   i. A licensed waste management company and Colour coded plastic bags or containers

ii. waste containers/bags which should have hazards signage, be leak-proof, moisture resistant and strong enough to prevent tear
iii. sharps containers, that are puncture-proof and available at point-of-care, not overfilled and properly sealed before disposal

2. Staff training and education on hand hygiene, use of PPE, safe handling and disposal of waste;
3. Management of clinical waste (blood stained, soiled items, sharps) should be disposed as biohazard waste
    i. Storage of waste containers stored in a locked room/area
    ii. Frequency of waste transportation, collection and disposal
4. Monitoring, management and documentation regarding
    i. Exposure management
    ii. Waste collection and disposal records

All waste shall be disposed of promptly to maintain a healthy and clean environment that enhances patient care in the dialysis facility.

Table 5.1: Frequency of cleaning

Frequency	Item/Area
After each patient use	**Patient Zone** - patient chair/bed; dialysis machine; BP cuff, patient/procedure table; patient container; other furniture in patient zone; TV controllers; shared equipment e.g. emergency trolley, oxygen equipment, equipment trolleys
Each shift	Clean front door handle (inside/outside) if applicable; patient bathroom handle (inside/outside); weighing scales/ support handles
Daily cleaning - I	Entrance, Clinical area, waiting area, staff station, doctor/consulting rooms, offices, staff room/kitchen, bathrooms; damp mop; all door handles to be cleaned with disinfectant. All rubbish bins are to be emptied and rubbish removed to collection point; Bins wiped, and liners replaced. Thoroughly damp mop hard floor surfaces, using healthcare grade disinfectant.
Daily cleaning - II Cleaning equipment	Cleaning items (including mops heads, buckets etc.) should be inspected and changed as required. The following are basic principles: - – Equipment should be washed with detergent and disinfectant after each use and stored upside down and allowed to dry between uses. – Buckets and containers should be inspected for cracks and replaced accordingly – Mop heads and cleaning cloths should be changed and laundered daily or after each use and changed when visible soiled; as much as possible due disposable items

Frequency	Item/Area
	– Equipment used to clean blood or body fluid/substance spills or when applying transmission-based precautions should be disposable and discarded after use.
Weekly Cleaning	Entrance, clinical area, waiting area, staff station, consulting rooms, meeting rooms, offices, staff room/kitchen. – Food fridges clean inside and out with detergent – Thoroughly dust horizontal surfaces of desks, chair legs – Damp mop all hard surface floors – High shelves damp dusting in clinical and water treatment room – Clean all trolleys, clinical waste bins with disinfectant, dry and replace bin liners – Clean and scrub shower recess area to remove soap residue and sanitise/disinfect; run hot and cold water to flush system
Monthly Cleaning	Entrance area, waiting room, staff station, consulting rooms/offices, meeting rooms, staff room/kitchen – Thoroughly damp dust all shelves, exhaust ventilators, air conditioning ducts and grills. – Clean glass partitions – Shared equipment (if not used): • Oxygen equipment • Emergency trolley • Equipment trolleys
Cleaning as required	**Hard floors** - completely strip sealer and floor finish re-apply a 6-coats system – two coats of high quality floor sealer and four coats of high quality floor finish to exceed the slip resistance standards. **Windows** – Upon request all windows and glass partitioning can be washed, both interior and exterior sides **Every 2 years** – Replace all curtains. If carpets in facility – steam clean

5.4.4 Monitoring

Monitoring should be an on-going activity built into the routine cleaning regimen. Periodic monitoring should take place immediately after cleaning to ensure that cleaning is being implemented as per standards and work instructions. Data from monitoring should be retained and used for trend analysis and benchmark analysis.

Checklists and audit tools will assist in monitoring and documenting cleaning and disinfection. Auditing the cleanliness of the healthcare setting periodically and whenever changes to methodologies are made is essential to ensure achievable standards are maintained and consistent over time.

Measures of cleanliness as applied to each item in the dialysis/healthcare setting ensure consistent, uniform interpretation of requirements for cleanliness. Measures are used for:

- Training of new staff (including cleaning/housekeeping)
- Feedback to staff responsible for cleaning
- Conducting cleaning audits, and
- Ensuring that cleaning expectations are clear and achievable for all staff.

Environmental cleaning audits including the store room should be conducted routinely and results reviewed by the Dialysis Clinic Manager (or equivalent). Any incidents related to consumables or shared patient equipment should be documented on Incident Reporting system and reviewed in accordance with IR and review process. Incidents are summarised and reported on regular (6-monthly) basis and distributed to senior management for discussion and clinical improvement meetings for action.

Work instructions and policies are regularly reviewed to ensure alignment with IPC practices, response to IR, cost-effective and pragmatic in nature for ease of compliance.

5.5 Blood and body substance spillage management

Healthcare facilities must develop a spill management plan with well-defined standard operating policies and work instructions for handling spills, safely. Staff who are managing spills should be trained on safe management of spills and be aware of risks and available options when assistance is required. A spill kit should contain all necessary items to readily clean up spills of a clinical or toxic nature and should be readily available. The spill kit should minimally include the following:

- PPE (Face shield, Face mask, Gloves, Apron and long sleeve gown)
- Absorbent materials/pads
- Receptacle/tongs/scooper (scraper)
- Mops/disposable cloths
- Disinfectant (e.g. Sodium Hypochlorite granules/diluted solution, household bleach)
- Detergent
- Plastic waste bags with appropriate labels
- Warning signage

(Refer to Table 5.2 for management of spills and spillage)

Table 5.2: Steps for management of spills and spillage

Preparation	1. Display signage 2. Limit traffic 3. Collect spill kit or prepare the disinfectant in accordance to manufacturer's recommedation 4. PPE
Remove spill	1. Carefully use absorbent material to absorb as much as possible of spill. If Biospot disinfectant solutions is used, pour over spillage with minimum contact of 2 mins (refer to manufacturer's recommendation) 2. Dispose soaked material using tongs/gloves and collect in biohazard bag 3. Mop area with appropriate disinfectant/detergent solution 4. Perform Hand hygiene after removing gloves
Clear equipment	1. Secure biohazard bag and dispose in biohazard bin 2. In dirty utility room, disinfect and clean equipment with detergent and then disinfectant 3. Perform Hand hygiene 4. Remove caution signs when floor is dry
Document IR	Document incident including an analysis of root cause.

5.6 Construction and Renovation

Renovation and construction work bring increased levels of dust, chemicals and vibration thus release harmful bacteria, spores into the dialysis setting/unit. Consequentially, it also can introduce and increase the risk of acquiring healthcare associated infection (airborne and waterborne bacteria and fungi e.g. *Aspergillus, Legionella*, have caused several outbreaks). To reduce the burden of HAI, it is important that renovation architects/designers and building executives/officers collaborate with the IPC team, clinic operations and healthcare workers to plan, conduct risk assessments and evaluate the construction progress.

The dialysis facility shall ensure an infection control renovation and construction policy is available to guide the staff in the dialysis unit. The policy would include the following key considerations for planning and evaluating the renovation and construction process:

a) <u>Before renovation and construction</u>

- Conduct Infection Control Risk Assessment *see below for details* (Refer to the *National Infection Control Prevention and Control Guidelines for Acute Healthcare Facilities*) ;
- Relocation of activities if needed;
- Plan on hoarding to prevent dust from entering the dialysis centre including all windows, doors, exhaust vents. These areas must be sealed to prevent air leaks into the dialysis unit;
- Removal of medical supplies and equipment from the construction area;
- To decrease exposure for patients during construction activities:
  - divert patient via an alternate route away from the construction site

- minimize waiting and procedure times near construction zones
- offer mask to patient or provide other barriers (e.g. covering open wounds) based on patient's clinical status

b) <u>During renovation and construction</u>

- Regular inspection of construction to ensure compliance;
- Monitor environmental cleaning;
- Surveillance of infections associated with respiratory, fungal, etc.

c) <u>Post renovation and construction</u>

- Ensure environmental cleaning has been carried out before opening the dialysis facility

For Risk stratification matrix for cleaning and frequency of cleaning in dialysis centre, refer to the *National IPC Guidelines for Acute Healthcare Facilities*.

5.7 References

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CHAPTER 6 CARE OF EQUIPMENT AND DEVICES

Routine cleaning and disinfection are necessary to maintain a standard of cleanliness, reduce microbial contamination and control or minimize the spread of infectious agents from infected resident/clients to other resident/clients or hospital personnel. Medical equipment also requires disinfection for safe patient care.

Infections caused by contamination of supplies/equipment with BBVs and pathogenic bacteria have been reported and reinforce the importance of proper handling and adherence to IPC practices.

In principle there should be limited sharing of equipment, however the HD procedure requires the dialysis machine to be used by more than one individual and hence strict adherence to cleaning and disinfection practices and use of standard precautions is required.

Disposable items that cannot be comprehensively cleaned and disinfected (e.g. adhesive tape, cloth-covered BP cuffs and tourniquet) should be dedicated for use on a single patient. External arterial and venous pressure transducer filters/protectors should be changed after each patient treatment and should be discarded after each use.

Dialysis programmes should ensure safe practice with:

a) Clear Policies and Work instructions for all equipment used for HD therapy
b) Staff education and training on equipment management
c) Documentation and record keeping
d) Review practices and competency through regular auditing

Medical devices must be cleaned thoroughly before effective disinfection can take place. Efficiency of this process is dependent on:

a) Prior cleaning
b) Appropriate disinfectant for the micro-organisms present
c) Appropriate strength of the disinfectant
d) Compatibility of the equipment
e) Appropriate contact time

Medical devices should be cleaned utilising Spaulding's classification to disinfection and sterilisation of resident/client-care items or equipment. (See Table 6.1 for Spaulding's

classification) The level of terminal reprocessing required by medical devices is based on the classification system developed by Spaulding. It divides medical devices into 3 categories, based on the patient's risk of infection due contact with various types of devices.

Table 6.1: Spaulding's Classification of Medical Devices and Required Level of Processing/Reprocessing Classification

	Definition	Level of Processing/Reprocessing	Examples
Critical Device	Device that enters sterile tissues, including the vascular system	Cleaning followed by Sterilisation	• Maggil forceps
Semi-critical Device	Device that encounters non-intact skin or mucous membranes but do not penetrate them	Cleaning followed by High-Level Disinfection (as a minimum) Sterilisation is preferred	• Dialyser
Noncritical Device	Device that touches only intact skin and not mucous membranes, or does not directly touch the client/resident	Cleaning followed by Low-Level Disinfection (in some cases, cleaning alone is acceptable)	• ECG machines • Oximeters • BP cuff • Infusion pump

6.1 Disinfection of healthcare equipment

A great number of disinfectants are used alone or in combination (e.g. hydrogen peroxide and peracetic acid) in the healthcare setting. These include alcohols, chlorine and chlorine compounds, Glutaraldehyde, hydrogen peroxide, iodophors, peracetic acid, phenolics and Quaternary ammonium compounds (QUATs). In most instance, a given product is selected for the intended use and applied in an efficient manner. Caution must be exercised on electronic medical equipment.

Choose the recommended disinfectants for environmental use in healthcare setting, e.g.

- Chlorine: Sodium hypochlorite (bleach)
- Quaternary Ammonium Compounds (QUATs)
- Ethyl alcohol or isopropyl alcohol in concentrations of (60% -90%) used to disinfect small surfaces.

When using a disinfectant,

a) It is important that an item or surface be free from visible soil and other organic items before applying disinfectant. Their presence may reduce or eliminate the effectiveness of disinfectants.

b) Use the disinfectant according to manufacturer's instructions on dilution and contact time.
c) An environmental disinfectant may be used for equipment that only touches intact skin; examples include intravenous pumps and poles, blood pressure cuffs.
d) Minimize contamination levels of disinfectant solution and equipment used for cleaning by proper dilution of disinfectant, frequent changing of disinfectant solution.
e) Wear appropriate personal protective equipment.

6.2 Care of devices & equipment

HD equipment includes HD machines, dialysers, water supply/treatment/distribution systems, component parts such as tubing and dialysers, acid and bicarbonate concentrate solutions, and instruments including blood pressure cuff, stethoscope, and clamps. HD machines need to be cleaned and disinfected after each use. Sterile and clean supplies are also integral to the provision of HD. Infections caused by contamination of supplies/equipment with BBVs and pathogenic bacteria have been reported. Refer to Section 6.4 for disinfection of HD machines.

6.3 Dialyser reprocessing

Dialyser reprocessing has been used in chronic dialysis programmes since the 1960/70s. Recently the percentage of countries using the practice of dialyser reprocessing has declined, in part due to inherent potential risks of cross-infection associated with its practice. The clinical practice guidelines (KDOQI, AAMI standards) do not advocate reprocessing of dialysers for patients with HBV. Therefore the dialysis facility should practice the use of single-use device such as dialyser to reduce cross-infection risks to patients and staff.

6.4 Haemodialysis machines

The disinfection, cleaning and management of haemodialysis machines, whether used for conventional haemodialysis or haemodiafiltration is critical in reducing the cross-infection risk. Dialysis programmes should ensure they have in practice:

1. Policies and Work Instructions
2. Documentation/records
3. Staff education/training for machine/equipment management
4. Staff competency and auditing programme
5. Surveillance and Risk management programme

Haemodialysis machines are routinely cleaned and maintained by the dialysis unit staff. After each patient use, the exterior surfaces of the machine are disinfected (ideally a disinfect wipe, minimising aerosol of disinfectant) compatible with manufacturer's guidelines. All manufacturers provide guidelines for the disinfection of the internal fluid pathways of the haemodialysis machines. There are two methods of disinfecting the internal fluid pathways of the HD machines:

i. Heat disinfection; or
ii. Chemical disinfection.

The dialysis facility should follow the standards recommended by the manufacturers to perform disinfection of the dialysate pathways.

6.4.1 Heat disinfection

Heat disinfection is an auto-cycle that subjects the pathway to an 80^{o}+ C water temperature for approximately 10minutes exposure time and complete cycle of 30-40 minute. This procedure can be in conjunction with agents e.g. Citrosteril® which is a potent thermos chemical disinfectant solution, which also removes the $CaCO_3$ (i.e. decalcifies) and disinfects in the same process. Further it is non-toxic and biodegradable. Heat disinfection is to be done as per manufacturer's instructions.

6.4.2 Chemical disinfection

Chemical disinfection can be accomplished using a variety of solutions e.g. peroxyacetic acid (compound comprised of peracetic acid and hydrogen peroxide). When using a chemical disinfectant, it is important to follow the manufacturer's recommendation regarding concentration and dwell time. Chemical disinfection is to be done as per manufacturer's instructions.

6.4.3 Policies and processes for disinfection of HD machines

Inactive HD machines could potentially develop bacterial growth and should be disinfected daily, in readiness for safe patient use. There should be a plan with work instructions to ensure the 'Standby'/inactive machines are disinfected at frequency as per manufacturer's guidelines. Most contemporary HD machines provide internal digital records of the disinfection history.

All dialysis programmes should have Policies and Work Instructions to guide staff regarding the type, frequency and process of HD machine disinfection and cleaning cycles to ensure safe, functioning machines for dialysis treatment.

As part of the HD machine disinfection the following components require regular cleaning:

- The dialyser couplings and shunt interlock
- Concentrate wands and/or powdered concentrate connectors
- Sealing area of the concentrate suction tubes
- Air-vent (filter) usually located at back of machine.
- Disinfection cycle must be performed after cleaning the dialysate components as per manufacturers recommendations.

Haemodialysis treatments using high-flux dialysers, haemofilters and haemodiafilters increases biomaterial deposits in the hydraulics and requires further regular cleaning, including monthly schedule for bleach disinfection cycle, followed by the regular disinfection cycle at the end of the scheduled day. If using Haemodiafiltration therapy the frequency may be increased to weekly; review manufacturer's guidelines.

If a blood leak occurs during the dialysis treatment (blood has leaked into the dialysis fluid pathway and the machine hydraulics), bleach disinfection is required to remove the biomaterial from within the dialysis fluid pathway, and the following shall be carried out:

- Bleach disinfection cycle immediately after treatment concludes;
- The usual rinsing and disinfection procedure shall be performed twice before the system is used on a different patient; **or**
- Follow with routine disinfection cycle accordingly to manufacturer's instructions.

To monitor the effectiveness of the machine disinfection schedule, regular microbiological testing should be scheduled, guided by ISO fluid for haemodialysis standards (*See* Table 6.2 for ISO 23500 standards). The schedule is developed to ensure the machines and distribution network is monitored at a minimum of 3 months and that each machine is tested at least annually.

Table 6.2: Sampling and Limit levels (ISO 23500 (2014 , ISO 23500-5 (2019) Guidelines Quality of dialysis fluid for haemodialysis and related therapies)

Fluid Type	**Frequency**	**Limit levels (ISO 2019)**	**Action Levels**
Dialysis water	Minimum of every 3 months	<100 CFU/ml Endotoxins< 0.25 EU/ml	50 CFU/ml <0.125 EU/ml
Dialysis Fluid	Minimum of every 3months*	<100 CFU/ml Endotoxins< 0.5 EU/ml	50 CFU/ml <0.25 EU/ml
Ultrapure Dialysis Fluid	Minimum of every 3 months*	< 0.1 CFU/ml Endotoxins < 0.03 EU/ml	NA
Substituion fluid	Establish safe practice; monitor frequency to reach standards	$<10^{-6}$ CFU/ml Endotoxins <0.03 EU/ml	NA

* ISO 23500 (2014) & ISO 23500-5 (2019) Guidelines states for testing frequency regular surveillance of WTS with increased frequency post implementation of WTS to ensure safety levels reached and maintained.

All machine results should be recorded and tracked with appropriate action taken based on:-

a) Results and trend
b) Knowledge of water treatment system including the distribution loop characteristics/structure.
c) Results may reflect individual machine problems for resolution or
d) Systematic problems requiring change in disinfection practices and update/review of current policies and work instructions.

The Medical Director of the dialysis unit/programme should review the machine results and 'sign-off' on both the laboratory results and action plan.

6.5 Auxillary equipment

All equipment that is non-single use, used in the care of patients managed on dialysis needs to be cleaned and disinfected in between patients. The equipment devices include but not limited to:

a) Blood Pressure Cuff
b) Glucometer
c) Thermometer devices
d) Body Composition Monitor
e) Transonic® Machine
f) Doppler/ultrasound tools
g) Infusion pumps

All equipment requires instruction/training from the manufacturer. Using both the training and manufacturer's manual as a guide, work instructions should be developed for both practice and cleaning for safe clinical use.

In adherence with IPC and standard precautions all these devices are required to be cleaned with disinfectant after patient use before removing from the patient zone and returning to general use. The disinfectant wipe (or equivalent) must be 'wet' enough to ensure all surfaces are exposed to disinfectant for cleaning; more than one wipe may be required.

A register of all auxiliary devices and the location of the work instructions may be of assistance with devices less frequently used in dialysis practice.

6.6 Recommendations

RECOMMENDATIONS:

1) There should be clear policies and work instructions developed and regularly reviewed that cover the reprocessing procedure, managing and cleaning the reprocessing equipment, documentation, training and auditing.

2) Environment:

- There should a designated area allocated for dialyser reprocessing if this is the practice in the dialysis facility. The area should be well ventilated and have enough space for the equipment and for allocated staff to safely perform the procedure.
- There should be 2 separate sinks – one for hand washing only and the other for dialyser reprocessing.
- The room should have access to Reverse Osmosis (RO) treated water, space for storage of reprocessed dialysers, sterilant and an eye-wash station for management of chemical splash. An area in the room should also be allocated for documentation/recording of the procedure, Safety Data Sheets for chemical solutions and data collection/maintenance records.

3) Equipment

- Automated reprocessing machines are recommended by the clinical practice guidelines to ensure measurement of effectiveness of procedure by undertaking 'pressure holding test' and 'residual volume', a measure of effective surface area. These reprocessing machines may have adjunct features that enable the user to label and scan the dialysers, facilitating safe recording and labelling.
- The reprocessing machine requires work instructions in-line with the manufacturer's machine manual that includes compatibility of disinfectants and cleaning solutions.
- The dialysers and reprocessing machines utilise RO water and monitoring of the safety of the RO water together with regular disinfection.

4) IPC practices

- When practising dialyser reprocessing staff must comply with PPE use and ensure gloves are changed between dialyser reprocessing to reduce cross-infection.
- Ideally staff should be scheduled for reprocessing and not move between the treatment and reprocessing areas. In cases where they are required to move between the areas they must change their PPE and implement hand hygiene before entering treatment area.
- Dialysers delivered to the reprocessing room should be delivered in plastic lined container that includes dialyser and blood lines, reducing blood spillage in the treatment area and cross-contamination.

- Caps from the dialyser should be stored in individual containers for each patient's dialyser and stored in germicide e.g. 1% Renalin® 100 solution. Dialyser port caps shall **never** be disinfected in a shared container or swapped to another dialyser.
- Each reprocessed dialyser is labelled with patient's name, reprocessed number and status of quality control parameters measured for dialyser reprocessing. The dialyser housing is then wiped with compatible low-level germicide; separate wipe for each dialyser. To ensure germicide effectiveness and stability the reprocessed dialysers are stored in a dark environment, caps are secured and require at least 11 hours exposure before the next use (Peracetic acid, Renalin®)

5) Recording keeping is required which include:
   - Germicide dilution checks
   - Water testing results
   - Logs of dialyser reprocessed, including information on reuse number, TCV (total cell volume), pressure holding test, potency test. Visual inspections, dialyser failures and disposal
   - Incident reports or investigations; patient and staff exposures
   - Audit results of reprocessing and practices and compliance
   - Education and training sessions; attendance records, training materials, competencies and evaluations
6) Strict adherence to IPC practices and patient safety is critical to success and reliability of a dialyser reprocessing programme.
7) Establishing policies and work instructions, training of staff and reinforcement of best practice by regular monitoring and auditing is the hallmark of safety and viability for a dialyser reprocessing programme.
8) Dialysis units/programmes should have WI developed from Machine Manuals and IPC Guidelines, for the cleaning and disinfection of the Haemodialysis machine.
9) Staff should be educated/trained on safe machine management.
10) Monitor HD machine fluid for dialysis and water for culture and sensitivity and take appropriate corrective action when required.
11) Disinfect HD machines as per manufacturer's instructions.

6.7 References

1. ANSI/AAMI RD47:2008/(R) 2013. Reprocessing of hemodialyzers. Association for the Advancement of Medical Instrumentation. Arlington USA
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3. ISO 11663:2014; Quality of dialysis fluid for haemodialysis and related therapies; ISO 23500 -5 (2019)

4. ISO 13958:2014; Concentrates for haemodialysis and related therapies; ISO 23500 -4 (2019)
5. ISO 23500 :2014; Guidance for the preparation and quality management of fluids for haemodialysis and related therapies; ISO 23500 -1 (2019)
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8. AAMI Standards for dialysis 2015 edition

CHAPTER 7 WATER QUALITY

Contaminants commonly found in tap water are toxic to haemodialysis patients. Hence, treated water used in patient care at the Dialysis Centre is fundamental for safe dialysis. Water constitutes >90% of the dialysate (Fluid for dialysis), emphasising the importance of monitoring the water quality. The water produced by reverse osmosis (RO) should have optimal chemical and microbial quality. Water quality assurance is a product of monitoring the water throughout the water treatment system (WTS), and includes regular disinfection, testing and procedures for actionable levels.

Preventative disinfection is the only means to control or prevent bacterial growth in the WTS, Consequently, RO membranes must undergo periodic cleaning and disinfection as per manufactuer's instructions. Furthermore, disinfection must include all pipes in the distribution system, including the inlet lines to the dialysis machines (the most common source of contamination in a fluid system is growth in the distribution pipes).
Additionally, to guarantee the quality of the feeding water and dialysis fluid (dialysate) a final filtration system made of microfilters removes bacteria and endotoxins by sieving and absorption processes (e.g.*Endotoxin Filter*).

Regular microbiologic sampling of dialysis fluids is recommended because gram-negative bacteria can proliferate rapidly in the water and dialysate in haemodialysis systems. High levels of these organism place patients at risk of pyrogenic reactions or healthcare-associated infections (HAI).

Bacteriologic and endotoxin assays are performed to validate the disinfection process and frequency, not to determine when disinfection is needed. If the HD facility's testing results are below the action levels, this suggests that the process and frequency of disinfection is effective. If testing results are above acceptable levels for bacteria/endotoxin, this would suggest that either disinfection processes or frequency are not sufficient to control bacterial growth. An adjustment to the frequency or/and process of disinfection would be indicated to keep bacteria/endotoxin below acceptable thresholds.

7.1 Microbiologic and Endotoxin sampling tests

1. Perform testing at least bi-weekly until a consistent quality of WTS is established on installation or when there are changes to the WTS; implementation process surviellence is maintained for 6 months

2. Once WTS quality established, perform bacteriologic assays of water and dialysis fluids at least three -monthly
3. More frequent monitoring would be required during outbreaks/equipment change until water quality re-established.
4. Measurements would be using standard quantitative methods (ISO 23500-1, 23500-3, 23500-5); *Culture techniques for dialysis water (permeate) and standard dialysis fluid (dialysate) See* Table 7.1 Below.
5. Dialysis Water used to prepare Fluid for dialysis (dialysate shall contain a total viable microbial count lower than 100 CFU/mL and less than 0.25 EU/mL
6. For centres practicing on-line haemodiafiltration, the microbial count should be from infusion port and less than10-6 CFU/ml and <0.03 EU/mL*

Table 7.1: Culture techniques for dialysis water (permeate) and standard dialysis fluid (dialysate)

Culture medium	Incubation temperature	Incubation time
Tryptone Glucose Extract Agar (TGEA)	17°C to 23 °C	7 days
Reasoner's agar no. 2 (R2A)	17°C to 23 °C	7 days
Tryptoic Soy Agar (TSA)[a]	35°C to 37 °C	48 hours
[a]The use of TSA has been only validated for measurement of standard dialysis fluid.		

7.2 Sampling source

For central RO systems, the recommended sampling location for bacteria/endotoxin samples are the first point of use, last point of use, and any auxiliary points e.g. reprocessing machine/s and/or concentrate mixing system ie. Anything connected to the RO- water distribution system.

The ISO 235000 (2019) recommends sampling frequently determined by regular surveillance. However, when repairs to the RO system result in intrusion to the membrane and dialysis water/fluid pathways, or when pyrogenic reactions are suspected, increased monitoring is required until quality standards established.

For portable systems, the recommended sampling frequency is quarterly or as recommended by manufacturer, when repairs are performed and during suspected pyrogenic reactions.

Note: There are portable systems that have been developed which incorporate an exchangeable cartridge that produces RO water. Testing frequently for these systems are the same as for portable systems.Product water used to prepare dialysis concentrates from powder at a dialysis facility, or to reprocess dialyzers shall contain a total viable microbial

count lower than 100 CFU/mL and an endotoxin concentration lower than 0.25 EU/ mL. The threshold for action level for the total viable microbial count in the product water shall be 50 CFU/mL, and the action level for the endotoxin concentration shall be 0.125EU/mL.

7.3 Sample collection

1. Follow proper procedures (aseptic non-touch technique) to collect samples to prevent potential contamination which may lead to a false positive result:
    a) Rinse sampling ports for at least 1 minute at normal pressure and flow rate before using a “clean catch” technique to collect samples; or
    b) Aspirate samples with needles from the sampling ports of dialysis machines aseptically following manufacturer’s instructions. Sample ports should be disinfected with alcohol pads and allowed to air dry before the sample is drawn.
2. Sample testing should be performed at least 3 monthly on the water treatment system; and at least annually on dialysis machine.

7.4 Monitoring

7.4.1 Sites

For monitoring of the water distribution system, samples should be taken from:-

a) the first and last outlets of the water distribution loop; a tap/valve should be located at inlet line station 1 of the distribution loop
b) the outlets supplying reuse equipment (if used) and
c) concentrate mixing tanks (if used).

If the results of these tests are unsatisfactory, additional testing (e.g. on the ultra-filter inlet and outlet, RO product water, and storage tank outlet) should be undertaken to identify the source of contamination.

7.4.2 Installation and monitoring

For a newly installed water treatment system (distribution piping system), or when a change has been made to an existing system, it is recommended that *at **least monthly (starting with bi-weekly to evaluate stability of system)*** testing be conducted for **6 months** to verify that bacteria or endotoxin levels are consistently within the allowed limits. The test(s) should be performed according to the manufacturer’s recommendation. After installing a water treatment, storage and distribution system, *the user* is responsible for continued monitoring of bacterial levels of the system to comply with the requirements of this standard.

7.4.3 Review and Action levels

All bacteria and endotoxin results should be recorded on a log sheet to identify trends and the need for corrective action. Any such actions should also be recorded if indicated. The Medical Director of the clinic needs to sign-off on both the results and actions. Review and

corrective action needs to be prompt – within 48 hours to ensure patient safety and reduce risk.

7.4.3.1 Action Level

Refers to corrective measures that need to be taken to reduce the levels of bacteria/endotoxin, **within 48 hours** of receiving the report.

- For bacteria/endotoxin levels exceeding the maximum allowable levels, the medical director must determine the course of action.
- The medical director must assess the impact to the patient and determine which option would result in a more detrimental outcome for the patient: not receiving the treatment or using a equipment/dialysis system that contains greater than the allowable CFU and EU limits.
- Take corrective action (may include WTS disinfction and review of policies/procedures)
- When limits exceed the maximum level, perform increased frequency of cultures/monitoring until a stable trend has been re-established demonstrating control of the bacteria/endotoxin levels which does not exceed the maximum allowable.

7.5 Recommendations

RECOMMENDATIONS:

1) Sample testing for bacteria and endotoxin should be performed at least 3-monthly on the water treatment system; *and at least annually on dialysis machines*. Ensuring the WTS is monitored at least 3-monthly and machine points are scheduled so that individual machines are tested at least annually
2) Where counts reach action level, prompt corrective action (within 48 hrs of receiving report) should be taken to reduce the levels of bacteria/endotoxin.
3) Dialysis centres/programs should have policies and procedures for:
   - Disinfection of WTS and distribution loop
   - Testing schedules
   - Collecting samples
   - Results and Action level management

7.6 References

1. ISO 23500 Parts 1, 2,3 & 5. Guidance for the preparation and quality management of fluids for haemodialysis and related therapies. International Organisation for Standards. Switerland

2. ISO 13959 Water for haemodialysis and related therapies 2014
3. ISO 26722 Water treatment equipment for haemodialysis applications and related therapies 2014
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CHAPTER 8 SURVEILLANCE AND OUTBREAK MANAGEMENT

8.1 Surveillance

Patients undergoing dialysis treatment have frequent insertion and removal of dialysis catheters and cannulations of arteriovenous fistula and graft. Therefore infection is a considerable risk in the dialysis unit which may realise sporadic transmission or an outbreak of blood-borne viruses, bloodstream infections and other complications.

Surveillance is a method used to monitor, review and evaluate all patient serological testing for Blood-borne viruses (BBV), microbiological screening of multi-drug resistant organisms (MDRO), potential seroconversion from overseas dialysis and any infections. A surveillance system allows a dialysis facility to track infections, evaluate treatment, measure outcomes and improve performance and benchmark against local, national and international level.

The dialysis facility shall develop and maintain a record-keeping system (e.g. book or electronic file) to document the results of patients serologic testing for viral hepatitis (including ALT), HIV, episodes of bacteraemia, vascular access infection, infectious diseases (Measles, Pulmonary Tuberculosis, Chickenpox etc.) and vaccination status.

Routine surveillance for carriage of MDROs is not recommended in outpatient settings as this will change with time. Instead manage all patients with well implemented standard precautions.

8.2 Outbreak management

Outbreak management and control should be considered a high priority for the dialysis centre. It is recommended that the Dialysis Centre keeps an ongoing baseline surveillance of patients and staff for common infectious diseases symptoms, such as:

- Respiratory symptoms – fever, cough, running nose, sore throat
- Chickenpox
- Hepatitis

8.2.1 Identification of an outbreak

An early sign of an outbreak is indicated by an increase in number of persons with infectious disease symptoms that is above the baseline norm.

Outbreaks may be associated with specific groups of residents, location, contaminated products or devices, HCWs and/or healthcare practices. Outbreaks of infectious disease may occur in dialysis centres.

8.2.2 Triggers for notification to MOH

MOH should be informed of the outbreak, if any of the following criteria are met:

- 10% of the total population (patients and staff) within 14 days are affected with the same illness
- 10 cases within 3 consecutive days
- Case(s) are severely ill [Dangerously Ill List (DIL) or in Intensive Care Unit (ICU)] or died.

All clusters of IDs which have met MOH's reporting criteria should be notified to MOH **within 24 hours of detection** via email (reportidcluster@moh.gov.sg), using the MOH Email Notification Template (Refer to Table 8.1). For urgent notifications or requests for assistance, LTCFs must contact the MOH at 9826 9294 directly, followed by formal notifications via email. Once notified, MOH will also assist the affected institution to monitor the situation, provide advice on additional infection prevention and control measures, and facilitate identification of pathogen(s) through laboratory testing, if necessary. Please refer to *MOH Guidelines on the notification of clusters of infectious diseases in Singapore* for details on notification of ID clusters.

Table 8.1: Email notification template for clusters of infectious diseases

S/N	Information required	Example
1.	Name of institution	ABC Nursing Home (COO Office)
2.	Address of Institution	111 May Road S(123456)
3.	Point of contact Contact number	Ms ABC (Manager) 61234567
4.	Number of cases as at date and time	13 as of 11 am, 11 Oct 2017
5.	Signs and symptoms	Abdominal pain, diarrhoea
6.	Onset date for the first case(s) Onset date for the last case(s)	8 Oct 2017 10 Oct 2017
7.	Current strength of residents and staff	122 residents 49 staff, including office and admin staff
8.	Number of cases hospitalised, if such info is available	2 at XXX Hospital

8.3 Outbreak investigation

All outbreaks, however minor, should be investigated promptly and the outcomes of the investigations documented.

8.3.1 Determine the existence of the outbreak

This can be done by comparing with the baseline rate of the disease or pathogen involved in the suspected outbreak. A quick analysis of past surveillance data may help towards this.

8.3.2 Verify the diagnosis of reported cases

Laboratory reports and medical records are reviewed and discussion with the attending physician is done during this step.

8.3.3 Define a case

Case definition is developed to help in identifying new cases, if any. This should include clinical information about the disease, characteristics of the people who are affected, information about the location and specification of time period for the outbreak.

8.3.4 Develop a line listing

This helps to display relevant information on each case to help determine risk factors for the outbreak development. Information gathered may include procedures, location, contact with healthcare workers, antimicrobials used, etc.

8.3.5 Perform descriptive epidemiology

An epidemic curve is drawn to help give useful tips on size of the outbreak, type of exposure (point source, person-person), time of exposure, progress of outbreak. This is drawn with the number of cases displayed on y-axis whilst the x-axis displays date of onset of the illness or symptom.

A geographical map showing the floor plan of the ward with cases marked out will also help to give new information and understanding of the outbreak.

8.3.6 Develop and test hypothesis

Develop a hypothesis using information from the descriptive epidemiology.

8.3.7 Implement control measures

Type of control measures to be used is determined by findings from the line listing and observations. Appropriate standard and transmission-based precautions are applied. Timely

education on hand hygiene or care of devices as well as audits may be required. Immunization or prophylaxis, if needed and relevant may be used to help control spread of the outbreak. Visiting arrangements by family members or friends should also be defined as part of the control measures.

8.3.8 Communication

The outbreak management protocol should also include the notification of the respective stakeholder e.g.

a) Healthcare and ancillary staff in immediate area
b) Supervisor of facility
c) IPC Personnel
d) MOH

It is good practice to also notify the appropriate regional general hospital of the outbreak in order to facilitate transfers of patients requiring acute medical attention or treatment and also to restrict care of patients to the dialysis centre during the duration of the outbreak.

8.3.9 Formation of Outbreak Control Team

This may be required in the case of an outbreak that requires more input from various people. The team may include the following:

a) Administrators (Medical and Nursing)
b) Managers of affected areas
c) IPC professional or designated person with IPC experience

8.3.10 Closure and report writing

A written report describing the outbreak and evaluating the control measures of the outbreak is helpful to identify learning points or gaps in practices that may require improvement action.

8.4 Recommendations

RECOMMENDATIONS:

1) The dialysis centre shall implement the following surveillance:
   - Prevalence of patients and staff Hepatitis B (Antigen and Antibody)
   - Hepatitis C
   - Human Immunodeficiency Virus (HIV)

2) All patients must be tested for HBsAg, anti-HBs, anti-HBc, HCV and HIV according to MOH's recommenation, before admission or transfer to/or from the dialysis service or whenever necessary.All results must be reviewed by the nurse manager in charge of the dialysis centre.
3) All anti-HBs negative or less than 10miu/ML patients should be vaccinated against Hepatitis B Virus (HBV).
4) Non-responder staff shall be referred to a hepatologist for further management.
5) Any abnormality or confirmed seroconversion shall be referred to the nephrologist in-charge, endocrinologist or primary physician in the acute hospital immediately.
6) Dialysis centre may include other surveillance in accordance to individual organisational policy such as:
   a. Vascular access infections

      Vascular access (catheter, fistula or graft) is the lifeline of haemodialysis patients. Bloodstream and vascular access infections can cause frequent hospitalisation, which resulted in increased use of anti-microbial antibiotics that pose risk of acquiring multi-drug resistant, morbidity and mortality. Dialysis centre may conduct surveillance for bloodstream infection (BSI), local access site infection (LASI), access-related bloodstream infection (ARBSI), and vascular access infection (VAI) as recommended in CDC Dialysis Event Surveillance Protocol to detect early signs of infections and implement measures to review catheter bundles practices.
   b. Infectious diseases (MD131 – Notification of Infectious Diseases)

      Dialysis providers also should be aware of their responsibility to monitor and report clusters of infections or other adverse events to MOH in accordance to MD131: Notification of Infectious Diseases. Failure to report illness clusters to MOH can cause delay to recognise potential disease outbreaks and implement infection prevention and control measures.
7) Each Dialysis Centre should have a written policy describing how an outbreak is identified and managed.

8.5 References

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CHAPTER 9 PANDEMIC PREPAREDNESS

9.1 Pandemic response plan

A pandemic is a global outbreak of an infectious disease which arises from cross transmission by different diseases like Severe Acute Respiratory Syndrome (SARS), H1N1 influenza, ranging from mild to very severe. It occurs when the whole population has little or no immunity to the disease including dialysis patients. To protect this vulnerable population, MOH has a national response plan "Disease Outbreak Response System Condition", or DORSCON (colour-coded framework). This intends to prevent, manage and reduce the impact of infections in the community and allow the individual renal facility to continue with their business (Table 9.1).

Table 9.1: MOH's DORSCON Framework

Colour	Nature of Disease	Impact on Daily Life	Advice to Public
Green	Disease is mild **OR** Disease is severe but does not spread easily from person to person (e.g. MERS, H7N9)	Minimal disruption e.g. border screening, travel advice	• Be socially responsible: if you are sick, stay home • Maintain good personal hygiene • Look out for health advisories
Yellow	Disease is severe and spreads easily from person to person but is occurring outside Singapore. **OR** Disease is spreading in Singapore but is **(a)** typically mild i.e. only slightly more severe than seasonal influenza. Could be severe in vulnerable groups. (e.g. H1N1 pandemic) ***OR*** **(b)** being contained	Minimal disruption e.g. additional measures at border and/or healthcare settings expected, higher work and school absenteeism likely	• Be socially responsible: if you are sick, stay home • Maintain good personal hygiene • Look out for health advisories
Orange	Disease is severe **AND** spreads easily from person to person, but disease has not spread widely in Singapore and is being contained (e.g. SARS experience in Singapore)	Moderate disruption e.g. quarantine, temperature screening, visitor restrictions at hospitals	• Be socially responsible: if you are sick, stay home • Maintain good personal hygiene • Look out for health advisories • **Comply with control measures**
Red	Disease is severe **AND** is spreading widely.	Major disruption e.g. school closures, work from home orders, significant number of deaths.	• Be socially responsible: if you are sick, stay home • Maintain good personal hygiene • Look out for health advisories • Comply with control measures • **Practise social distancing : avoid crowded areas**

The pandemic response plan establishes a proactive and effective infection prevention and control (IPC) system which communicates with internal and external stakeholders to minimise and prevent unnecessary morbidity and mortality. It also enables the dialysis facility to be better prepared of sudden surge in demands of vaccines, pandemic stockpiles, dialysis capacity, holding area, entrance and exit, staffing, screening (triaging), staff and patient education, travel restrictions, quarantine and surveillance.

9.2 Recommendations

RECOMMENDATIONS:

1) Risk assessment to identify possible exposure and health risk to patient, Healthcare Workers (HCWs) and visitors.
2) Develop a pandemic preparedness plan together with stakeholders and periodic review to evaluate the organisational needs to streamline the plan and protect everyone from harm.
3) Establish communication plan:
    - Appoint the chief command and committee for pandemic preparedness plan
    - Develop internal and external communication plan with staff, physician, patients, visitors, vendors, suppliers, volunteers and public.
    - Provide ongoing update to staff on the pandemic situation in accordance with MOH's directives and circulars and World Health Organization (WHO)
    - Consolidate and analyse daily reports from the dialysis centre which includes fever-related and suspect cases, staff medical leave and daily temperature monitoring
4) Develop a pandemic preparedness plan and policy to respond by slowing down and limiting the spread of disease to reduce the surge on the healthcare system and maintain essential dialysis services and limit community disruptions.
5) Maintain a surveillance system to monitor HAI and infectious diseases.
6) Identify a holding area for febrile or suspect case till ambulance arrival.
7) Maintain essential one-week pandemic stockpile always in accordance to MOH's directives which includes cleaning and disinfection supplies, personal protective equipment (isolation gown, gloves, N95 mask, surgical mask), alcohol-based handrub, chlorhexidine handwashing solutions etc.)
8) Provide essential training for staff on:
    - pandemic response, containment and mitigation plans and refresher when necessary
    - standard and transmission-based precaution and terminal cleaning
9) Conduct an annual pandemic table-top exercise to assess the readiness for pandemic crisis.
10) Conduct flu vaccination exercise annually or when necessary.
11) Conduct pandemic preparedness audit in accordance to individual organisational policy.

9.3 References

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