INFECTION PREVENTION AND CONTROL IN DIALYSIS UNIT

INTRODUCTION

- Haemodialysis **(HD)** and peritoneal dialysis is a lifeline for patients with end stage renal disease **(ESRD)** or renal failure and are awaiting kidney transplant.
- Dialysis patients are at high risk of infection because of underlying illness and numerous environmental and procedural illnesses.
- Establishing a comprehensive infection prevention and control **(IPC)** program for dialysis settings will reduce the infection risks for both patients and healthcare workers (HCWs).

OBJECTIVE

- To overview the multiple infections transmitted/ induced in dialysis patients.
- To stress on the essential elements of IPC program in dialysis units.

DEFINITIONS

Central Venous Catheter (CVC):

- **CVC** is only intended for short term access use for HD in an emergency, while awaiting a fistula to heal or in preparation for a graft.
- It carries the highest risk of infection.
- Standard care procedures must be followed to reduce the risk of infection.

Fistula:

- A connection surgically created between an artery and vein (usually in the arm).
- It is accessed via a needle for HD.
- It has the lowest risk of infection.

Vascular graft:

- An artificial tube surgically placed between an artery and vein (usually in the arm).
- This graft is accessed via a needle for HD.
- It carries an intermediate risk of infection.

DEFINITIONS (CONT')

Dialysate:

- A balanced electrolyte solution which is introduced on one side of the semi-permeable dialyser membrane (opposite to the patient's blood) to exchange solutes with blood during **HD.**

Dialysis water:

- Purified water that is used to mix the dialysate or to disinfect, rinse, or reprocess the dialyser.

Dialyser:

- A part of the **HD** machine; it has two sections separated by a membrane.
- The patient's blood flows through one side and the dialysate flows through the other side.

DEFINITIONS (CONT')

Reverse osmosis (RO):

- A process used to purify dialysis water by removing dissolved inorganic solutes as well as bacteria and their endotoxins.

Peritoneal dialysis (PD) :

- **PD** involves dialysis fluid instilled via a surgically inserted **PD** catheter into the peritoneal space of the abdomen.
- Most catheters are made from silicone.
- The fluid is removed, taking with it any toxins.
- Most common types of **PD** include chronic ambulatory, continuous cyclical and chronic intermittent **PD**.

How Dialysis Works

In-oenter hemod1atysis rs the most common blood-cleansing therapy used by Americans with kfdney failure Patients typically are treated three limes a week for three-lo-four-hour sessions. Bloodlines can be attached to either a catheter or fistufa.

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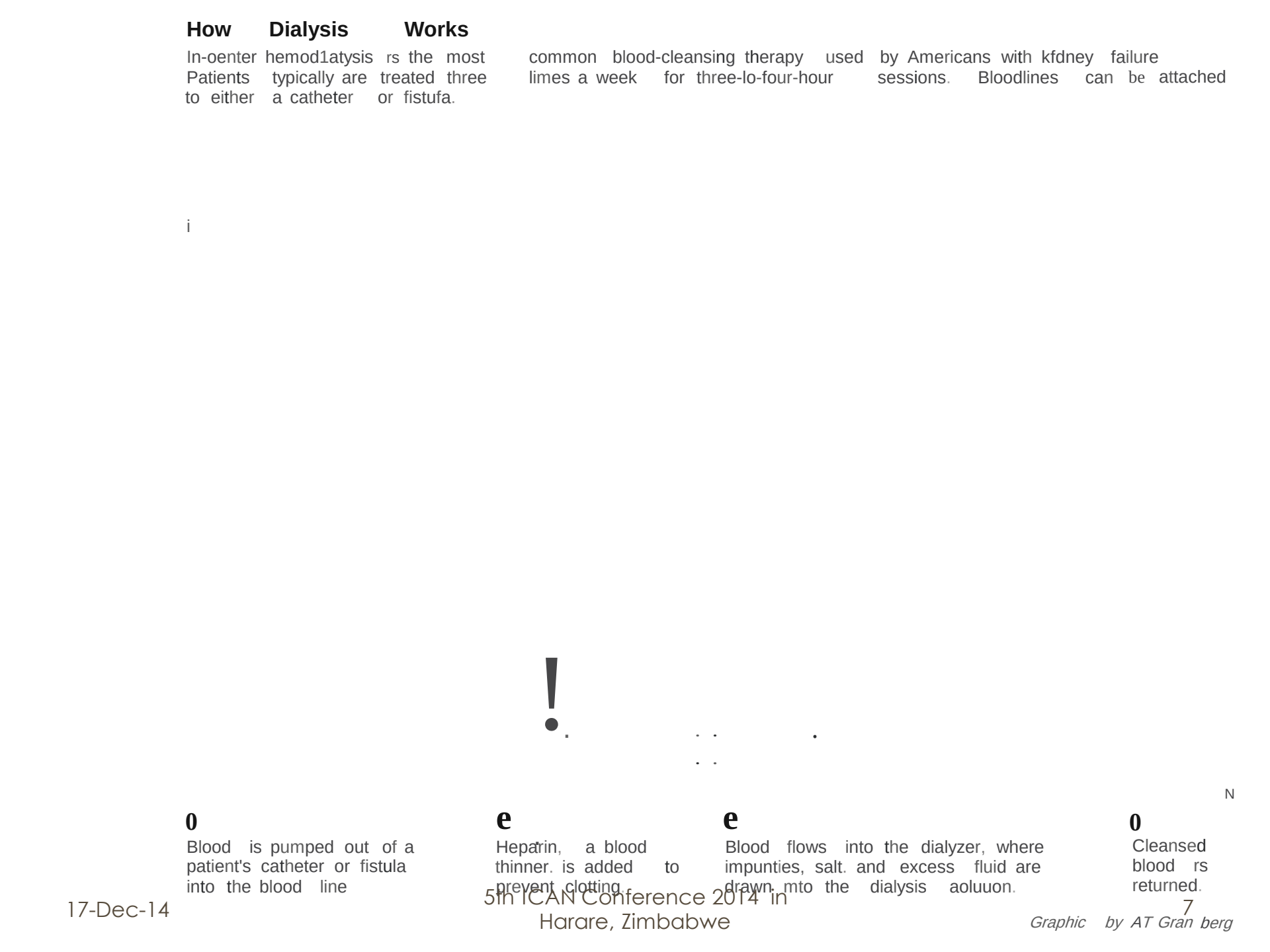

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Blood is pumped out of a patient's catheter or fistula into the blood line

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Heparin, a blood thinner. is added to prevent clotting

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Blood flows into the dialyzer, where impunties, salt. and excess fluid are drawn. mto the dialysis aoluuon.

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Cleansed blood rs returned.

Graphic by AT Gran berg

UNDERLYING DISEASES OR CONDITIONS PRECIPITATING TO INFECTIONS IN DIALYSIS PATIENTS

- Diabetes
- Hypertension
- Cardiovascular disease
- Immunosuppressive therapy
- Other critical diseases
- Direct access into normally sterile areas.
- Contamination:

at various steps in the dialysis procedure (extrensic) or of any of the components of the dialysis system (intrinsic).

THE MOST COMMON TYPES OF DIALYSIS-ASSOCIATED INFECTIONS

- **Access site infections**
- **Bacteremias**
- **Peritonitis**
- **Pyrogenic reactions**
- **Infections with blood-borne pathogens**

INFECTION-ASSOCIATED RISKS

- Hepatitis B
- Hepatitis C
- Acquired immune defi ciency syndrome (AIDS)
- Bacterial disease
- Fungi
- Mycobacteria

HEPATITIS B

- Hepatitis B virus (HBV) is transmitted through percutaneous or permucosal exposure to the blood of infected patients (HBsAg-positive or HBeAg-positive).
- HBV remains viable at room temperature for at least **7days**
- HBV has been detected on: **clamps, scissors, and external surfaces and parts of dialysis machines.**
- HBV can be transmitted to patients or staff on gloves or unwashed hands.

HEPATITIS C

- HCV is transmitted by percutaneous exposure to infected blood.

- Factors that increase HCV infection in HD patients

1. history of blood transfusions,
2. volume of blood transfused, and
3. years on HD.
4. inadequate IPC practices.

- Transmission of HCV through:

1. shared equipment and supplies not disinfected between patients,
2. use of common medication carts,
3. shared multi-dose medication vials,
4. contaminated HD machines, related equipment & blood spills.

ACQUIRED IMMUNE DEFICIENCY SYNDROME (AIDS)

- Human immunodeficiency virus (HIV) is transmitted by blood or blood-containing body fluids.

- There have been very few reports of HIV transmission in dialysis and these resulted from inadequate disinfection of equipment, including access.

BACTERIAL DISEASE

- Increased risk of infection and colonisation with multi-drug resistant organisms (MDRO), such as Staphylococcus aureus (MRSA) and vancomycin-resistant enterococci (VRE).
- Vancomycin use is high in dialysis populations.
- Outbreaks of MRSA in some dialysis units from colonised\infected patients.
- MDR Gram-negative infections as Pseudomonas aeruginosa, Stenotrophomonas maltophilia, and Acinetobacter spp

MYCOBACTERIA

- Reports of mycobacterial infections in dialysis patients from contaminated water.
- High-risk for progression from latent tuberculosis to active TB disease.
- Frequent hospitalisation of dialysis patients increases the risk of transmission of TB to other patients or to HCWs.

FUNGI

- Dialysis patients are susceptible to fungal infections such as Aspergillus spp.
- In addition, there is a risk of Candida bacteraemia and peritonitis with the patient's skin as a source.

Basic Principles of IPC in Dialysis Unit

1-SURVEILLANCE

Routine testing / or documentation for:

- HBV , HCV & HIV as soon as, it is anticipated that dialysis is required & every 3 months, for : HBsAg, HCV & HIV antibody
- Patient's vaccination (e.g. HBV).
- Bacteraemia, access site infections, and peritonitis.
- Treatment station used and machine number, as well as names of staff connecting and disconnecting the patient.

This information will be useful in any outbreak investigation.

2-STANDARD AND TRANSMISSION-BASED PRECAUTIONS

- Segregation of HBsAg-positive patients and their equipment and supplies from those used for non-HBV-infected patients.
- Patients with either HCV or HIV infection also require a dedicated machine.
- Contact Precautions for MDR microorganisms, such as MRSA and VRE, and Gram negative microbes.

2-STANDARD AND TRANSMISSION-BASED PRECAUTIONS (CONT')

- Proper hand hygiene (HH) (as WHO's 5 moments).
- Staff must wear a mask and gloves and the patient must wear a mask while the site is being accessed.
- Wash the access site using an antibacterial soap/scrub and water.
- Cleanse the skin by 2% chlorhexidine gluconate/70% isopropyl alcohol, 70% alcohol, or 10% povidone iodine.
- Access lines used for HD must not be used for other purposes.

3-ENVIRONMENTAL CLEANING AND DISINFECTION

- Hospital grade disinfectant is used for all patient areas.
- Special attention to high-touch items or surfaces likely to be contaminated with blood or body fluids.
- Prompt containment and cleaning of spills of blood or body fluids.
- Prevention of mould contamination resulting from water damage or wetting of permeable walls, furniture, etc.
- Strict adherence to IPC precautions for construction and renovation activities
- Used supplies and dialysers should be disposed of to prevent contamination of patients and environmental surfaces.

4-EQUIPMENT CLEANING AND DISINFECTION

- Policies and procedures for correct care and maintenance of, dialysis systems, including the water treatment system, distribution system, and dialysis machines.
- Reusable dialysers must be cleaned, receive high-level disinfection, and be thoroughly rinsed and dried prior to reuse.
- Adequate cleaning and disinfection of dialysis machines and equipment and reusable supplies between all patient uses.

5-SAFE MEDICATION AND INJECTION PRACTICES

- Avoid contamination of multi-dose vials.
- The stopper should be disinfected with alcohol before accessing the vial.
- A single use sterile needle and syringe for each access.
- Single-use vials are preferable.
- Needles should not be recapped.
- Used sharps should to be discarded sharps containers.
- Safety engineered medical devices (e.g., self-retracting or self sheathing needles) when possible.

6-PATIENT IMMUNISATION, POST-VACCINATION TESTING, AND SCREENING

- Screen for HBV prior to start of HD treatment.
- Immunise for HBV.
- Testing for HBV one to two months after the primary vaccinations.
- Annual testing for antibody to HBsAg . A booster dose should be administered when anti-HBs levels decline to <10 mIU/ml.
- Dialysis patients younger than 65 years ---------a dose of pneumococcal vaccine followed by a dose every 5 years. If over 65 years, only one dose of vaccine is required.
- Screening of patients for MRSA or VRE is only necessary in outbreak or suspected transmission.

7-PATIENT AND HCWs EDUCATION

- The staff should receive initial and on-going education on the basic principles and practices of dialysis, infectious risks and potential adverse events, and IPC practices.

- The patient should receive education on access site and dressing care, signs and symptoms of infection, and the importance of reporting potential infections.

8-OCCUPATIONAL SAFETY CONSIDERATIONS

- Standard Precautions and, as necessary, transmission-based precautions, PPE and HH to protect from blood or body fluids.

- Gloves, masks, and gowns must be used when connecting and disconnecting dialysis patients during the dialysis process.
- Routine testing of staff for HCV, HBV, or MDRO is not recommended.
- Staff should receive hepatitis B vaccination.

9-WATER TREATMENT AND TESTING

- Testing of dialysis water and dialysate at least monthly as per the US Association for the Advancement of Medical Instrumentation (AAMI) guidelines.
- Water quality; both microbial and chemical components should also be monitored.
- Water used to prepare dialysate or to process dialysers and dialysate should contain a total viable microbial count of no more than 200 CFU/ml and an endotoxin concentration lower than 2 EU/ml.
- If the total viable microbial count reaches 50 CFU/ml or the endotoxin concentration reaches 1 EU/ml, corrective measures should be taken promptly.

9-WATER TREATMENT AND TESTING (CONT')

- A study done by Abdel-Aal et al.(2003)on water an the water and dialysate fluids of four Egyptian hospitals.
- Samples taken at four seasons.
- A higher contamination with fecal bacterial was found in spring and summer whereas fungal contamination as Aspergillus spp. was more detected in autumn and summer.

SUMMARY

- Dialysis (HD or PD) is a lifeline for patients with ESRD or renal failure and\ or awaiting kidney transplant.
- Patients receiving dialysis treatments are at increased risk of infection. IPC programs includes:
- Hand hygiene,
- Appropriate PPE to provide a barrier to contact with blood, body fluids, Non-intact skin or mucous membranes,
- Immunisation of patients & HCW's,
- Aseptic technique----------to reduce patient/client exposure to microorganisms,
- Management of sharps, blood spills, linen, and
- Waste management to maintain a safe environment,
- Routine environmental cleaning.

CONCLUSION

- Infection control is a responsibility of everyone involved with the dialysis treatment process.
- Implementation of IPC procedures and a safe environment including water, all are critical in eliminating or mitigating infection risk for both patients and HCW.
- Patients' education is also an essential to prevent infections associated with dialysis.

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Thank You for Attendance