

Implementation of the National Infection Prevention and Control Strategic Framework

PRACTICAL MANUAL



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FOREWORD

Many medical practices and risks associated with healthcare are emerging as major challenges for patient safety and contribute significantly to the burden of harm due to unsafe care. Healthcare-associated infections (HAI) are one of the frequently encountered patient safety incidents in care delivery and pose a major public health challenge impacting on morbidity, mortality and quality of life. The prevalence of HAI in mixed patient populations of low to middle income countries is approximately twice that of high-income countries

These infections also present a significant economic burden at the societal and health facility level. Effective infection prevention and control (IPC) programmes have been proven to be one of the cornerstones for combating HAI and antimicrobial resistance (AMR).

The National IPC Strategic Framework (2019) was aligned with the World Health Organization's (WHO) core components for IPC (2016). The strategic framework gives guidance to public and private health facilities and health workers on compliance with standards relating to IPC practises. To further assist health facilities to implement the IPC strategic framework, this practical implementation manual has been developed in parallel to accompany this document.

I believe and trust that this practical manual for implementation of the National IPC Strategic Framework will strengthen evidence-based IPC practices at health facility level towards combating threats posed by epidemics, pandemics and AMR, and achieving the WHO Sustainable Development Goals 3 and 6 in compliance with the International Health Regulations.



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ABBREVIATIONS AND ACRONYMS

ABHR	Alcohol-based hand rub
AMR	Antimicrobial resistance
AMS	Antimicrobial stewardship
ASTM	American Society for Testing and Materials
CAUTI	Catheter-associated urinary tract infections
CCC	<i>Carbapenemase-producing Enterobacteriaceae, C. difficile, and Candida species</i>
CCHF	Crimean-Congo haemorrhagic fever
CEO	Chief executive officer
CLABSI	Central line-associated bloodstream infections
CRE	Carbapenemase- resistant Enterbacteriaceae
SSD	Sterile Services Department
ECG	Electrocardiography
EN	European Norms/Standards
EMS	Emergency medical services
ESBL	Extended spectrum beta-lactamase
ESKAPE	<i>Enterococcus faecium, S. aureus, K. pneumoniae, A. baumannii, P. aeruginosa and Enterobacter spp</i>
GNB	Gram negative bacilli
HAI	Healthcare-associated infection
HCWM	Healthcare waste management
HCRW	Healthcare risk waste
HH	Hand hygiene
IDC	Indwelling Catheter
IPC	Infection Prevention and Control
IV	Intravenous
IVD	In vitro diagnostic medical device
MDRO	Multidrug resistant organism
MDR-TB	Multidrug-resistant tuberculosis
MMS	Multimodal improvement strategies
NGT	Nasogastric tube
PEG	Percutaneous endoscopic gastrostomy
PPE	Personal protective equipment
PSI	Patient safety incident
SED	Safety Engineered Devices
SP	Standard precautions
SSI	Surgical site infections
TB	Tuberculosis
XDR-TB	Extensive Drug-Resistance Tuberculosis
VAP	Ventilator-associated pneumonia
WASH	Water, sanitation and hygiene
WHO	World Health Organization



CHAPTER 1

INTRODUCTION

1. CHAPTER 1: INTRODUCTION

These implementation strategies should be read in conjunction with the National Infection Prevention and Control (IPC) Strategic Framework (2019) to support an IPC programme at health facility level towards reducing healthcare-associated infections (HAI) and antimicrobial resistance (AMR). This manual is aligned with the World Health Organization (WHO) Core Component IPC programme recommendations and highlights the essentials for developing and improving IPC at health facility level in a systematic, stepwise manner for South Africa. It supports the Framework for the Prevention and Containment of AMR in South African Hospitals (2018).²

1.1 Target Audience

This manual is aimed at health workers in both public and private health facilities, non-governmental and faith-based organisations rendering health care, including provincial/district/national level IPC practitioners/managers responsible for implementation and governance of IPC programmes at health facilities. This manual will be used as a basis for training of health workers.

1.2 Multimodal improvement strategies to implement IPC

Using a multimodal strategy (MMS) will facilitate the IPC process, involve and engage various stakeholders, will define and allocate responsibilities towards ensuring commitment and sustainability of a national and health facility level IPC programme.¹

All IPC activities should be contextually grounded and driven by a multimodal approach which allows implementation in an integrated manner. This facilitates a group/team's efforts towards improving IPC practice, patient safety and reducing HAI and AMR. The IPC team supported by the IPC committee, is responsible for applying a multimodal approach to various aspects of their work. Bundles of care and checklists should be incorporated into MMS. Leaders should provide both political and financial support increasing accountability via monitoring and feedback to ensure the desired behavioural change and safe patient care. Successful MMS includes the involvement of champions or role models at national, provincial, district and health facility level.

WHO has identified five elements of an effective MMS towards ensuring that IPC is visibly practised throughout the entire health system.

1. **System change (*Build it*):** availability of the appropriate infrastructure and supplies to enable the implementation of infection prevention recommendations.
2. **Education and training (*Teach it*)** of health workers and key role-players.
3. **Monitoring and feedback (*Check it*)** on infrastructure, practices, processes, outcomes and providing feedback based on interpretation of data.
4. **Reminders and communication (*Sell it*)** to guide improvements in the workplace.
5. **Culture change (*Live it*)** within the health facility to strengthen a climate of safety. See Figure 1.¹

¹ World Health Organization. Interim Practical Manual supporting national implementation of the WHO Guidelines on Core Components of Infection Prevention and Control Programmes. Geneva: World Health Organization; 2017.

² National Department of Health. South African Antimicrobial Resistance National Strategy Framework; a one health approach 2018 – 2024

Figure 1: The five elements of a multimodal strategy (WHO)¹



Targeting only ONE area (that is, unimodal) at the expense of the others is highly likely to result in failure.

All five areas should be considered, and the necessary action taken based on the local context, which is informed by periodic assessments.³

³ World Health Organization. Interim Practical Manual supporting national implementation of the WHO Guidelines on Core Components of Infection Prevention and Control Programmes. Geneva: World Health Organization; 2017.

1.3 Structure of the implementation manual

This manual is structured into ten chapters with subsections giving specific guidance to implement the National IPC Strategic Framework. Where national documents already exist, references or links will be provided.

THE KEY TERMS AND DEFINITIONS USED IN THE MANUAL ARE LISTED IN APPENDICES

CHAPTER 1: Introduction

CHAPTER 2: Standard precautions:

- hand hygiene;
- appropriate use of personal protective equipment;
- appropriate use of antiseptics, disinfectants and detergents;
- decontamination of medical devices;
- safe handling of linen and laundry;
- healthcare waste management;
- respiratory hygiene and cough etiquette;
- patient placement;
- principles of asepsis;
- injection safety and occupational health;
- environmental cleaning;

Chapter 3: Transmission-based precautions

Chapter 4: Built environment and infrastructure for IPC

Chapter 5: Surveillance of Healthcare-associated infection (HAI)

Chapter 6: Antimicrobial stewardship

Chapter 7: Outbreak response

Chapter 8: Reporting of notifiable medical conditions

Chapter 9: Education and training of staff and IPC staff

Chapter 10: Monitoring and evaluation



CHAPTER

2

STANDARD PRECAUTIONS

2. CHAPTER 2:

STANDARD PRECAUTIONS

Standard precautions (SP) are aimed at reducing the risk of transmission of microorganisms including bloodborne pathogens, from recognised and unrecognised sources. Patients and staff may serve as reservoirs for microorganisms, even if only colonised and not exhibiting any signs of infection.^{4,5} SP are the basic level of infection prevention measures which apply to relevant healthcare delivered to all patients.



SP should be applied to all patients and in all relevant situations, regardless of diagnosis or presumed infection status.

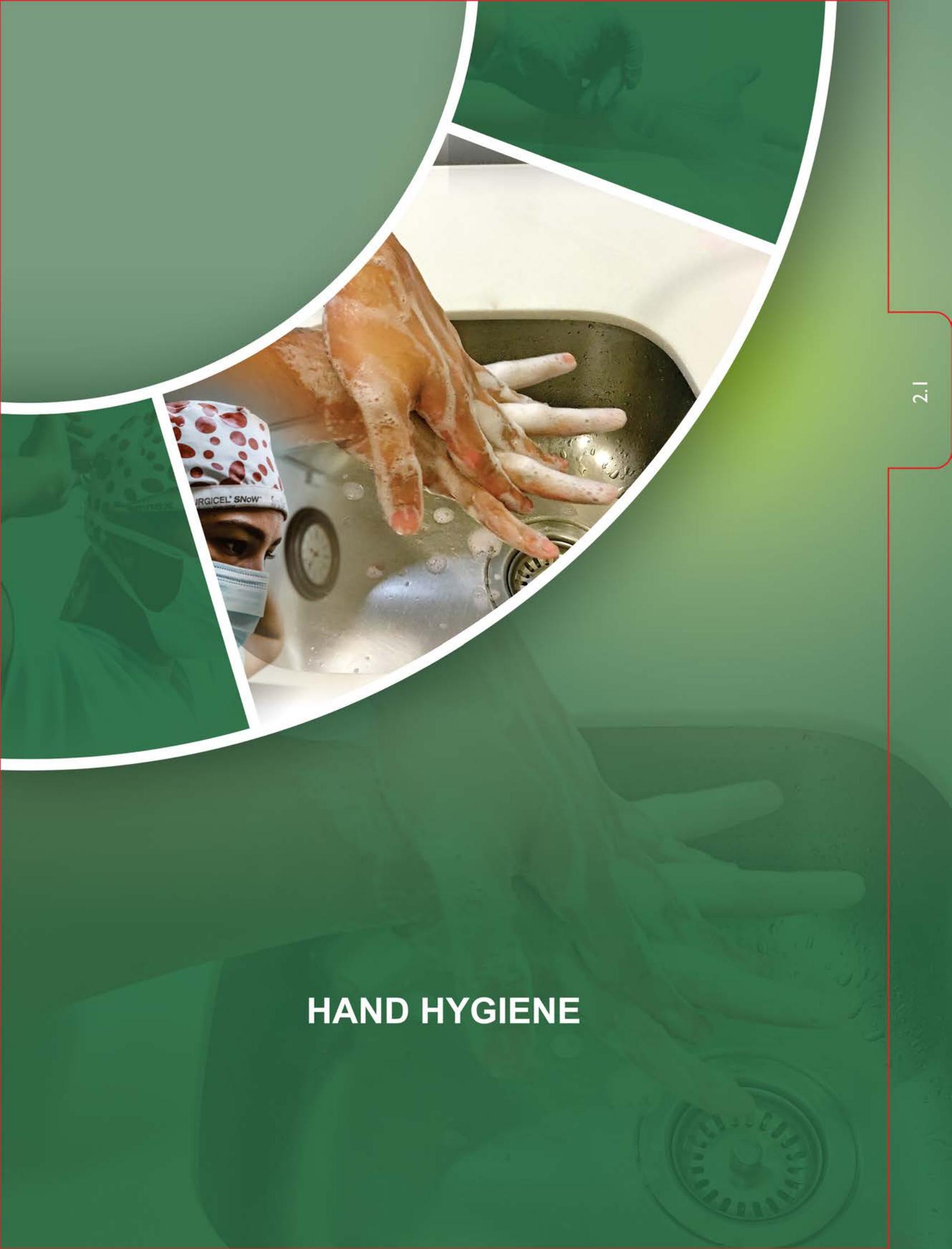
The key elements of standard precautions are:

- hand hygiene;
- appropriate use of personal protective equipment;
- appropriate use of antiseptics, disinfectants and detergents;
- decontamination of medical devices;
- safe handling of linen and laundry;
- healthcare waste management;
- respiratory hygiene and cough etiquette;
- patient placement;
- principles of asepsis;
- injection safety and occupational health⁶;
- environmental cleaning;

⁴ World Health Organization [Internet]. Clean Care is Safer Care: Infection Prevention and Control. [updated 2017; cited 2019 May 29]. Available from: https://www.who.int/csr/resources/publications/EPR_AM2_E7.pdf

⁵ CDC Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, 2007. <http://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf>

⁶ Guidelines on Core Components of infection prevention and control at the national and acute healthcare facility level. WHO 2016. Available from <https://www.who.int/infection-prevention/publications/core-components/en/>



HAND HYGIENE

2.1 HAND HYGIENE

Effective hand hygiene (HH) is a critical component of SP and ensures patient and staff safety⁷; it is the simplest, and most cost-effective measure to reduce HAI.⁸ Although the link between HAI and HH was made in the mid-1800s by Dr Ignaz Semmelweis⁹, a systematic review including 96 studies by Erasmus et al, 2010, found HH compliance rates globally, to be only 40%.¹⁰

Multimodal implementation strategies (see sections on MMS) - a core component of effective IPC programmes^{11,12} has improved HH compliance.¹³ In order to ensure successful implementation and sustainability of HH strategies, commitment by management at all levels is critical.

2.1.1 Why Hand Hygiene?

Skin flora: Transient skin flora is found on the surface layers (epidermis) which are easily transmitted through physical contact between patients, health workers and the healthcare environment and has been implicated in HAI. Transient flora can be easily removed by good HH practices.¹⁴ Resident flora live in the deeper skin layers (dermis) and being part of normal flora, are more difficult to remove.¹⁵

Transmission of organisms via hands

Transmission can occur either by direct contact with the patient, or indirectly via contact with medical equipment or patient surroundings. This occurs in five sequential steps as follows, (see **Figure 2**):

1. Organisms are present on the patient's skin or in blood and body fluids or have been shed onto inanimate objects immediately surrounding the patient; and
2. transfer onto the hands of the HCW; and
3. remain viable on the hands of the HCW; and
4. with missed opportunities for hand hygiene, inadequate hand hygiene, or inappropriate a hand hygiene agent or action; and
5. then the contaminated hands of the caregiver come into direct contact with another patient (directly) or with an inanimate object that will come into direct contact with the patient (indirectly).

⁷ Haley RW, Culver DH, White JW, Morgan WM, Emori G, Munn VANP, et al. The efficacy of infection surveillance and control programs in preventing nosocomial infections in US hospitals. *Am J Infect Control*. 1982;10(5):317-340. doi:10.1016/0196-6563(82)90086-2

⁸ Boyce JM, Pittet D. Guideline for Hand Hygiene in Health-Care Settings. *Infect Dis Clin Pract*. 2002;11(5):306-11.

⁹ Best M, Neuhauser D. Ignaz Semmelweis and the birth of infection control. *Qual Saf Heal Care* [Internet]. 2004;13(3):233-4. Available from: <https://qualitysafety.bmj.com/content/13/3/233>

¹⁰ Erasmus V, Daha TJJ, Brug H, Richardus JHH, Behrendt MD, Vos MCC, et al. Systematic Review of Studies on Compliance with Hand Hygiene Guidelines in Hospital Care. *Infect Control Hosp Epidemiol* [Internet]. 2010;31(03):283-94. Available from: https://www.cambridge.org/core/product/identifier/S0195941700028927/type/journal_article

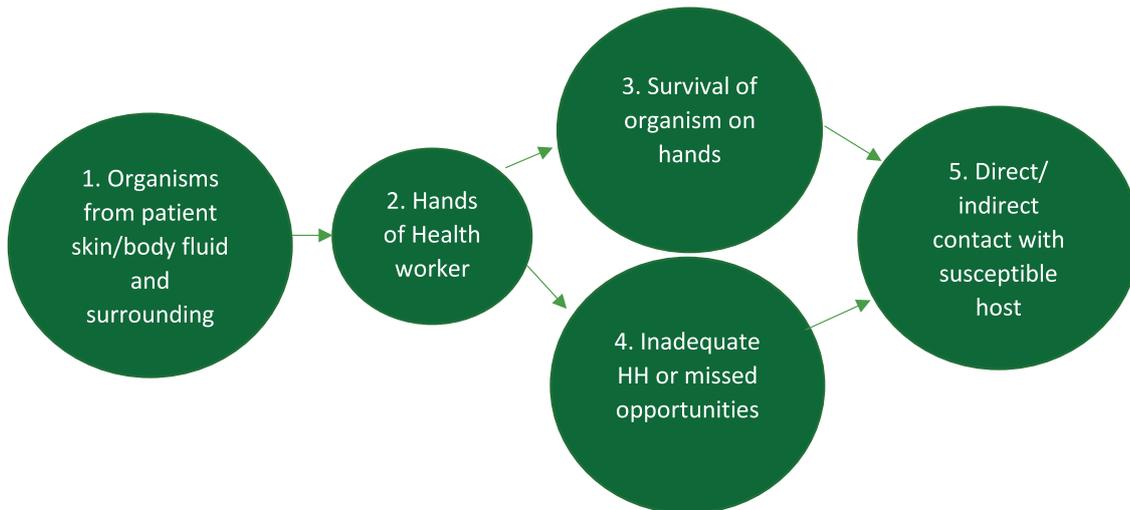
¹¹ World Health Organization (WHO). Guidelines on Core Components of Infection Prevention and Control Programmes at the National and Acute Health Care Facility Level. 2016.

¹² World Health Organization. WHO multimodal improvement strategy [Internet]. World Health Organization Publications. 2018 [cited 2018 Nov 1]. p. 1. Available from: <http://www.who.int/infection-prevention/publications/ipc-cc-mis.pdf>

¹³ Shen L, Wang X, An J, An J, Zhou N, Sun L, et al. Implementation of WHO multimodal strategy for improvement of hand hygiene: A quasi-experimental study in a Traditional Chinese Medicine hospital in Xi'an, China. *Antimicrob Resist Infect Control*. 2017;6(1):1-7.

¹⁴ National Institute for Health and Clinical Excellence. Infection : prevention and control of healthcare-associated infections in primary and community care. 2012.

¹⁵ World Health Organization. WHO | Clean Care is Safer Care [Internet]. 2009. p. 6. Available from: http://www.who.int/gpsc/en/nhttp://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf

Figure 2: Transmission of organisms via hands in a healthcare environment

Barriers to hand hygiene

When developing HH improvement strategies, the following should be addressed^{16,17,18}

- HH agents that cause skin irritation and dryness.
- The perception that patient activities take priority over HH especially when there is a heavy workload and understaffing.
- Lack of resources (water, soap and paper towel).
- Infrastructure limitations: Plumbing and hand wash basins inconveniently located and/or not available.
- Alcohol-based hand rub (ABHR) not available at the point of care.
- HH products not user friendly.
- Unavailability and inadequate knowledge of guidelines, protocols or technique for HH.
- Lack of positive role models and social norms.
- Lack of recognition of the risk of cross-transmission of microbial pathogens.
- Simple forgetfulness and lack of attention to detail (many wash hands but not adequately).



DO NOT wash hands and immediately apply ABHR to wet hands as this may damage the skin.

2.1.2 Use of gloves

Gloves should never be used as a substitute for HH. The perception that gloves eliminate the need for HH is also a barrier to HH compliance; Pinhole perforations may be present in gloves prior to wearing them and these perforations increase with use.¹⁹

- ✓ HH must be practised before and after the use of gloves.
- ✓ Failure to remove gloves and disinfect hands after use constitutes non-compliance with HH.

¹⁶ World Health Organization (WHO). WHO Guidelines on Hand Hygiene in Health Care [Internet]. 2009. Available from: <http://www.who.int/infection-prevention/publications/hand-hygiene-2009/en/>

¹⁷ World Health Organization. WHO | Clean Care is Safer Care [Internet]. 2009. p. 6. Available from: http://www.who.int/gpsc/en/nhttp://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf

¹⁸ Ryan K, Havers S, Olsen K, Grayson PML. Hand Hygiene Australia [Internet]. 2017 p. 46. Available from: www.hha.org.au

¹⁹ Gessler A, Stärk A, Sigwarth V, Moirandat C. How risky are pinholes in gloves? A rational appeal for the integrity of gloves for isolators. PDA J Pharm Sci Technol. 2011 May-Jun;65(3):227-41. doi: 10.5731/pdajpst.2011.00716

- ✓ Alcohol should never be applied directly onto gloves as it will damage them.
- ✓ Hands must be thoroughly dried before donning gloves to reduce the risk of skin irritation.

2.1.3 Dermatitis

This is a general term used to describe inflammation of the skin characterised by redness, itchiness, dryness and swelling.²¹ Health workers with contact dermatitis may remain colonised with potentially pathogenic microorganisms for prolonged periods of time.²⁰

Causes of dermatitis²¹

- Allergy to latex and related products.
- Frequent use of certain HH products such as soap.
- Application of ABHR to wet hands.
- Donning of gloves while hands are still wet from either washing or ABHR.
- Use of powdered gloves concurrently with alcohol-based products.^{22,23}
- Use of products not tested for tolerance or sensitivity.

Recommendations for the protecting hands of HCWs

- All cuts and abrasions must be covered with a waterproof dressing.
- ABHR should contain emollients that assist with maintaining skin integrity, and when applied regularly, will protect hands from dryness.
- Avoid communal jars of hand cream as the contents become a source of cross-contamination.
- Provide alternate HH products for health workers with confirmed allergies.

Where ABHR is available in the health facility for hygienic hand antisepsis, the use of antimicrobial soap is not recommended.²¹

Best Practice for Hand Hygiene

Nails:

- Nails should be kept short and clean²⁴ and not show past the end of the finger.²⁵
- Long nails can pierce gloves.²⁶
- Nail polish should not be allowed as organisms can survive under the nail polish and in the nail bed and cuticle.²⁷
- No acrylic nails, artificial nail or nail enhancements to be worn.²⁷

Jewellery: The wearing of rings or other jewellery when delivering health care is strongly discouraged. For religious or cultural reasons, the wearing of a simple wedding ring (band)

²⁰ Al J de V et. Outbreak of *Serratia marcescens* colonisation and infection traced to a healthcare worker with long-term carriage in the hand. *Infect Control Hosp Epidemiol.* 2006;27:1153–8.

²¹ Ryan K, Havers S, Olsen K, Grayson PML. *Hand Hygiene Australia* [Internet]. 2017 p. 46. Available from: www.hha.org.au

²² World Health Organization (WHO). *WHO Guidelines on Hand Hygiene in Health Care* [Internet]. 2009. Available from: <http://www.who.int/infection-prevention/publications/hand-hygiene-2009/en/>

²³ World Health Organization. *WHO | Clean Care is Safer Care* [Internet]. 2009. p. 6. Available from: http://www.who.int/gpsc/en/nhttp://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf

²⁴ HSE South(Cork and Kerry). *Guidelines on Infection Prevention and Control.* 2012 p. 1–7.

²⁵ Josephson D. *No Title. Intraven Infus Ther Nurses Princ Pract Thomson Delmar Learn.*

²⁶ World Health Organization. *WHO | Clean Care is Safer Care* [Internet]. 2009. p. 6. Available from: http://www.who.int/gpsc/en/nhttp://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf

²⁷ Ryan K, Havers S, Olsen K, Grayson PML. *Hand Hygiene Australia* [Internet]. 2017 p. 46. Available from: www.hha.org.au

during routine care may be acceptable. However, in high-risk settings, all rings or other jewellery should be removed.^{25,28} Religious or cultural wrist adornments which are difficult to clean should be removed during hand hygiene.

Generally, short sleeve clothing is appropriate in most clinical settings except when used as PPE for EMS (i.e., full sleeve coveralls).

2.1.4 Consumables and equipment required for hand hygiene

The essential items required to provide hand washing facilities are a hand wash basin with clean running water, a constant supply of good quality products such as paper towels, liquid soap and ABHR.

Hand Washing products

Paper towel dispensers

- Paper towel dispensers should be wall mounted close to the hand wash basin where soap dispensers are available.
- No-touch paper roll dispenser for automatic dispensing of a paper towel is best however single use pull-out paper towels are also acceptable.
- If single use pull-out paper towels are used, care should be taken to load the dispenser correctly to prevent contamination of the paper towels.
- Paper should have adequate strength to withstand contact with wet hands.
- Warm air hand dryers are not recommended for health facilities.^{29, 30, 31}

Liquid soap- non-medicated

- Liquid soap for washing hands must be available at each basin.
- Clean running water should be available
- It should be provided in a closed container that is either manually or elbow-operated with a pump action or an automated dispenser
- Closed containers must have single use disposable sachets.
- Liquid soap must have a surfactant to allow good lather.
- The product should be hypo-allergenic and be well tolerated.

Bottles for liquid soap

- Liquid soap must be supplied in disposable 500ml pump top bottles (no topping-up or decanting allowed)
- However, if facilities are still using containers that have to be refilled, ensure that a heat stable product (which can withstand temperatures of 80° C) is purchased so that the bottles can be thoroughly cleaned, and heat disinfected between each use (microwave or heat washer disinfectant).
- Plungers/pump must be disposable since they are difficult to clean and disinfect.

²⁸ World Health Organization (WHO). WHO Guidelines on Hand Hygiene in Health Care [Internet]. 2009. Available from: <http://www.who.int/infection-prevention/publications/hand-hygiene-2009/en/>

²⁹ Mayo Clinic. C Huang, W Ma, S Stack. The Hygienic Efficacy of Different Hand-Drying Methods: A Review of the Evidence. Mayo Foundation for Medical Education and Research www.mayoclinicproceedings.org. August 2012;87(8):791-798

³⁰ AM Snelling, T. Saville, D. Stevens and C.B. Beggs. Comparative evaluation of the hygienic efficacy of an ultra-rapid hand dryer vs conventional warm air handdryers. *Journal of Applied Microbiology* 110, 19–26. 2010

³¹ EL Best, P Parnell, MH Wilcox. Microbiological comparison of hand-drying methods: the potential for contamination of the environment, user, and bystander. *Journal of Hospital Infection* 88 (2014) 199e206



Note: most disposable bottles and pump tops supplied by HH companies are not robust enough for reprocessing. Reprocessing of dispensing bottles is not recommended.

Heat disinfection of liquid soap containers

Step 1: Wash used containers with soap and lukewarm water in a designated sink ensuring all traces of soap has been removed.

Step 2: Fill a bowl with 250 to 500 ml of clean water and place it in a microwave. This will act as a heat sink to ensure the liquid soap containers do not overheat or melt during the microwaving process.

Step 3: Place the bowl with the liquid soap containers in the microwave and run for at least 3 minutes on the highest setting. Remove carefully when completed, **DO NOT TOUCH THE INSIDE OF CONTAINERS.**

Step 4: Inspect the liquid soap container to ensure integrity. Discard if damaged.

Step 5: Bottles must be thoroughly dried by inverting upside down on a drainer or using an air-dryer.

Step 6: Each liquid soap container should be labelled with a date when refilled.



NOTE: Bottles should never be topped up with liquid soap.

Hand rubbing

Alcohol based hand rub is the recommended product for hand rubbing by the WHO.

Alcohol-based hand rub formulations

ABHR must be available at all points of care. And also at points of public interface.

Table 1 outlines the WHO formulations. Other formulations may be used provided they have passed EN/ASTM and adheres to relevant South African Standards and Regulations.

Table 1: WHO alcohol formulation (minimum requirements)

Purpose	Alcohol type and content	Glycerol concentration	Hydrogen peroxide
Routine use	Isopropyl alcohol 75% (v/v) 68.5% (w/w)	1.45% (v/v)	0.125% (v/v)
Routine use	Ethanol 80% (v/v) 73/4% (w/w)	1.45% (v/v)	0.125% (v/v)
Surgical Hand rub	Ethyl Alcohol 85.5% (v/v) 80% (w/w) with 0.5%-2% chlorhexidine gluconate	0.725% (v/v)	0.125% (v/v)

*Concentration: Volume/Volume (v/v) % When the solution is a liquid sometimes it is convenient to express its concentration in volume/volume percent (v/v %). Weight/weight (w/w) % Used where the weight of each chemical is used and not the volume.

Table 2: Standards measuring efficacy of HH products

HH product	EN standard European	ASTM USA
Hygienic hand rub	1500	1174
		1838
		2276
		2613
		2011
Surgical hand rub	12791	1115

Bottles for ABHR

- Alcohol-based hand rub bottles should be designed to minimise evaporation.
- Date and record the day the bottle is placed in the dispenser and replaced. This will assist with monitoring of consumption.
- Sturdy disposable bottles (up to 500 ml) with pump-action tops are recommended.
- Long-nose pump action tops are recommended to avoid splashing, see Figure 3.
- Sprays are not recommended due to the following:
 - A single squirt spray may not yield a sufficient volume.
 - Does not fit well in the elbow operated dispenser.
 - Does not allow application of the fingertips first method.
 - Can cause respiratory irritation for the user.³²

Brackets for ABHR

- Stainless steel or epoxy-coated holders for ABHR
- Medical grade stainless steel holder, rust and corrosion resistant.
- Must be suitable in shape and design for the pump top bottles used in the health facility.
- Have adjustable clamp to fit onto over-bed tables or brackets to fit onto, wall, trolleys, or other fixed surfaces in the patient zone, see **Figure 3**.

³² World Health Organization (WHO). WHO Guidelines on Hand Hygiene in Health Care [Internet]. 2009. Available from: <http://www.who.int/infection-prevention/publications/hand-hygiene-2009/en/>

- If a lever arm is necessary, the length of the lever arm must not obstruct workflow.

Figure 3: Bracket for ABHR which fits overbed tables or on the wall



Types of ABHR dispensers

There are two types of dispensers, i.e., automated and manual (**Table 3**).

Table 3: Types of ABHR dispensers

Type of dispenser	Advantages	Disadvantages
Automated Dispensers	<ul style="list-style-type: none"> • Aesthetically pleasing • Fast • Non-touch • Closed system that minimise contamination of the content 	<ul style="list-style-type: none"> • Unusable when require replacement of batteries • Standardized amount of product pre-set and usually < 2-3ml (depending on hand size) • Costs of maintenance and batteries
Manual Dispensers	<ul style="list-style-type: none"> • Manually operated dispensers • Not dependent on batteries • Wall or work surface mounted • Closed system that minimise contamination of the content • Robust to use 	<ul style="list-style-type: none"> • Can be contaminated if incorrect technique is used

Amount of ABHR required per HH action

Size of hands differs and therefore an exact or pre-set amount of ABHR dispensed may be difficult to predict. The rule is the amount of ABHR that fills the palm of a cupped hand without spilling and this is usually approximately 2-3 ml (depending on hand size).

Small ABHR containers for personal use

ABHR containers, especially those which are small volume bottles carried by the health worker, may be poured into a cupped hand for HH. This is acceptable practice since the hands will be disinfected prior to touching patients.

Positioning of ABHR dispenser³³

- The maximum size of an individual ABHR dispenser should not exceed 500 mls.
- ABHR should be placed at the entrance of every clinical area and fixed to the wall.
- Wall-mounted brackets should be placed at a convenient height (avoid placing at eye level to prevent splashing).
- Dispensers should be installed according to manufacturer's recommendations and to minimise leaks or spills.
- Dispensers must also be located at the point of care, preferably between the health worker and the patient (at arm's length), e.g., at foot of bed, on the over-bed, procedure trolley or ICU chart trolleys.
- Dispensers should be monitored daily for content cleanliness and function.
- Regular maintenance of dispensers and brackets should occur in accordance with manufacturer's guidelines. Product usage signs should be clearly visible and laminated or framed.
- Regular monitoring of each area is recommended.
- Placement of each dispenser should ensure protection of vulnerable populations, for example in psychiatric units, drug and alcohol units, paediatric units and units caring for cognitively impaired patients. Here, smaller ABHR bottles (50-60ml) carried by the HCW is preferred.
- Placement of dispensers in the EMS setting must consider ease of access at the point of care while also considering that vulnerable populations (paediatric and mental health care patients) are transported by EMS. Dispenser could for example be placed at the side or rear doorway to the patient compartment, farthest from the stretcher. This may also promote use when entering and exiting the compartment.

Site-specific instructions should be developed to manage adverse events, such as ABHR ingestion, eye splashes or allergic reactions.



Note: When procuring ABHR, ensure that the bottles fit holders that are currently in use otherwise all holders will have to be changed at great expense and require drilling of new holes in the walls!

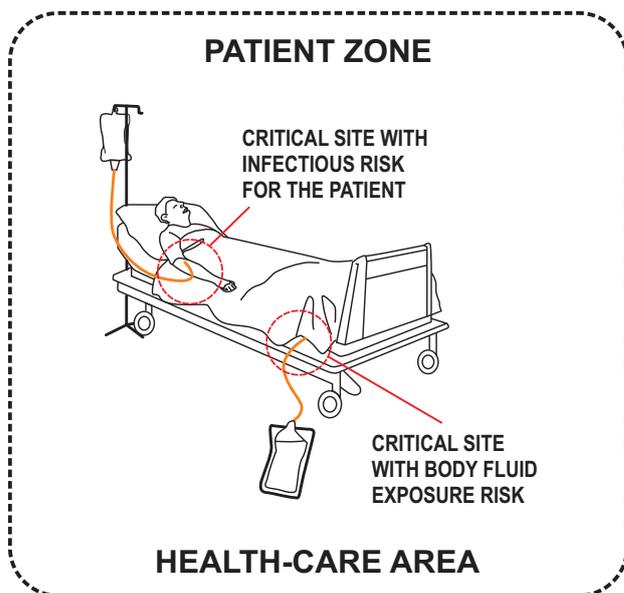
Principles of hand hygiene

The activity and associated risk of transferring microbes to or from a patient will dictate when hands need to be cleaned (5 Moments of HH). HH should be performed when entering or leaving the patient zone (**Figure 4**) and after any activity that may contaminate the hands and transfer microbes to the patient.

³³ Ryan K, Havers S, Olsen K, Grayson PML. Hand Hygiene Australia [Internet]. 2017 p. 46. Available from: www.hha.org.au

Indication for hand hygiene (WHEN)

Figure 4: Illustration of patient zone and healthcare area³⁴

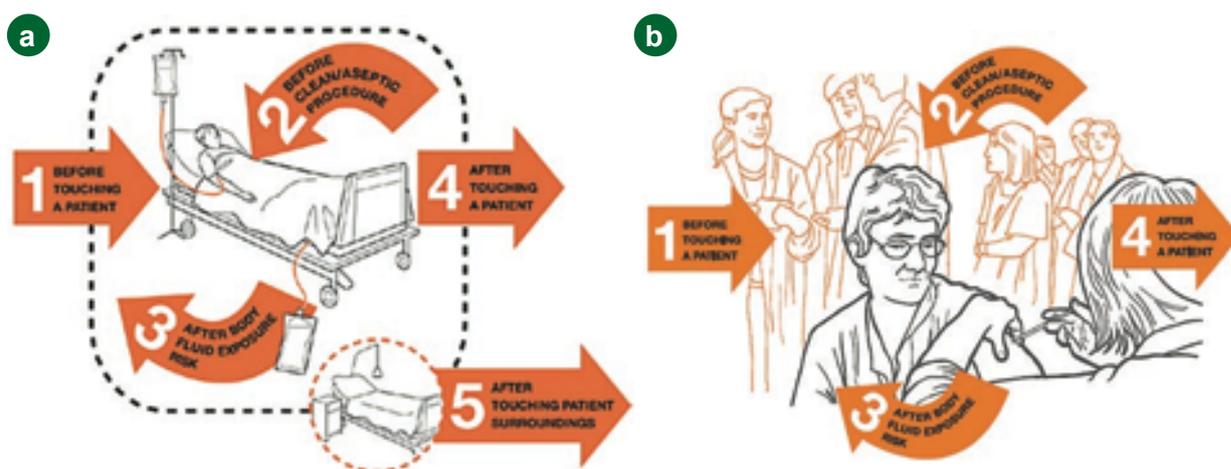


Understanding the critical moments **WHEN** HH should be practiced and adhering to these critical moments of when hand hygiene must be performed is key to preventing transmission. The “Five Moments for Hand Hygiene” identified by the WHO for when HH should be performed by health workers and mothers of infants admitted to healthcare are illustrated in **Figure 5 (a,b,c,d)**. These 5 moments are applicable to both inpatient and outpatient settings. Training should focus not only on technique, but also on the practical implementation of these 5 Moments of HH (Appendix B) e.g., scenario-based training to ensure that HH opportunities are not missed. Applying the principles in **Figure 5**, it is possible to develop similar moments for specific scenarios in your facility.

Most often health workers can grasp the technique but not the critical moments and should learn WHEN to apply it to real life scenarios.

Figure 5: The 5 Moments of Hand Hygiene applied to different scenarios

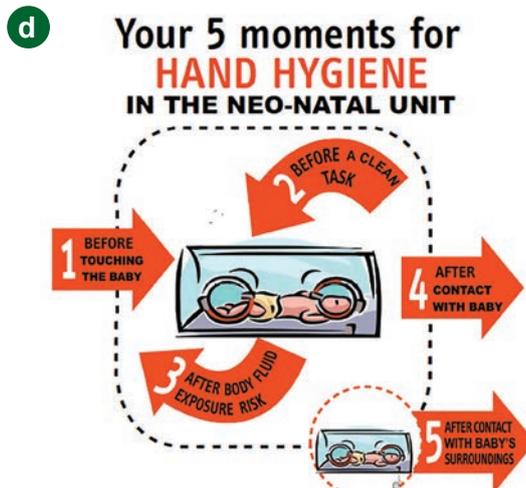
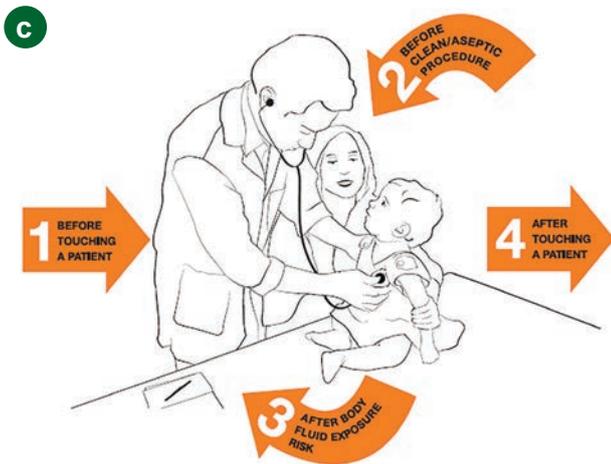
- The 5 Moments of Hand Hygiene³⁵
- giving vaccination
- paediatric consultation³⁶ and
- is for mothers attending infants in health facilities



³⁴ World Health Organization. WHO Guidelines on Hand Hygiene in Health Care. Geneva. 2009

³⁵ World Health Organization. WHO Guidelines on Hand Hygiene in Health Care. Geneva. 2009

³⁶ World Health Organization. WHO Hand Hygiene in Outpatient and Home-based Care and Long-term Care Facilities



Moment One: Before touching a patient

WHY:

- To protect the patient against acquiring potential pathogens from the hands of the HCW including EMS. For example, shaking hands, physical examination, checking the patient’s vital signs, personal care activities, before preparation and administration of oral medication, feeding.

Moment Two: Immediately before carrying out a clean/aseptic procedure

WHY:

- To protect the patient from potential pathogens (including their own) from entering their body during a procedure. Examples are just before carrying out an invasive procedure such as insertion of an intravenous catheter, administration of parenteral medication, suctioning of a patient, performing wound care, and preparation of a sterile field.

Examples for EMS are **before**:

1. an invasive procedure (intravenous (IV)/intra-osseus (IO) start, intubation, suctioning),
2. moving from a dirty task to a clean task on the same patient (e.g., removing their shoes and then performing wound care),
3. preparing and giving medications (includes oral and subcutaneous, intramuscular or intravascular injections, eye drops),
4. prior to donning PPE including gloves prior to contact with the patient or the patient’s environment.



NOTE: Always perform hand hygiene before donning (putting on) gloves!

Moment Three: After a body fluid exposure risk

WHY:

- To protect yourself and the healthcare surroundings from transmission of potential pathogens from the patient such as after carrying out an invasive procedure, or any potential body fluid exposure.
- For EMS it will be **after** suctioning secretions, contact with blood and/or bodily fluids, wound care, an invasive procedure (e.g., IV/IO start), contact with linen covered in blood and/or body fluids, doffing PPE that has come into contact with blood and/or bodily fluids.

- To prevent colonisation/infection in health workers, contamination of the healthcare environment, and transmission of microorganisms from a colonised site to a clean site on the patient.

Moment Four: After touching a patient

WHY:

- To protect yourself and the health care surroundings from potential pathogens carried or shed by the patient. This indication is determined by the occurrence of the last contact with intact skin or the patient's clothing or a surface in the patient's zone, after direct patient contact. This only applies to EMS if there has been contact with the patient/patient environment after contact or procedures have been completed.
- To prevent colonisation/infection in health workers and contamination of the health care environment.

Moment Five: After touching a patient's surroundings

WHY:

- To protect yourself and the healthcare surroundings from potential pathogens from the patient's surroundings. Examples after touching the patient's immediate surroundings such as bed rails, curtains, monitor, over-bed table, bedside locker, call bell, table, clinical notes or surfaces, even if the patient has not been touched.
- To prevent colonisation/infection in health workers, and contamination of the healthcare environment. After touching the patient's environment, the health worker has microorganisms on their hands; these microorganisms can be transmitted to the next patient/surface the health worker touches. This includes after carrying out environmental cleaning.
- For EMS, Moment 5 would be after contact with the inside of the ambulance particularly where the patient is lying - the entire cabin should be considered part of the patient's surroundings.

Types of hand hygiene methods

Table 4 summarises the methods of HH, the aim thereof, what products should be used and the main indications for each method. The three HH techniques are described in detail below, (**Appendices C to E**).

Before carrying out hand hygiene:

- Ensure availability of all necessary hand washing facilities and supplies before starting the process.
- Remove all hand, wrist jewellery and accessories (only plain wedding band allowed).
- Arms must be bare below the elbows (except when using PPE for EMS for example rescue jackets).

Table 4: Summary of hand hygiene methods

Method	Aim	Products	Main indicators
HH using ABHR Alcohol hand rub	Destroy transient microbes	Use ABHR	<ul style="list-style-type: none"> • Before patient contact • Before clean or aseptic technique • After contact with the patient • After contact with the environment • Before wearing gloves • After having removed gloves – if hands are not visibly soiled
HH using soap and water Hygienic hand wash	Remove transient microbes	Wash with plain liquid soap and water and dry thoroughly with a paper towel	<ul style="list-style-type: none"> • When visibly soiled • After personal hygiene processes • After contact with blood and body fluids • Before and after wearing of gloves - if hands are visibly soiled • <i>C. difficile</i> cases
Surgical hand preparation	Destroy transient and reduce resident microbes on the skin for a prolonged period of time	<ul style="list-style-type: none"> • Surgical “scrub”: Three-minute washing with antiseptic agents (4% chlorhexidine gluconate) before a theatre list • No scrubbing with a nail brush • Surgical hand rub: ABHR (85.5% Ethyl alcohol) between theatre cases 	<ul style="list-style-type: none"> • Starting operating sessions or between procedures when contact with patient’s blood or body fluid has occurred and hands are visibly soiled. • Use ABHR between theatre cases when hands are not visibly soiled.

Alcohol hand rub technique

HH, using ABHR is regarded as the gold standard.^{37,38} When practiced correctly, it is highly effective in preventing transmission of microbes. It is more efficacious than soap and water as it rapidly and effectively inactivates a wide array of potentially harmful microorganisms found on hands.

WHO recommends the use of ABHR based on the following:³⁹

- Rapid and broad-spectrum microbicidal activity with minimal risk of generating resistance to antimicrobial agents.

³⁷ World Health Organization (WHO). WHO Guidelines on Hand Hygiene in Health Care [Internet]. 2009. Available from: <http://www.who.int/infection-prevention/publications/hand-hygiene-2009/en/>

³⁸ Pittet D, Donaldson L. Clean Care is Safer Care: The first global challenge of the WHO World Alliance for Patient Safety. *Am J Infect Control*. 2005;33(8):476–9

³⁹ World Health Organization. WHO | Clean Care is Safer Care [Internet]. 2009. p. 6. Available from: http://www.who.int/gpsc/en/nhttp://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf

- Suitability for use in resource-limited or remote areas with lack of accessibility to hand wash basins or other facilities for HH (including clean water, paper towels, etc.).
- Capacity to promote improved compliance with HH by making the process faster, available at the point of care and thus, more convenient.
- Economic benefit by reducing annual costs for HH and HAI.⁴⁰

The areas on the hands most often missed are the fingertips, which are the most contaminated, and traditionally the last step in the technique. It is also the part of the hand that is most frequently in contact with patients. The technique for using ABHR, has thus been modified **to start with the fingertips**.⁴¹

Method:

Duration of the entire procedure takes 15 seconds minimum or as long as it takes for the alcohol to dry completely. See **Appendix C**⁴².



Note: the hand rubbing action starts with dipping the fingertips first into the palm containing ABHR.

Hygienic hand wash technique

Method:

Duration of the entire procedure should be no more than 40 to 60 seconds. (**Appendix D**⁴⁴).



Note: hand washing will begin with palm to palm rubbing of liquid soap

Surgical hand preparation technique

Pre-operative hand preparation refers to the hand disinfection procedure prior to any surgical procedure. Surgical hand preparation should reduce resident flora from the hands of the surgical team for the duration of the procedure, to minimise the possibility of bacterial contamination from hands into an open wound.

Pre-operative surgical hand preparation process:

- Pre-operative surgical hand preparation with soap and water.
WHEN: On arrival in the operating theatre and after having donned theatre clothing (cap/hat/bonnet and mask).
- Pre-operative surgical hand rub
WHEN: Can only be performed on clean hands and between surgical procedures (if hands are not visibly soiled).

Pre-operative surgical hand preparation with soap and water

“Scrub” does not involve using a nailbrush or any other coarse material to remove skin. It is carried out by vigorously rubbing the hands and forearms with the other hand continuously for a minimum of two minutes. This is a two-stage process:

⁴⁰ McDonald LC, Gerding DN, Johnson S, Bakken JS, Carroll KC, Coffin SE, et al. Clinical Practice Guidelines for Clostridium difficile Infection in Adults and Children: 2017 Update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA). Clin Infect Dis. 2018;66(7):987–94.

⁴¹ Pires D, Bellissimo-rodrigues F. Revisiting the WHO “ How to Handrub ” Hand Hygiene Technique : Fingertips First ? 2016;(Table 1):8–11.

⁴² Infection Control Society of Southern Africa (ICSSA). <https://www.fidssa.co.za/ICSSA>

⁴⁴ Infection Control Society of Southern Africa (ICSSA). <https://www.fidssa.co.za/ICSSA>

- 1) These steps aim to remove *transient* flora: Remove all jewellery (rings, wedding bands, watches, bracelets, traditional or religious strings or skins before entering the operating theatre.
 - Wash hands with plain soap and water. Wash the wrists and forearms to the elbows as well.
 - Pay attention to the areas underneath the nails.
 - **Nailbrushes should not be used as they may damage the skin and encourage shedding of cells and bacteria.**
 - Rinse the arms, wrists and forearms with tepid water.
 - Dry hands and arms with paper towels.

Surgical scrub with antiseptic/antimicrobial soap aims to reduce the resident flora/microbial load. During surgery, microbes can be inadvertently released from micro tears in gloves and expose the patient to infection.

- Use **antimicrobial soap** (4% chlorhexidine gluconate) for this stage.
- “Scrub” each side of each finger, between the fingers, and the back and front of the hand. This should take a minimum of two minutes.

Pre-operative surgical hand rub technique

After the first handwash, ABHR may be used between cases if the hands are not visibly soiled. The method is shown in **Appendix E**⁴⁶.

Patients and visitors

- Patients should be given health education on HH to encourage good practice.
- Patients should have access to both ABHR and HH facilities with running water and soap as well as paper towels to dry the hands. Bed bound patients should be offered the means for hand-cleansing after bedpan/urinal use for example, by offering them wet wipes, soap and water or ABHR (if hands are not soiled visibly).

Recommendation for mothers:

- Before entering the unit or ward, wash hands and dry.
- ABHR may be used as follows:
 - before touching the baby or the cot
 - before expressing breast milk
 - before breastfeeding
 - after changing the diaper (if hands are not soiled)
 - after holding the baby or tidying the cot
- when leaving the Neonatal Unit or paediatric ward

⁴⁶ Infection Control Society of Southern Africa (ICSSA). <https://www.fidssa.co.za/ICSSA>

2.1.5 Hand hygiene promotion

Posters

- Hand rub methodology posters must be placed at strategic places and above alcohol dispensers in the health facility.
- HH posters serve as reminders in the workplace and can be strategically placed throughout the health facility.
- These should be rotated and/or replaced to keep the message fresh.
- HH posters must be laminated or framed and checked regularly to ensure integrity.
- HH posters must be displayed:
 - in all clinical areas for health workers
 - in toilets and bathrooms for patients and visitors

Hand hygiene campaign (live it)

HH awareness campaigns should be conducted according to the Health Awareness Calendar, such as the 5th of May World Hand Hygiene Day to create awareness and enhance compliance to HH. Reports thereof should be compiled and kept as evidence. Patient involvement in HH campaigns has proven to be effective in promoting compliance amongst health workers.

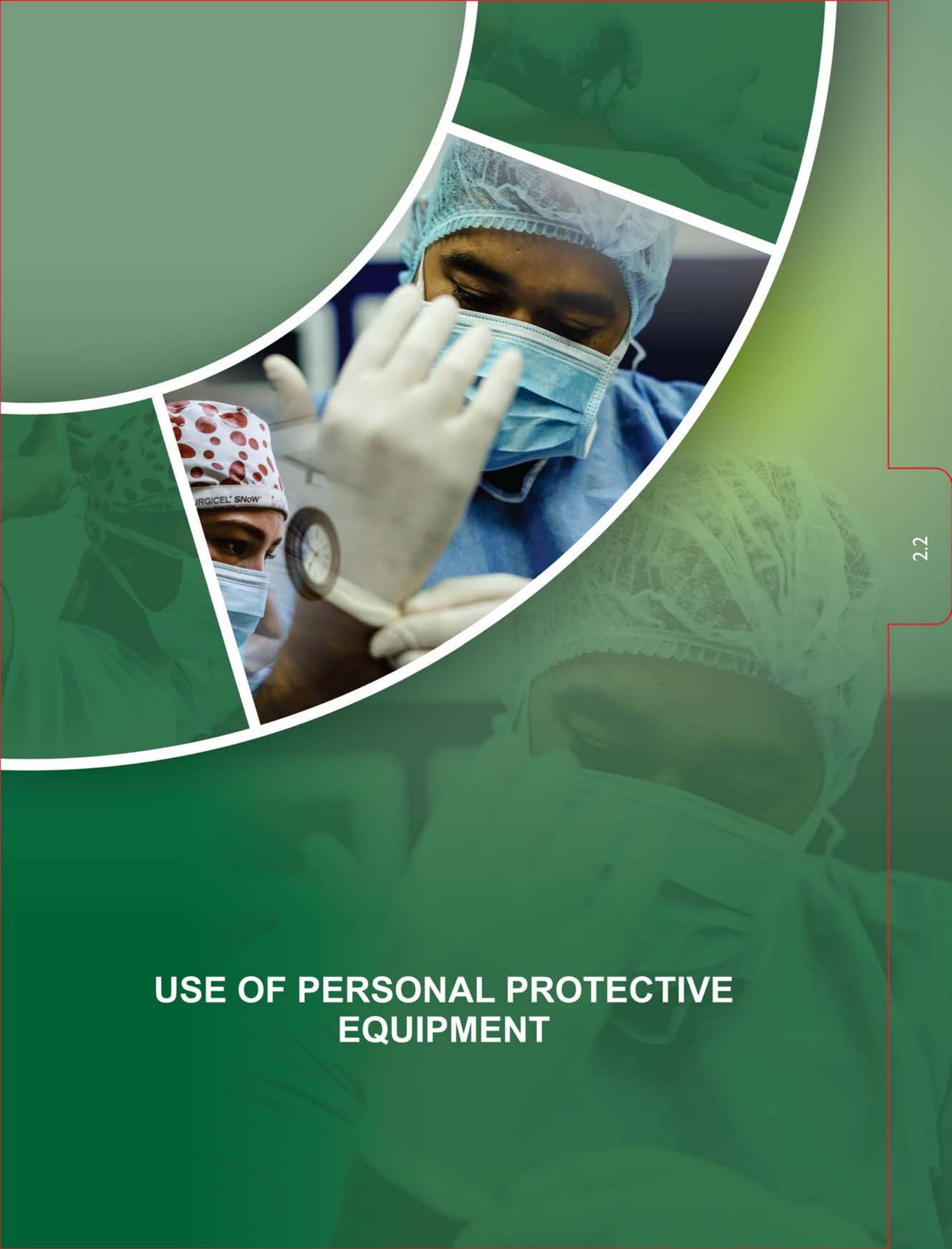
Hand hygiene education (teach it),

All new staff must receive training in IPC practices including HH. Encourage partnerships between mothers, patients, their families, and health workers to promote HH in the healthcare setting and at home.

- Establish the health facility overall HH compliance rate (baseline) by directly observing health workers during routine clinical care. The WHO Observation Tool hand hygiene self-assessment framework (HHSAF) should be used to conduct the audits. This tool can be downloaded from <https://www.who.int/gpsc/5may/tools/en/>.

Compliance and monitoring (check it)

- Quarterly audits (200 observations per quarter) must be conducted, and results communicated to staff members and facility managers at the IPC Committee meetings. Annual audits results can be compared with the baseline to document improvement.
- It is recommended that each ward, department or clinical area identify a HH champion. The HH champion should be the role model and monitor HH practices.
- Indirect monitoring method can also be used, for example, by recording and tracking consumption of HH supplies during the period of a month. Total litres issued can be divided by average number of bed days and then expressed as a rate: litres (or ml) per 1000 bed days.
- There should be evidence that the WHO Hand Hygiene Self-assessment Framework tool is completed annually, and improvements made where gaps were identified. (See *section under education*).



USE OF PERSONAL PROTECTIVE EQUIPMENT

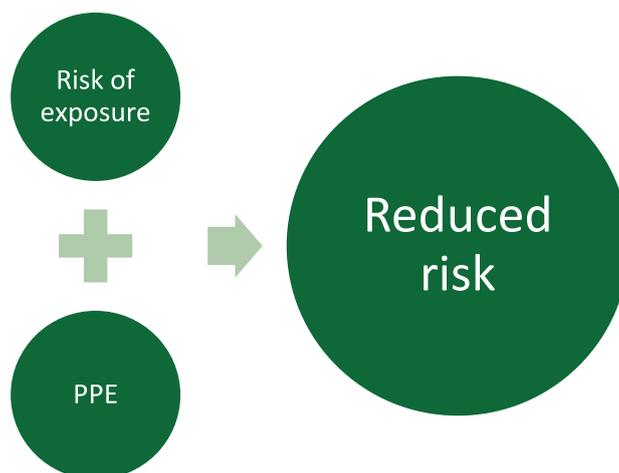
2.2 USE OF PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) is specifically used to protect clinical and non-clinical health workers (including cleaners, ancillary staff and food service workers) from exposure to body fluids or from droplet or airborne pathogens, chemicals or heat. PPE includes, but is not limited to gloves, aprons, gowns, caps, face covers, and protective eyewear (goggles). The use of PPE is based on risk assessment of each situation and discarded immediately afterwards, see **Figure 6**.

The following principles are used to do a risk assessment and to establish what type of PPE should be used:

- Identify the hazard/problem/threat e.g., likelihood of exposure to blood and body fluids/pathogens when inserting an intravenous line.
- Evaluate the risk associated with the hazard e.g., contact with blood borne viruses (e.g., Hepatitis B).
- Determine appropriate ways to eliminate or control the hazard (e.g., wearing gloves when in contact with blood and body fluids).⁴⁸

Figure 6: Approach to risk reduction



2.2.1 Rules about the use of PPE

- PPE serves a very specific purpose and when contaminated, can be a transmitter of microbes.
- PPE provides some, but not total, protection to the user. PPE is only effective if used as part of an IPC process and has little or no value as a sole measure for containing pathogens, therefore hand hygiene is essential after removing gloves.
- The use of PPE without indication (to allay personal prejudice or fear) may increase the risk of infection.
- PPE is not a substitute for poor infection control practice (including lack of administrative or engineering controls) or indeed healthcare procedures.
- All PPE has a finite or limited life and must be discarded after use as indicated, preferably after each procedure or after each patient use.
- PPE must be of good quality and be fit for purpose.⁴⁹

⁴⁸ Dramowski. A., 2014. Infection Prevention and Control A guide for healthcare workers in low-resource settings. Bettercare

⁴⁹ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

The same PPE should never be used between patients. Discard after each patient contact.

Types of PPE

There are different types of PPE indicated when carrying out a procedure and are used to protect both the patient and the staff.

2.2.2 Gloves

Gloves are used to protect the health workers' hands from direct contact with blood, body fluid, secretions or excretions. If such risk is possible, gloves should be worn and discarded after each procedure or patient use. Gloves come in a variety of materials, but the common ones used in health facilities are listed below. Each type of material has advantages and disadvantages. **Table 5** sets out the different types of gloves and their recommended use.⁴⁷

Materials used in gloves

Latex is commonly used in gloves designed to prevent contact with blood and body fluids. These are available in different sizes, lengths and can be sterile or non-sterile. Their popularity is based on their elasticity and good fit. However, latex allergy is becoming increasingly common and there is a move away from latex gloves to other equally effective ones.

Nitrile is a popular material for gloves. It is less elastic than latex but does fit well and can prevent penetration of blood and body fluids. As it is latex free, it is often recommended in cases of latex allergy. It is not ideal for use in surgical procedures but may be used in other minor operations and aseptic procedures. Initial diminished dexterity with nitrile gloves is quickly overcome with practice. Nitrile gloves are more puncture-resistant and more resistant to chemicals than latex gloves.

Vinyl gloves are usually not sterile. These are adequate for carrying out non-clinical activities.

Plastic (Hampshire) gloves are no longer recommended for healthcare purposes but may be used in catering.

Domestic gloves are made of reinforced latex and should be used for manual cleaning such as the environmental cleaning, kitchen or decontamination areas in SSD.

Heavy-duty gloves should be used for handling waste; made of leather and reinforced to protect against sharps, heat and chemicals. Specific heat-resistant gloves should be used when removing items from the steam sterilisers in the SSD.⁵⁰

⁵⁰ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

Table 5: Glove types and indications for use

Type	Type of material	Recommended use
	Latex, short cuff, non-sterile examination glove	Routine use for non-sterile procedures where gloves are indicated.
	Latex, sterile, cuff (individually wrapped)	All surgical procedures Sterile (aseptic) procedures
	Latex - long cuff, non-sterile	Maternity SSD
	Nitrile – mid-forearm	Viral haemorrhagic fever
	Nitrile (short cuff)	EMS, in cases of latex allergy Non-invasive procedures Endoscopy
	Vinyl (short cuff)	Substitute for latex non-sterile examination glove. Used for non-clinical tasks
	<i>Hampshire</i> Pressed on to a folded sheet of paper Thin, plastic, poor seal	Kitchen Pharmacy Not recommended for direct clinical or patient care
	Domestic gloves	Environmental cleaning Kitchen and manual washing Manual cleaning of medical devices Should be colour coded for different areas of use.
	Heavy duty and heat-resistant gloves	Removal of waste Sterilisers in SSD

2.2.3 Face Covers

Face covers are recommended for reducing infectious droplets from a person (source) to another person in close proximity. Cloth or fabric masks are recommended for use by the community as a public health measure, to prevent transmission of respiratory viruses such as SARS-CoV-2, or influenza especially during epidemics. As part of respiratory etiquette, always covering the mouth and nose with a tissue, cloth or the crook of the elbow, when coughing or sneezing, is advised. Cloth masks are not recommended for use in healthcare.

The more frequent use of face covers is when delivering healthcare; the purpose of which is to prevent droplets from reaching the mucous membranes of the nose and mouth, and to reduce inhalation of infectious pathogens by the healthcare worker. The use of face shields is increasing to provide added protection to healthcare workers.

There two common face covers used in clinical practice are surgical face masks and respirators. Surgical face masks should cover the nose and mouth for surgical or other procedures. Respirators are designed to prevent the inhalation of noxious substances or particles including biological hazards such as microbes.

All types of face covers, (masks and respirators) must fit the face well to provide maximum benefit to the user.

Face covers serve two purposes:

- To prevent or reduce the transmission of droplets and aerosols between health workers and patients.
- To prevent splashing of mucous membranes during procedures.

Surgical masks

Face masks (surgical) are made of several layers of paper with nonwoven polypropylene spunbond inserted between the outside layers. They protect the health worker against fine to medium sized aerosols, and splashes of blood or body fluids. They create a short-term barrier against dispersal of large droplets and most aerosols during coughing or sneezing. Surgical masks may become inefficient after 15 minutes of continuous use and should be changed when damp or soiled. They should be discarded before going on a break and a fresh surgical mask worn.

The different types of face covers are shown in **Table 6**.⁵¹ There are many more types, but the most essential types are covered here.

Table 6: Types of face covers and indications for use

Types		Recommended use
	Surgical face mask	<ul style="list-style-type: none"> • For use in theatres, outpatient settings, sterile procedures • PPE for <i>airborne precautions for visitors & patients</i>: measles, varicella, drug-sensitive PTB (see transmission-based precautions) • PPE for <i>droplet precautions</i> e.g., influenza or within 1 meter from a patient <p>Face masks should be discarded after a single use. DO NOT use a surgical face mask with the lower ties either undone or cut off!</p>

⁵¹ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

Types		Recommended use
	Goggles	<ul style="list-style-type: none"> Goggles protects the eyes from splashes PPE for droplet precautions when invasive procedures are performed. <p>Goggles do not provide splash or spray protection to other parts of the face.</p>
	Face mask with visor	<ul style="list-style-type: none"> Face masks with visors protect mucous membranes against splashes and replace a goggle and mask combination. These are indicated in any risk prone procedure which involves light to moderate splashes from blood or body fluids.
	Face shields or visors	<ul style="list-style-type: none"> Face shields may be used in conjunction with a surgical mask or respirator to protect eyes and mucous membranes During aerosol generating procedures During close contact with COVID-19 patients
	Respirators without valves Cone shaped respirator	<ul style="list-style-type: none"> Pulmonary TB Pulmonary MDR-/XDR-TB airborne precautions Prolonged care of a patient with pulmonary MDR-/XDR-TB Healthcare worker contact with patients with varicella (chickenpox) or measles Aerosol generating procedures on COVID-19 patients⁵² For high-risk procedures: <ul style="list-style-type: none"> Bronchoscopy Open or closed suctioning of patients with TB Dental procedures on patients with known TB especially MDR-/XDR-TB
	Duckbill shaped respirator	
	Respirator with valve: Flat or cone shape	<ul style="list-style-type: none"> Expiratory valves are used when prolonged contact with the patient (over one hour) is expected. For use with patients with MDR- and XDR-TB. <p>These are preferable to the non-valved respirators and are more comfortable for the user – <i>but valved respirators are not recommended for the care of COVID-19 patients.</i></p>
	Paper mask (Queen Charlotte)	Not recommended for use in health facilities as it offers no protection against inhaling microorganisms.

Face masks should be discarded after a single use. Face masks with attached visor offers protection to the eyes against minor splashes.

⁵² See COVID-19 Infection Control Guidelines Version 3 (NDOH, South Africa), for list of aerosol generating procedures.

Respirators

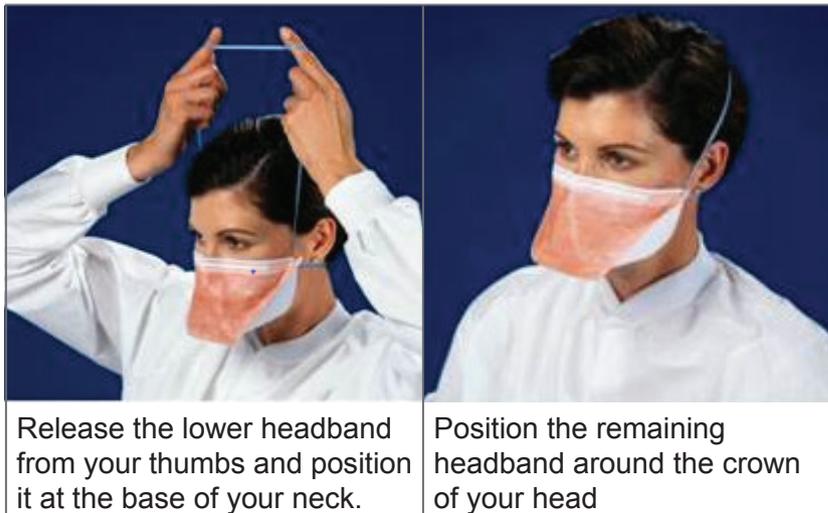
Respirators have been introduced into healthcare practice, mainly because of the risk from MDR-and XDR-TB but are recommended for use when nursing all patients with pulmonary TB. More recently, respirators are recommended for HCW carrying out aerosol generating procedures on COVID-19 patients. The respirator is only moderately water resistant. It is designed to filter out 95% of noxious substances carried in the air, including biohazardous pathogens such as *Mycobacterium tuberculosis*.

Face types and shapes differ, as do designs of respirators. Fit testing is recommended to ensure an adequate fit and maximum protection and to prevent air leaks around the edges of the respirator. See the Fit test for respirators (**Table 7**).

- Once the correct respirator has been selected, further fit testing is not necessary if the same type of respirator is used, and the wearer’s face has not changed due to significant weight loss or gain.
- However, respirators are only efficient if they are correctly moulded to the person’s face and there is no air leakage around the edges of the respirator during an intake of breath.
- Respirators straps must go around the head (not just the ears), to give a perfect face seal- if you can breathe easily for hours at a time, the fit is incorrect.
- Respirators must be donned correctly (**Table 8**).

Table 7: Fit test for a respirator

		
<p>A respirator is worn, and a sealed hood is put over the head of the wearer.</p>	<p>A substance, such as saccharin, is aerosolised into the hood and the person indicates whether it can be tasted.</p>	<p>The respirator is adjusted to fit, until the substance can no longer be tasted. The respirator has passed the fit test.</p>

Table 8: Putting on a respirator

Respirators with ear loops do not provide a sufficiently tight face fit and will require a clip across the back of the head to ensure a good seal.

Seal checks

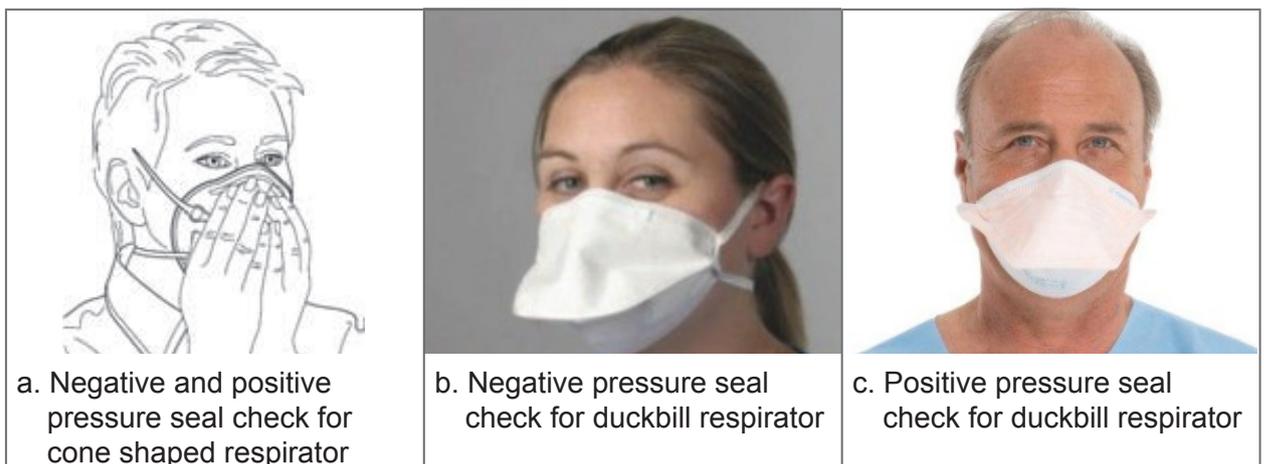
A seal check is a procedure conducted by the health worker that wears the respirator to determine if the respirator is being properly worn. A seal check must be performed every time a respirator is worn. The seal check can either be a positive pressure or negative pressure check (**Table 9**).

- Negative pressure seal check:

- *Cone shape respirator:* Cup hands over respirator without excessive pressure. Breathe in sharply. A light collapse of the respirator should be felt with no air leaking in around the face-to-face piece seal. **Table 9a.**
- *Duckbill respirator:* Breathe in sharply. The respirator should collapse inwards. **Table 9b.**

+ Positive pressure seal check:

- *Cone shape respirator:* Cup hands over respirator. Blow out. A build-up of air should be felt with no air leaking out around the face-to-face piece seal edges of the device.
- *Duckbill respirator:* Breathe out forcefully; the respirator should expand on the exhale. **Table 9c.**

Table 9: Seal check

Re-use of a respirator

- **Limited reuse depending on the local conditions** and has been recommended and widely used as an option for conserving respirators **during respiratory pathogen outbreaks and pandemics.**
- Reuse refers to the practice of using the same respirator for multiple encounters with patients but removing it ('doffing') after each encounter. The respirator is stored in between encounters to be put on again ('donned') prior to the next encounter with a patient. For tuberculosis prevention, CDC recommends that a respirator classified as disposable can be reused by the same worker if it remains functional and is used in accordance with local infection control procedures. There is a limit to the number of times the same respirator is reused, often referred to as "limited reuse".^{53, 54}
- If the respirator is to be reused it should be type-fitted to the face of one healthcare worker who uses it over a period of not more than one week or until damp or mis-formed.
- The respirator should be removed carefully using a paper towel and placed in a paper (not plastic) bag, labelled with the health worker's name, to avoid damage. See Table 10 for the respirator doffing technique. Carry out hand hygiene immediately afterwards.
- Deterioration of respirator efficiency occurs with humidity, dirt and crushing.⁵⁵

Table 10: Respirator doffing technique

		
<p>Without touching the respirator, slowly lift the bottom strap from around your neck up and over your head.</p>	<p>Lift off the top strap. Do not touch the respirator.</p>	<p>Store respirator in a paper bag with your name on it. Do not crush the respirator when storing it.</p>

Face Shields

Face shields are used to protect the eyes and mucous membranes of the user from splashes and aerosol. It does not have a good fit and therefore should be used in conjunction with a face cover such as a surgical mask or respirator. The face shield must be cleaned thoroughly with soap and water and wiped dry. If disinfection is required, the external surface may be wiped with a 70% alcohol swab.

2.2.4 Aprons

- Plastic aprons should be available in all health facilities and should be used as recommended.
- Aprons are worn to protect clothes from splashes during a clinical procedure or during contact precautions (**Table 11**).⁵⁶

⁵³ IOM: Reusability of facemasks during an influenza pandemic: facing the flu. Washington, D.C.: National Academies Press, 2006.

⁵⁴ <https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html#ref2>

⁵⁵ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

⁵⁶ Western Cape Department of Health. IPC Manual: Tygerberg Hospital, Cape Town, South Africa

- Plastic aprons are water resistant but can become contaminated and may transmit pathogens if used between patients.
- Aprons are single patient use only and must be discarded at the end of each procedure.
- The re-use of plastic aprons after cleaning with a disinfectant is not recommended.
- **Routine use of aprons is not recommended.**

Plastic aprons are available in different colours if colour coding is in place.

Table 11: Plastic aprons - recommended use and technique

Type	Recommended use and technique
	<ul style="list-style-type: none"> • Disposable plastic aprons are worn when: <ul style="list-style-type: none"> • Splashing, exposure to blood or body fluids is expected. • During damp cleaning. • When washing items in the sluice. • Decontaminating of medical devices either in SSD or other areas.
	<ul style="list-style-type: none"> • Don an apron so that it covers your entire front and sits high on the chest. • Do not walk around with the tapes untied. • To remove an apron, break the neck band and fold the bib section down. Break the waist ties and fold the apron inside out, thus containing the contaminated/exposed surface inside. Discard in a biohazardous waste container.

2.2.5 Gowns

Cloth or cotton gowns are not recommended for IPC purposes since these are not water resistant. Sterile cotton gowns are used in the operating theatre and labour ward but should be used in conjunction with a plastic apron underneath to prevent soaking of clothes. Commercially available **non-woven water-resistant gowns** and **coveralls** with a layer of waterproof material for the front and arms are usually expensive and are used in selected indications such as when treating a bleeding patient with viral haemorrhagic fever (**Table 12**).⁵⁷

Table 12. Types of gown and body covers available for use in healthcare

Type	Recommended use
 <p>Cloth or cotton gowns</p>	<ul style="list-style-type: none"> • Reusable; laundered and sterilised • Used in operating theatre and labour ward ONLY. • Used with plastic apron underneath to reduce fluid contamination.

⁵⁷ Western Cape Department of Health. IPC Manual: Tygerberg Hospital, Cape Town, South Africa

Type	Recommended use
 <p>Non-woven water-resistant gowns</p>	<ul style="list-style-type: none"> • Disposable • Used when treating bleeding patients with haemorrhagic fever. • Dealing with COVID-19 patients as recommended by policy
 <p>Coveralls</p>	<ul style="list-style-type: none"> • Water resistant • Disposable • Used when treating bleeding patients with haemorrhagic fevers. • Dealing with COVID-19 patients as recommended by policy <p>Note: These are very uncomfortable to wear for prolonged periods of time especially in hot and humid situations.</p>

2.2.6 Head covers

The routine use of head covers of any type has been abandoned since there is no scientific evidence for their use – and it is an extra expense. Head covers (made up of non-woven water-resistant material) are only recommended when working in a sterile environment or where clean items are processed.

Head covers are indicated for use in:

- operating theatres for both staff and patients;
- the clean section of the SSD;
- processing of sterile feeds; and
- sterile fluid production in the pharmacy

Under exceptional circumstances, head covers are recommended when attending severely immune compromised patients such as patients having had a bone marrow transplant.⁵⁸

2.2.7 Shoes/boots and overshoes/shoe covers

Closed toes shoes are recommended for use by all healthcare workers in the clinical setting. This to ensure that they are protected in case of accidental spillage or dropping of sharp instruments. Sandals are not recommended when working in clinical areas. These rules apply to all categories of healthcare workers.

Overshoes/shoe covers

Overshoes/shoe covers should not be used in the general healthcare environment. By touching the shoes when putting on overshoes, hands become contaminated. Overshoes can result in creating an aerosol while walking and can transmit microbes from the floor to the environment and patient surrounding area.^{59,60}

⁵⁸ Western Cape Department of Health. IPC Manual: Tygerberg Hospital, Cape Town, South Africa

⁵⁹ Patient shoe covers: Transferring bacteria from the floor onto surgical bedsheets. Article (PDF Available) in American journal of infection control 44(11) · May 2016 with 585 Reads. DOI: 10.1016/j.ajic.2016.03.020

⁶⁰ Galvin, Justin & Almatroudi, Ahmad & Vickery, Karen & Deva, Anand & Kelly Oliveira Lopes, Lillian & Costa, Dayane & Hu, Honghua. (2016). Patient shoe covers: Transferring bacteria from the floor onto surgical bedsheets. American Journal of Infection Control. 44. 10.1016/j.ajic.2016.03.020.

Overshoes may be issued to visitors to the operating theatre who do not have dedicated “inside shoes”. Although their use is not recommended, if these are to be used, care must be taken to decontaminate hands using ABHR after donning and removing overshoes. Although there is no evidence of transmission via this route, it is still recommended that disposable, knee-length overboots or gumboots should be worn when caring for patients with viral hemorrhagic fevers.

Theatre footwear

Dedicated footwear, e.g., closed shoes or clogs with heel support straps, should be used in the operating theatre. Theatre footwear should:

- have closed toes
- be clean and well maintained (it is recommended that a designated washer-disinfector be used. In the absence of a washer-disinfector, theatre shoes must be hand washed)
- be easy to clean
- be non-slip/ with good traction
- support the foot
- enclose the foot. **(Table 13)**

Footwear in non-theatre settings

Footwear in non-theatre settings should:

- be soft-soled and have closed toes
- have low heels
- be non-slip with good traction
- be clean and well maintained
- support the foot.

When to put on/remove dedicated footwear

Where dedicated footwear is used, for example, in SSD, clean rooms or minor surgery, it should be removed before leaving the operating theatre complex or clean area. Dedicated footwear is usually stored in the dressing rooms, and this is where the exchange between outside and inside footwear is made.

Cleaning of footwear

It is the responsibility of the wearer to ensure that theatre footwear is washed and disinfected appropriately (using manufacturer recommended procedure/solutions) in a designated washer-disinfector when visibly contaminated. There is no cleaning requirement for footwear used in non-theatre settings unless they become contaminated with blood or body fluids; in which case they should be cleaned appropriately.

Table 13: Shoes/boots

Type	Recommended use
<p>Shoes</p> 	<p>Shoes with closed toes and heel protection should be worn when protection from splashes and dropped sharps is required.</p>

Type	Recommended use
Boots 	Boots should be worn: <ul style="list-style-type: none">• by staff handling healthcare risk waste.• when treating patients with viral haemorrhagic fevers, if disposable overboots or coveralls with attached booties are not available, gumboots should be white in colour to show any contamination.

2.2.8 Donning and doffing of PPE

The donning and doffing of PPE is a critical process that requires significant care. **Appendices F and G** illustrate the procedures for donning and doffing of PPE.

An educational video demonstrating safe donning and doffing of PPE can be downloaded from www.medicine.uct.ac.za/news/covid-19-resources.



USE OF ANTISEPTICS, DISINFECTANTS AND DETERGENTS

2.3 USE OF ANTISEPTICS, DISINFECTANTS AND DETERGENTS

Disinfectants, detergents and other cleaning materials are chemicals. Some of these can have a detrimental effect on the users, patients and visitors. More importantly, disinfectants share common mechanisms of resistance with antibiotics which increases the risk of AMR especially in healthcare facilities. The role of biofilms is increasingly recognised in encouraging persistence of MDROs and AMR and therefore disinfectants must be limited to essential indications only. Disinfectants must be used specifically when indicated according to SOPs and guidelines of the facility or national guidelines.

Health workers should understand the difference between detergents, antiseptics and disinfectants and follow their appropriate indications in health facilities.

2.3.1 Definitions

Detergents are water-soluble cleaning agents used for cleaning porous and non-porous surfaces; they have no disinfection properties.

Antiseptics are used to reduce microbial levels on the skin and living tissue.

Disinfectants are used for reducing microbial contamination on surfaces and inanimate objects. Humans must never be sprayed with chemical disinfectants such as chlorine because it is toxic and can cause serious harm to the health worker.⁶¹

Surface disinfectants should not be sprayed directly onto surfaces as this causes aerosolisation. Should be applied using a clean cloth and the surface wiped systematically and carefully.

2.3.2 Detergents

These are chemicals which attract dirt and organic matter and bind them. Most of the detergents used in healthcare are pH neutral and are specifically designed for use in health facilities. Most of the routine cleaning should be done with clean water and a neutral detergent. The detergents should be compatible with the material they are used to clean. Detergents usually have no killing ability but do remove organic matter which contain microbes and thereby reduce environmental contamination.

2.3.3 Antiseptics

Antiseptics are chemicals applied to living tissue to reduce levels of microbes on the skin, such as pre operative skin preparation.

Indications for the use of antiseptics:

- Hand hygiene
- Skin preparation for surgery
- Aseptic procedures such as insertion of intravenous devices.

Types of antiseptics

The recommended antiseptics for use on living tissue are:

- **Chlorhexidine:** strength: 0.5% to 4% w/v; either in water or 70% isopropyl alcohol.
- **Povidone iodine:** aqueous or in 70% isopropyl alcohol (no longer recommended for routine use).

⁶¹ Mehtar S, Andre N. H. Bulabula A NH, Haurace Nyandemoh H and Steve Jambawai S; Deliberate exposure to chlorine - the aftermath of Ebola in West Africa. *Antimicrobial Resistance and Infection Control* (2016) 5:45
DOI 10.1186/s13756-016-0144-1

- **Alcohol** (Isopropyl, propyl, ethanol) - in ISO or EN specified concentrations or WHO minimum standards with an emollient is recommended for HH.⁶²

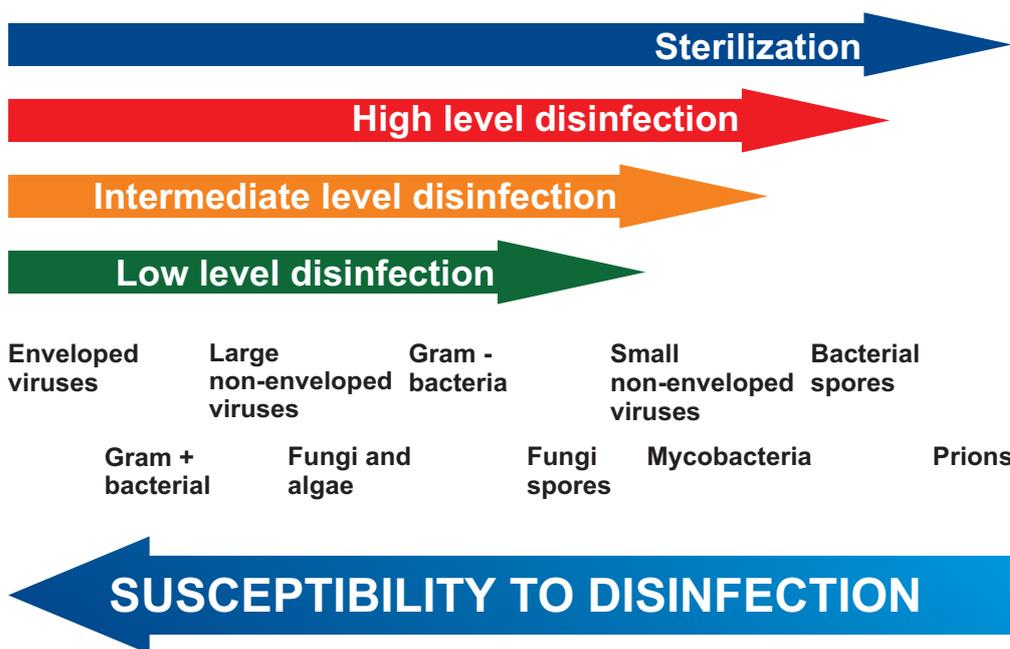
Chemicals which are used as antiseptic as well as disinfectant may be harmful to living tissue (except 70% alcohol)

Chlorhexidine-containing preparations must not be used for cleaning environmental surfaces because it is expensive, wasteful, and being an antiseptic (and not a disinfectant), it has specific indications for use on skin.

2.3.4 Disinfectants

Surfaces should be thoroughly cleaned before applying disinfectants to further reduce bioburden and should be used according to the manufacturers’ instructions. Disinfectants and detergent-disinfectants must comply with the standards as set out in the Compulsory specification for disinfectants and detergents-disinfectants published under R529 of 14 May 1999 (VC 8054), in terms of the Specifications Act of 1993, which stipulates the disinfecting and cleaning efficacy of detergents, disinfectants, corrosiveness, water insoluble-water matter content and rinsing properties. The hierarchy of antimicrobial activity of the various disinfectants are shown in **Figure 7**.

Figure 7: The hierarchy of disinfectant activity illustrating intrinsic resistance of microbes and levels of disinfection required⁶³



Disinfectants have also been implicated in cross resistance with antibiotics, heavy metals and other medication. They promote the acquisition and persistence of healthcare-associated pathogens and therefore should be used with great care, as recommended, and at effective dilutions.

ALWAYS CLEAN FIRST, THEN DISINFECT

⁶² Western Cape Department of Health. IPC Manual: Tygerberg Hospital, Cape Town, South Africa

⁶³ McDonnell, G.; Burke, P. Disinfection: Is it time to reconsider Spaulding?, 2011. doi:10.1016/j.jhin.2011.05.002

Indications for the use of disinfectants in environmental cleaning

The routine use of disinfectants in the environment is not recommended for several reasons:

- There is no added benefit of using disinfectants routinely especially since good cleaning removes up to 80% of organic contamination.
- Disinfectants cannot improve more than cleaning on reducing the level of environmental contamination with microbes.
- Disinfectants contribute to increasing resistance to antimicrobial agents among pathogens.
- There are ecological reasons for not overusing disinfectants especially those that are not biodegradable - these accumulate in the waterways and promote antimicrobial resistance.
- They have little or no direct effect on biofilms.
- Disinfectants are expensive.
- Health workers and patients can develop allergies to some disinfectants.
- Disinfectants must be compatible with the detergents and soaps used for cleaning.

Any application of a disinfectant must be with a cloth and the surface wiped carefully covering all areas in a systematic technique. It should never be sprayed.

Recommended Disinfectants

Currently, the following disinfectants are recommended for environmental disinfection following thorough cleaning:

- Chlorine releasing agent – hypochlorite (strength: 1,000-10,000 ppm).
- Alcohol based (70%-90%) agent.
- Quaternary ammonium compounds (QAC) and other chemicals available on the market for use in healthcare.
- Non-touch disinfection technologies such as vaporised hydrogen peroxide has been introduced to add further disinfection after terminal cleaning following MDRO outbreaks particularly for high dependent and isolation units. **This technology should always be used as an addition to cleaning with a detergent and water; and disinfection, and the technology does not replace these two processes.**
- UV disinfection: has been recently introduced to deal with terminal cleaning following MDRO outbreaks, particularly for high dependent and isolation units. **This technology should always be used as an addition to cleaning with a detergent and water; and disinfection, and the technology does not replace these two processes.**

Appropriate use of disinfectants

The following are the indications for the use of disinfectants when there is no outbreak or pandemic.

- Terminal cleaning after:
 - contact precautions
 - droplet precautions
 - airborne precautions.

- Decontamination of high dependency or isolation units following outbreaks of MDROs.
- Main kitchen surfaces before and after preparing cooked food.
- Operating theatres - after excessive blood spillage has been cleaned up.
- Burns Unit – cleaning of baths after each patient use.
- Sterile fluid and medication preparation areas.⁶⁴

The IPC Team at the health facility should be consulted for instruction on the choice of disinfectant to use for particular infectious diseases during terminal cleaning.

Use of disinfectants for reprocessing heat sensitive medical devices - see Section on Decontamination of Medical devices

Recommendations for the use of detergents and disinfectants for environmental cleaning stratified by risk are set out in **Table 14**.

Table 14: Recommendations for the use of detergents and disinfectants for environmental⁶⁵

Uses	Agents	Comments
LOW-RISK AREAS:		
Corridors All wards Ablution blocks Beds Lockers Floors Surfaces	Detergent and clean water.	Use clean, warm water with a neutral detergent. Apply with a clean cloth or mop (for floors), rinse and dry.
HIGH-RISK AREAS:		
Transplant units Oncology units Operating theatres ICU Neonatal ICU Trauma & Emergency Milk Kitchen Isolation rooms or wards Sluice rooms Patient compartment of ambulances	Detergent and clean water. AND Wipe over with hypochlorite 1:1000 ppm disinfectant solution (bleach) as recommended by IPC Team.	Chlorine releasing agents or other disinfectants may be used routinely in high-risk areas, but alternatives should be considered for neonatal units. Consult IPC Team for use in terminal cleaning.
Stainless steel surfaces, enamel baths and basins	Detergent and clean water OR Ammonia containing detergent where there are fatty deposits.	Ensure the product is non-abrasive - scratches will retain dirt and bacteria.

⁶⁴ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

⁶⁵ Western Cape Department of Health. IPC Manual: Tygerberg Hospital, Cape Town, South Africa

Uses	Agents	Comments
HIGH-RISK AREAS:		
Blood spillages, other infected surfaces or spillages.	Detergent and water Chlorine disinfectant (bleach)	<ul style="list-style-type: none"> • Wear appropriate PPE • Wipe away spillage with paper towels • Clean the area with water and detergent and dry • Wipe over with chlorine 1000ppm solution • Dispose waste and PPE • Hand hygiene
Trolley surfaces	Detergent and clean water AND 70% alcohol	Wipe over with 70% alcohol wipe at beginning and end of treatment or wound dressing (and ensure dryness).

Advantages and disadvantages of disinfectants.

Some advantages and disadvantages of commonly used disinfectants are outlined in **Table 15**.⁶⁶

Table 15: Advantages and disadvantages of common healthcare disinfectants⁶⁷

	Disinfectant	Advantages	Disadvantages
Low-level disinfectants	<i>Improved Quaternary ammonium compounds e.g., alkyl dimethyl benzyl ammonium chloride, alkyl dimethyl ethylbenzyl ammonium chloride</i>	<ul style="list-style-type: none"> • Toxicity: <ul style="list-style-type: none"> • May be used on food contact surfaces • Wide material compatibility <ul style="list-style-type: none"> • Non-corrosive • Detergent properties, good cleaning ability • Low cost 	<ul style="list-style-type: none"> • Toxicity: <ul style="list-style-type: none"> • Skin irritant • Can also cause respiratory irritation. • Narrow microbiocidal spectrum <ul style="list-style-type: none"> • Cannot be used to disinfect instruments. • Diluted solutions may support growth of microorganisms. • Affected by environmental factors: <ul style="list-style-type: none"> • Activity reduced by various materials (e.g., cotton, water hardness, microfibre, organic material) • Induces cross resistance with antibiotics. • Persists in the environment and waterways.

⁶⁶ Rutala WA, Weber DJ. 2016. Monitoring and improving the effectiveness of surface cleaning and disinfection. *American Journal of Infection Control* 44: 69-76

⁶⁷ Best Practices for Environmental Cleaning in Healthcare Facilities: for Resource-Limited Settings [Internet]. Atlanta: US Centers for Disease Control and Prevention and Cape Town: Infection Control Africa Network, 2019. Available from: <http://www.icanetwork.co.za/icanguideline2019/>

	Disinfectant	Advantages	Disadvantages
Mid-level disinfectants	<i>Alcohols (60-80%) e.g., isopropyl, ethyl alcohol, methylated spirits</i>	<ul style="list-style-type: none"> • Broad spectrum (but not sporicidal) • Rapid action • Non-toxic • Non-staining, no residue • Non-corrosive • Low cost • Good for disinfecting small equipment or devices that can be immersed 	<ul style="list-style-type: none"> • Slow acting against non-enveloped viruses. • Does not remain wet: <ul style="list-style-type: none"> • Rapid evaporation making contact time compliance difficult (on large environmental surfaces) • Affected by environmental factors: <ul style="list-style-type: none"> • Inactivated by organic material. • Material compatibility: <ul style="list-style-type: none"> • May damage materials (plastic tubing, silicone, rubber, deteriorate glues) • Flammable
	<i>Chlorine e.g., bleach/sodium hypochlorite, sodium dichloroisocyanurate (NaDCC)</i>	<ul style="list-style-type: none"> • Broad spectrum (sporicidal) • Rapid action • Non-flammable • Low cost • Readily available • Can reduce biofilms (at high concentrations) 	<ul style="list-style-type: none"> • Affected by environmental factors: <ul style="list-style-type: none"> • Inactivated by organic material. • High toxicity: <ul style="list-style-type: none"> • Can release toxic chlorine if mixed with acids or ammonia. • Skin and mucous membrane irritant. • Material compatibility: <ul style="list-style-type: none"> • May damage fabrics, carpets • Corrosive • Leaves a residue, requires rinsing/removal with a clean cloth. • Offensive odours • Poor stability: <ul style="list-style-type: none"> • Subject to deterioration if exposed to heat and UV.
	<i>Improved hydrogen peroxide e.g., 0.5% enhanced action formulation hydrogen peroxide, 3% hydrogen peroxide</i>	<ul style="list-style-type: none"> • Rapid action • Non-toxic • Detergent properties, good cleaning ability • Not affected by environmental factors <ul style="list-style-type: none"> o Active in the presence of organic material • Safe for environment 	<ul style="list-style-type: none"> • Material compatibility: <ul style="list-style-type: none"> • Contraindicated for use on copper, brass, zinc, aluminium.

Hypochlorite (chlorine) must be used at the correct dilution to ensure maximum efficacy. See **Table 16** and **Appendix H**⁶⁸ (illustrations). The application of the different strengths of chlorine in health care is set out in **Table 17**.

⁶⁸ National Health Laboratory Services. Courtesy of Prof AG Duse



NOTE: Bleach solution becomes unstable rapidly, hence it needs to be freshly prepared daily or changed on becoming dirty/turbid. Chlorine bleach can be corrosive so must be used sparingly and all equipment must be rinsed off after its use.

Table 16: Correct method of diluting different concentrations of hypochlorite

Product	Available chlorine	How to dilute to 0.5%	How to dilute to 1%	How to dilute to 2%
Sodium hypochlorite – liquid bleach	3.5%	1 part bleach to 6 parts water	1 part bleach to 2.5 parts water	1 part bleach to 0.7 parts water
Sodium hypochlorite – liquid bleach	5%	1 part bleach to 9 parts water	1 part bleach to 4 parts water	1 part bleach to 1.5 parts water
NaDCC (sodium dichloro-isocyanurate) – powder	60%	8.5 grams to 1 litre water	17 grams to 1 litre water	34 grams to 1 litre water
NaDCC (1.5g/tablet) - tablets	60%	6 tablets to 1 litre water	11 tablets to 1 litre water	23 tablets to 1 litre water
Chloramine - powder	25%	20 grams to 1 litre water	40 grams to 1 litre water	80 grams to 1 litre water

Table 17: Indications for the use of different strengths of chlorine solutions⁶⁹

Indication of chlorine use	Available parts per million (ppm) of free chlorine
Blood spillage (HIV, HBV, HCV)	10,000 ppm
Pre-cleaned surfaces, cleaning equipment	1000 ppm
Catering and infant feed equipment	125 ppm
Hydrotherapy pools	4-6 ppm
Drinking water	0.5-1.0 ppm



NOTE: All chemicals must include the manufacturer's instruction for dilution.

2.3.5 Patient care articles and medical equipment

This section deals with routinely used equipment both clinical and non-clinical and the recommended method of decontamination (**Appendix I**). If incorrectly processed, these articles can harbour healthcare-associated pathogens and lead to outbreaks.

- Clean patient care articles and medical equipment thoroughly (till visibly clean) and ensure it is dry.

⁶⁹ Fraiese AP, Bradley C. Ayliffe's Control of Healthcare Associated Infection (2009) Chap 5: p 92

- Disinfection using heat is preferred to chemical disinfection, depending on the manufacturer's guidelines.
- Store clean and dry until further use - make sure there is no recontamination such as splashes in the sluice area.

Material safety data sheet - Refer to the OHS Act for material safety data.⁷⁰

Method for manual cleaning

- Wear gloves, apron and a mask with a visor to protect mucous membranes from splashes.
- Hold the item under the water level to minimise splashes.
- Clean items with a soft brush, brushing carefully, if applicable.
- Examine the item to ensure it is visibly clean.
- Rinse and dry thoroughly before disinfection or patient use, depending on the manufacturers' guideline.



NOTE: All items (medical devices) must be clean and dry before being used for a patient. When procuring items, a heat disinfection method is preferred.



NOTE: During an outbreak, all patient care articles should be disinfected with heat or a compatible chemical disinfectant to ensure that no transmission takes place.

⁷⁰ Republic of South Africa. Occupational Health and Safety Act, Act no 85 of 1993. Gazette. 2 July 1993



DECONTAMINATION OF MEDICAL DEVICES

2.4 DECONTAMINATION OF MEDICAL DEVICES

Decontamination is a general term used to describe processes that include cleaning, disinfection and sterilisation.

2.4.1 Level of decontamination

The WHO Decontamination Guideline (2016)⁷¹ clearly outlines and emphasises the need for optimal cleaning, disinfection and sterilization of reprocessed medical devices that are used for patient care. **Table 18** provides an overview of the levels of decontamination and description of each.

Table 18: Level of decontamination and description of each level

Level of decontamination	Description of decontamination
Cleaning	Cleaning refers to the physical removal of body fluids, tissue, dust or foreign material. It will reduce the number of microorganisms as well as the dirt, thereby improving contact with the surface being disinfected or sterilized, reducing the risk of dirt being fixed to the surface. Removal of dirt will also limit the risk of inactivation of a chemical disinfectant and the multiplication of microorganisms. The removal of contamination from an item to the extent necessary for further processing or for intended use. [ISO/TS 11139]
Level of decontamination	Description of decontamination
Disinfection	Disinfection refers to the destruction or removal of microorganisms at a level that is not harmful and renders the item safe to handle by health workers. This process does not necessarily include the destruction of bacterial spores.
Sterilization	Sterilization refers to a validated process that renders a product free from microorganisms. It is the complete destruction or removal of microorganisms, including bacterial spores.

2.4.2 Spaulding's classification

Spaulding's classification categorises medical devices into three (critical, semi-critical and non-critical), based on the risk of infection to the patient (**Table 19**).

Table 19: Spaulding's classification for decontamination

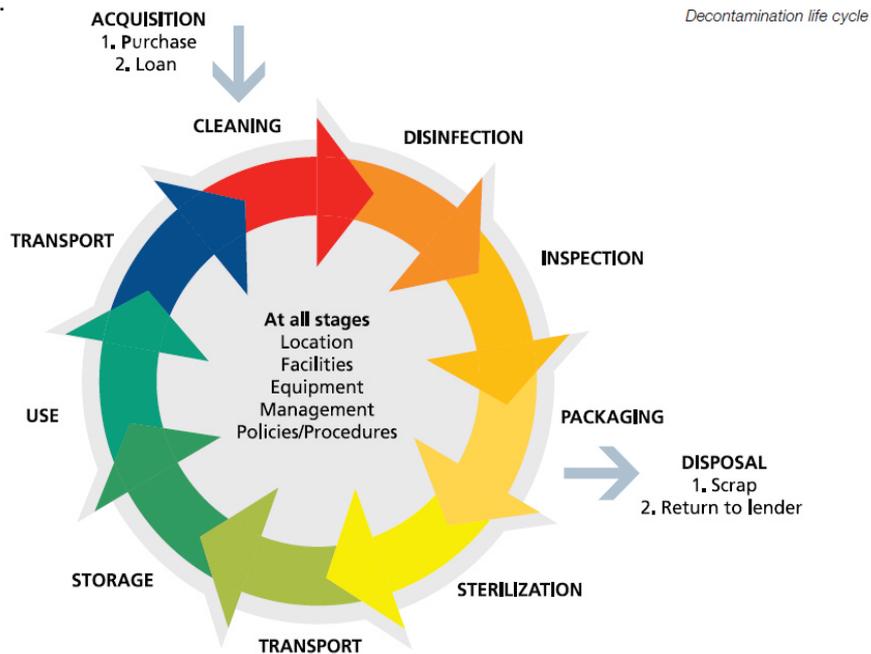
Risk classification	Category	Type of decontamination required
Critical high risk	Critical	Any re-usable medical device (such as surgical instruments, rigid endoscopes) used to enter a sterile body cavity (e.g., abdominal cavity, cranium, joint cavity) will require sterilization either by steam (if heat stable) or by chemical means (if heat sensitive).
Semi-critical medium risk	Semi-critical	Medical devices that come into contact with non-intact skin and mucous membranes require high level disinfection and seldom, sterilization. Examples include endoscopes (gastrosopes, bronchoscopes) and respiratory devices.

⁷¹ World Health Organization. Decontamination and Reprocessing of Medical Devices for Health-care Facilities. Geneva; 2016. <http://www.who.int/infection-prevention/publications/decontamination/en/>

Risk classification	Category	Type of decontamination required
Non-critical low risk	Non-critical	Devices that come into contact with intact skin, environmental surfaces or other areas which pose a low risk will require thorough cleaning and drying, with low level disinfection if indicated. Examples include blood pressure machine cuffs, stethoscopes and thermometers.

2.4.3 The Decontamination Life cycle⁷²

Figure 8: Reprocessing cycle of reusable medical devices. Each step is vital to safe reprocessing and reuse.



For further guidance on effective sterilization and decontamination for reprocessing of medical devices, please refer to *Decontamination and Reprocessing of Medical Devices for Health Facilities (WHO)*.⁷³

If in doubt regarding reprocessing a medical device, consult the manufacturer or the IPC Team.

Single use devices may not be re-processed routinely. If essential to reprocess such devices, consult the manufacturer.

A summary of the steps to improve cleaning and decontamination are outlined below:

Transporting used medical devices

Pre clean rinse

All surgical instruments and medical devices should be wiped with a cloth or rinsed off in cold water prior to sending them for sterilization. The removal of course debris, blood and tissue allows for safer transportation and better cleaning in the Decontamination Unit. The medical devices should be placed in a sealed container, where they can remain moist, until collection. Dried on organic matter is difficult to remove and should be avoided.

⁷² Life cycle in SSD, HBN13, 2004, ISBN 0113224923, NHS Estates,UK

⁷³ Decontamination and reprocessing of medical devices for health-care facilities. Geneva: World Health Organization; 2016.

Receiving instruments in the Dirty Area

All medical devices should be sent to the the Decontamination Unit or Sterile Services Department for reprocessing. These are received in the dirty area of the unit, checked and logged. The appropriate method of cleaning, either manual or automatic, is documented. The medical devices are opened or disassembled and laid out for cleaning.

Cleaning of Medical Devices

Thorough cleaning of all medical devices is essential to remove biofilm. The presence of any organic matter will increase the risk of contamination and harm to patients. It is essential that the appropriate method and cleaning agents are used during reprocessing (Table 20).

If in doubt, consult the manufacturer and or the IPC team for advice.

Long tubes with narrow lumens, such as suction catheters or nasal prongs, cannot be cleaned and therefore cannot be sterilized.

It is pointless to soak narrow lumen tubing in a disinfectant since these solution cannot penetrate the biofilm formed inside the lumen. The safety of the medical device cannot be guaranteed and therefore should not be considered. It is cheaper to provide single use disposable tubing for patients. Single use items also contribute reducing healthcare associated infections.

Table 20: Cleaning agents and general recommendations

Method	Agents	General recommendations
Manual cleaning	Soap and water (Detergent) Enzymatic cleaner	<ul style="list-style-type: none"> • Clean instruments immediately after use (PPE for health worker). • Two sinks, one for washing and one for rinsing. • Follow manufacturer instructions. • Open hinged/jointed instruments to ensure access. • Disassemble instruments before cleaning. • Use only suitable cleaning tools and accessories (cloths, brushes). • Clean below water level to prevent splashing.
Automated cleaning <ul style="list-style-type: none"> • Washer disinfectant • Ultrasonic 	Soap and water (Detergent) Enzymatic cleaner	<ul style="list-style-type: none"> • Load washer disinfectant with open/disassembled instruments. • Low temperature first wash <35°C • Main wash > 55°C • Disinfection rinse (71°C for 3 min or 80°C for 1min) • Final cold rinse • Ultrasonic for hollow bore instruments

Inspection Assembly and Packaging

Once washed, the clean items are safe to handle. The staff will inspect each medical device to ensure it is fit for purpose. If not the item must be sent for repairs or be replaced in the surgical tray. If any debris is found, the medical device must be returned for another round of cleaning. Once found to be clean and fit for purpose, the medical devices are assembled and placed in an appropriate container or packaging.

If steam is the method of sterilization, the packaging must allow steam to penetrate throughout its contents during the process. The sterilizer must be packed systematically to allow maximum steam penetration into all areas of the packaging.

Steam sterilizers

There are several methods of sterilization (**Table 21**) but the cheapest and most often used is steam (moist heat). High temperature steam under pressure is used for sterilization of medical supplies in health facilities. A sterilizer in which high temperature steam is used for killing the microorganisms is called an autoclave. The general principle is to remove the air from within the chamber, which will be replaced by saturated steam. On contact with the objects inside the chamber, latent heat is released which kills microorganisms including spores. Each reprocessing cycle is monitored using physical and chemical indicators to ensure the contents have been processed according to given standards.

Sterilization temperatures commonly used for medical devices and fluids:

- 121°C for 15 minutes
- 134°C for 3 minutes

Table 21: Methods of Sterilization

Method	Types
Heat	<ul style="list-style-type: none"> • Flaming • Incineration • Steam under pressure • High-temperature water (>100°C) • Dry heat
Poisoning by gases and chemicals	<ul style="list-style-type: none"> • Ethylene Oxide • Combination of formaldehyde and steam • Glutaraldehyde

Post sterilization

After the cycle has been completed the contents are removed, and stored in a dry, well-lit area awaiting dispatch to the clinical areas.

2.4.4 Decontamination using disinfectants

Heat sensitive items, like endoscopes, cannot be sterilized by steam or heat and therefore require cleaning and reprocessing using appropriate chemical disinfectants. Several disinfectants are available on the market that provide **high level disinfection**. **Table 22** sets out the properties, antimicrobial activity and toxic effect of some of the disinfectants available on the market.^{74, 75}

It must be noted that because these are toxic substances, meticulous care in wearing of PPE, good ventilation and learning the correct method and in use dilutions are important for staff handling such chemicals.

Endoscopes are complex medical devices with several channels, each of which has to thoroughly cleaned and disinfected. Several outbreaks of infection have been recorded relating to both endo and bronchoscopes. The person carrying out the reprocessing must be well trained and supervised if necessary.

⁷⁴ Western Cape Department of Health. IPC Manual: Tygerberg Hospital, Cape Town, South Africa

⁷⁵ Best Practices for Environmental Cleaning in Healthcare Facilities: for Resource-Limited Settings [Internet]. Atlanta: US Centers for Disease Control and Prevention and Cape Town: Infection Control Africa Network, 2019. Available from: <http://www.icanetwork.co.za/icanguideline2019/>

Meticulous records of reprocessing for each item must be kept.

Once reprocessed and decontaminated, the items must be safely stored to avoid damage.

Table 22: Disinfectants: properties, antimicrobial activity and toxic effect

Disinfectant	Spectrum	Stability	Inactivation	Corrosive/damaging	Health worker	Environment
Orthophthalaldehyde	Broad	Moderate	No	No	Toxic/Irritant	Irritating/sensitising
Alcohol	Not spores or non-enveloped viruses	Good	Yes	Lens cement	Toxic/Irritant	Corrosive
Peracetic acid	Broad	No	No	Slight	Slight irritant	Fire hazard, corrosive
Peroxide compounds	Variable	Moderate	Yes	Slight	Not very toxic	90% biodegradable
Not recommended for medical devices						
Chlorine releasing agents	Broad	No	Yes	Yes	Irritant	Not biodegradable
Clear phenolics	Not spores or non-enveloped (NE) viruses	Yes	No	Slight	Poisonous	Not biodegradable
Quaternary ammonium compounds (QAC)	Poor	Yes	Yes	No	Low toxicity	Damages cement, rubber

2.4.5 General recommendations

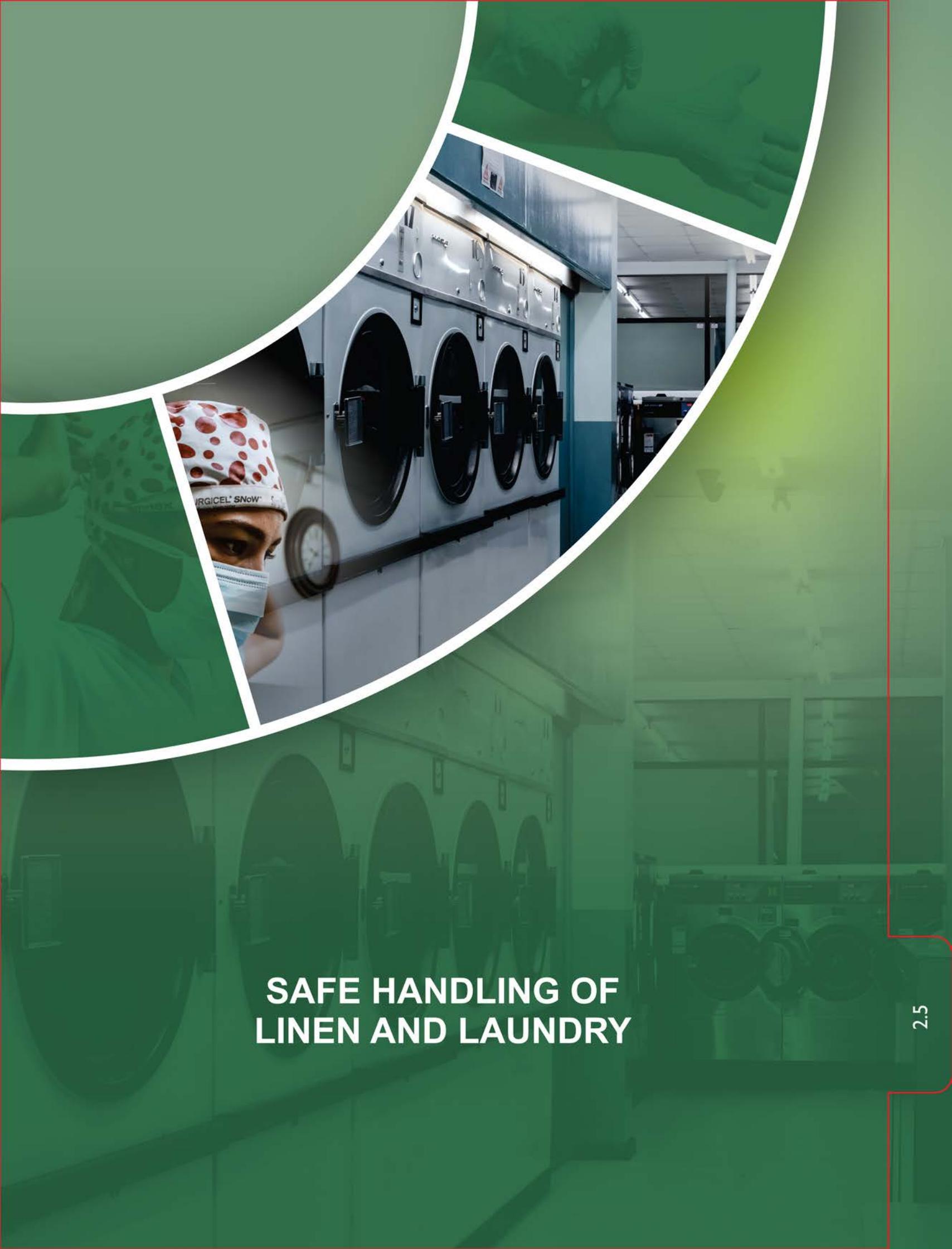
Provision for hand hygiene must be available in each section of the Decontamination Unit.

- A separate gowning area for each section with appropriate PPE must be available.
- All reusable medical devices must be reprocessed in a Decontamination Unit or a Sterile Services Department. **No cleaning or packaging of medical devices should take place in clinical areas.**
- Medical devices should be rinsed off to remove gross soiling at point of use.
- Medical devices should be transported safely (in suitable containers and on trolleys) to the area for decontamination.
- All health workers handling used medical devices must be immunised against hepatitis B, have proper protective equipment and be trained in applicable decontamination processes.
- All health workers handling used medical devices must always wear appropriate PPE (long gloves, mask, goggles, apron, safety shoes)

2.4.6 The Decontamination Unit:

The following recommendations should be considered when setting up a decontamination unit

- Have segregated dirty and clean areas for reprocessing medical devices, with regulated ventilation to reduce transmission and provide comfort to the staff.
- Ensure that the workflow is from dirty to clean with no crossover of staff or equipment.
- Have separate areas for cleaning, inspection/assembly and packaging, sterilization and storage which do not allow recontamination of sterile items.
- Be well ventilated, light and airy, easy to clean.
- Ensure the equipment used for decontamination and sterilization is functional, the processes are validated (with records) and is regularly maintained (with logbooks).
- Sterile storage area must be airy, bright and dry with ambient temperatures not exceeding 27°C.



SAFE HANDLING OF LINEN AND LAUNDRY

2.5 SAFE HANDLING OF LINEN AND LAUNDRY

Used linen may be heavily contaminated with a wide range of organisms including scabies mites and therefore should always be handled with care to prevent their dispersal or transfer. Guidelines must be in place and followed to ensure the safe handling of linen and laundry to:

- Prevent clean (general/theatre) linen from becoming contaminated before it is used in patient care;
- Prevent dirty (used/soiled/infectious/infested) linen from contaminating patients, staff, the environment, and clean linen.

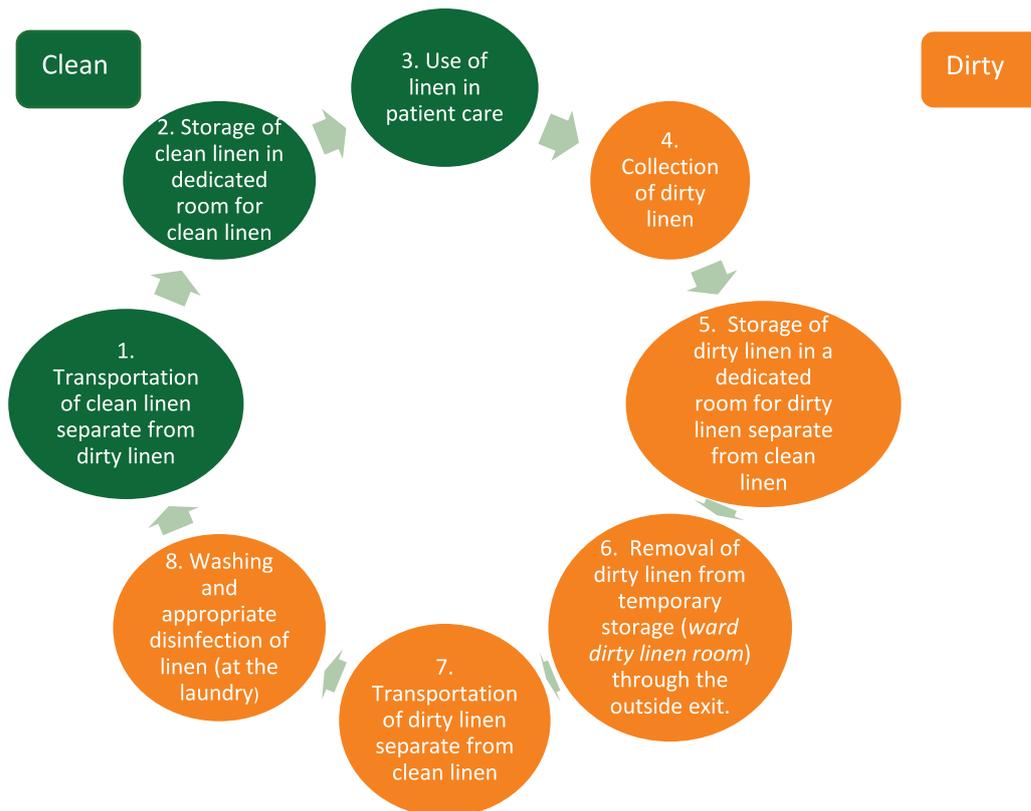
2.5.1 Healthcare facility musts:⁷⁶

- A standard operating procedure for the management of linen including colour coding.
- Adequate resources must be provided to ensure effective laundering of linen, including for proper maintenance of laundry building and laundry equipment.
- A quality management system must be established incorporating:
 - work instructions and procedures;
 - process control procedures;
 - quality control procedures; and
 - control of linen (clean/soiled) procedures.
- A procedure specifically for infection/contamination control must be made available to staff handling linen. The procedure should include control measures through differentiation between categories of soiled linen, i.e., of high-risk to normal soiled linen: containers and plastic bags must be colour coded in accordance with SANS 1024-1 (as amended):
 - Category **A (red plastic bag)** = sealed bag of high-risk infection for immediate incineration.
 - Category **B (yellow plastic bag)** = sealed bag of high-risk/potentially infectious (blood/body fluids contaminated or sluiced) for direct loading into washing machines;
 - Category **C (transparent plastic bag)** = sealed bag of infested/potentially infested linen. A clear standard operating procedure (SOP) on health and environmental protection must be documented and communicated to all laundry staff.
- There needs to be a trained designated staff member for the control of laundry, and he/she must ensure that the requirements regarding pollution, occupational and environmental hygiene are complied with, including appropriate action in respect of any risks associated with infection or other hazards.
- Procedures for the use of protective clothing and personal hygiene where staff are in contact with high-risk areas or linen should be documented and include precautionary measures.

2.5.2 The Laundry Cycle

The movement of clean and dirty linen from the point of use to the processing area and back is shown in **Figure 9**. The red and green sections denote used or dirty areas and clean areas respectively.

⁷⁶ National Department of Health. National Environmental Health Norms and Standards for premises and acceptable Monitoring Standards for Environmental Health Practitioners, 24 December 2015. Government Gazette; 2015

Figure 9: Laundry cycle

2.5.3 Laundering process

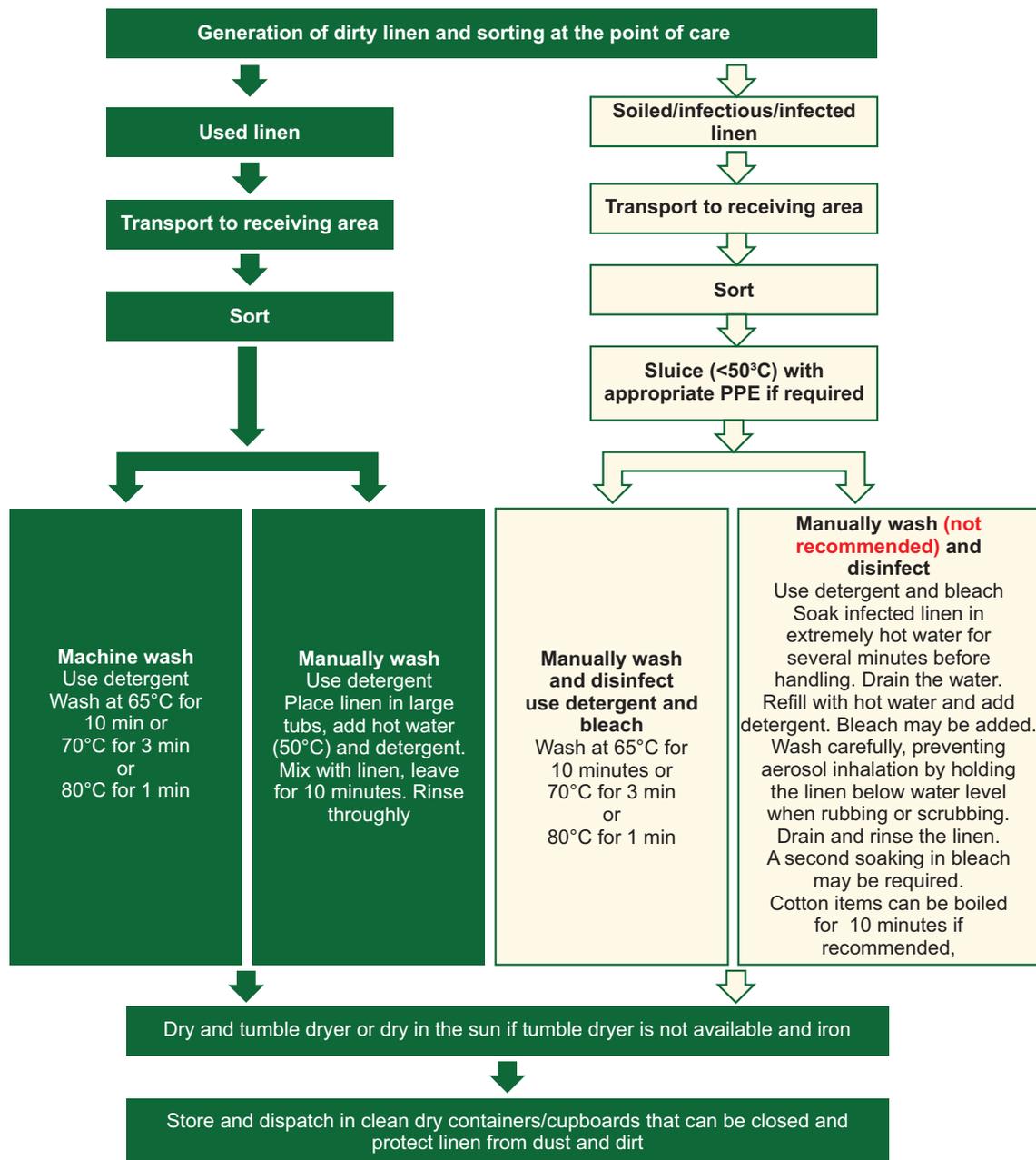
All healthcare linen, irrespective of where it is processed (in-house or outsourced), must go through a laundering process (see Figure 10) that meets the following IPC standards:

The pre-wash (sluice) cycle should not exceed 50°C. This is to avoid coagulation of proteinaceous material on the linen.

- Use of an approved detergent and bleach in the correct concentrations.
- Approved temperature and duration of the wash cycle as per manufacturer recommendation.
- Washing of heat-sensitive patient clothing and uniforms at a temperature of no more than 40°C.⁷⁷

⁷⁷ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

Figure 10: Linen processing



2.5.4 Transportation and storage of clean linen

- Clean linen must be transported from the laundry to the user area in clean, closed containers.
- Clean linen, pillows, duvets and blankets must be stored on slatted shelves in a designated clean storage area (clean linen room or cupboard) that is kept closed AND NOWHERE ELSE.
- When beds are being made, the clean linen that will be used must be stacked on a linen trolley and the trolley parked outside the patient room.
- The clean linen must not be left on these trolleys since the linen will become contaminated in busy and open areas like the passages.
- In order to prevent contamination, linen should not be stored at floor level.
- Wash or use ABHR before handling clean linen.

2.5.5 Storage and transportation of dirty linen

- Dirty linen must be stored in closed bags in a designated area (dirty linen room) until it is collected from the unit/ward/clinic/operating theatre to be taken to the laundry. The door of the dirty linen room must be kept closed and access to the room must be restricted.
- The storage period must not exceed 24 hours except over weekends.
- The frequency of collection of linen depends on the volume of laundry:
 - Once a day in the mornings from the wards
 - Three times a day from the trauma and labour ward
 - Up to four times a day from the operating theatres
- Dirty linen must be transported to the laundry in closed containers.
- Linen handlers must wear heavy-duty rubber gloves for their protection and wash their hands after removal of the gloves.
- The service provider is responsible for:
 - Washing the reusable material linen bags
 - Cleaning the linen trolleys on a regular basis
 - Cleaning and disinfecting the dirty linen transportation containers and transportation vehicle before they are loaded with clean linen
 - Cleaning up a spillage from the linen immediately.
- There must be no contact between clean and soiled linen at any time.⁷⁸
- EMS may keep dirty linen in a closed, colour-coded bag on the ambulance until shift change if more frequent drop-off is not possible. Drop-off of dirty linen must take place at least at shift change.

2.5.6 Frequency of changing bed linen and towels

Hospitals

- The bed linen and towels of patients must be changed:
 - daily in critical care and high care areas
 - between patients and at regular intervals depending on whether the linen is soiled or every two to three days in the wards.
- In all cases the bed linen and towels must be changed immediately when they become visibly soiled.

PHC facilities and EMS

Due to a high turnover of patients in PHC and EMS, a change of fresh bed linen between each patient is neither practical nor cost effective and most of these patients are dressed.

Two options are offered here:

- Use a linen saver/paper roll to cover the bed and discard after each patient. This may be expensive, but is practical, alleviates the need for laundry and might be more cost effective in the long run.
 - Linen must be changed at the end of a shift and when visibly soiled.
- Ensure the mattresses and covers are intact. Wipe the mattress over with a damp cloth and then detergent to remove all visible organic matter.

⁷⁸ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

Once dry, wipe with a disinfectant wipe. This method is dependent on meticulously wiping down between each patient and a supply of disinfectant wipes.

- Mattresses that are visibly soiled should be cleaned with a detergent and water and disinfected.

2.5.7 Handling of dirty linen

Take the following steps to handle dirty linen safely:

- Wear gloves and a plastic apron when handling soiled, infectious or infested linen. There is no need to wear gloves when handling used linen.
- Move the dirty linen trolley to the patient bedside/examination table/operating table and transfer the linen directly from there into the bag on the trolley. Do not carry dirty linen to the dirty linen room or place it on the floor or on the bedside table or other surfaces. The dirty linen will contaminate the staff clothing or the surfaces onto which it is placed.
- Do not shake dirty linen and handle it as little as possible to prevent the dispersal of skin scales carrying potentially harmful microorganisms.
- Roll the linen inwards to enclose the most contaminated areas.
- Hold dirty linen away from the body to prevent contamination of the uniform/scrub suit.
- Choose the **appropriate colour plastic bag** for different categories of linen
- All dirty linen bags must be labelled with the date and the ward/unit/clinic name.
- Ensure that no additional items (used dressings, sticky tape, instruments) are placed into the linen bags and especially that no sharps inadvertently end up in the linen.
- Use ABHR after handling dirty linen, including when moving from one patient's bed to another when making beds.
- For PHC and EMS, clean the mattress between patients or use a paper roll to cover the surface or wipe over with a disinfectant.
- Carry out HH after procedure is completed and/or after removing of gloves.⁷⁹

No linen should be washed or sluiced in clinical areas.

Patients should not be allowed to bring their own linen to health facilities.

Linen in isolation rooms must be changed more frequently to reduce the bioburden.

2.5.8 Handling of Infested linen

In addition to measures mentioned above (wear gloves and plastic apron when handling infested linen; place linen in transparent plastic bag while at the bedside of the patient; close and label the bag with the unit/health facility name and date), the following procedure must be followed:

- Put an additional label on the bag that states "infested linen".
- Put the closed bag in the sluice room and contact the pest control department to treat the linen.
- The Pest Control Department will treat the linen according to their standard operating procedure.
- Request the housekeeper to send this linen to the linen sluice area of the health facility.

⁷⁹ Western Cape Department of Health. IPC Manual: Tygerberg Hospital, Cape Town, South Africa

2.5.9 Curtains

Record must be kept of when window and bed curtains are changed.

- **Window curtains** must be changed every three months or immediately when they become visibly soiled.
- **Inter-bed/privacy curtains** are considered as part of the patient's linen because they are handled often and can easily become contaminated. Change inter-bed curtains:
 - After discharge of an infectious patient
 - Every four weeks if the patient(s) are non-infectious
 - Immediately when they become visibly soiled.⁸⁰

⁸⁰ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa



HEALTHCARE WASTE MANAGEMENT

2.6 HEALTHCARE WASTE MANAGEMENT

Healthcare waste includes Healthcare Risk Waste (HCRW) and general waste. HCRW requires sound management through proper collection, storage, transportation, treatment and disposal in order to prevent and control potential infections of health workers, patients and the environment as a result of poor management.

Healthcare waste management (HCWM) is governed by various national and provincial legislation set out to protect the health workers, the public, handlers of waste and the environment and to manage waste effectively.^{81, 82} The legislation requires that all health facilities that generate healthcare waste:

- have a duty to manage waste safely
- are legally and financially responsible for the safe handling and environmentally sound disposal of the waste they produce
- must always assume that the waste is hazardous until shown to be safe; and
- remain responsible for the waste from the point of generation until its final treatment and end-disposal.⁷⁷

2.6.1 Healthcare waste management plan and committee

Legislation stipulates that every **major health care waste generator** must have a cost effective HCWM plan that is signed off by the CEO/accounting officer of the facility and have a waste management committee in place.

Minor generators may prepare HCRW management plans as a self-regulatory measure but must have a Standard Operating Procedure in place to guide the management of HCRW.

The HCWM plan must include information relating to: facility information relating to workload, contact details of person in charge such as the healthcare waste officer, categories of healthcare waste generated, classification of waste streams, description of waste management systems (generation, segregation, containment, transportation, treatment, and disposal), contracting systems for transportation and end point disposal, and details of an on-going training programme including IPC and Occupational Health. HCWM must form part of performance management development system of managers at various levels up to the CEO, therefore the HCWM plan should outline reporting structures.

2.6.2 Waste management committee

A waste management committee can be established as a sub-committee of a facility IPC committee or other relevant committee. For smaller facilities regarded as major generators, waste management must form part of the agenda items in a relevant committee.

The waste management committee should comprise of, but is not limited to the following members:

- The designated or appointed Health Care Waste Management Officer (Ideally an Environmental Health Practitioner)
- A representative of the section responsible for Infection and Prevention Control
- Chief Executive Officer/Facility Manager

⁸¹ National Department of Health. National Environmental Health Norms and Standards for premises and acceptable Monitoring Standards for Environmental Health Practitioners, 24 December 2015. Government Gazette; 2015

⁸² National Department of Health. Regulations relating to health care waste management in health establishments, 23 May 2014. Government Gazette; 2014

- A representative of the section responsible for Quality Control
- A representative of the section responsible for Procurement and Contract Management
- A nominated Health and Safety Representative
- A representative of the section responsible for Cleaning and Hygiene Services; and
- A representative of the section responsible Occupational Health and Safety.

The committee must be chaired by the facility waste management officer/CEO, or a person delegated by the CEO and must meet at a minimum once every quarter (at least 4 meetings per year).

Duties and responsibilities of the Committee members⁸³

The duties and responsibilities include facilitating the development of, coordinating and monitoring the implementation of the HCWM plan; providing strategic and technical input relating to the implementation of IPC matters; ensuring that standard operating procedures are in place that are in line with the objectives of the NDOH in HCWM; supporting training of both clinical and non-clinical staff; monitoring of implementation strategies; and supporting development of remedial action.

2.6.3 Occupational Health and Safety in healthcare waste management

Health facilities must ensure that:

- All persons who manually handle containers of untreated HCRW, must wear clean overalls or uniform, full-length heavy-duty aprons, protective heavy duty domestic gloves and closed toe shoes or water-resistant boots and a respirator/appropriate mask.
- Additional PPE must be provided in accordance with risk assessment, see section on PPE.
- A health and safety guideline/policy and strategy must be in place to guide occupational health and safety matters as they relate to waste management.⁸⁴
- Occupational health and safety incidents are immediately reported to the responsible staff member if any of the following occur:
 - Exposure to blood and body fluids either due to a sharps injury or spillage.
 - Exposure to chemicals, radiation and other noxious substance.
 - Back injury or physical injury during transportation of waste.

2.6.4 Cradle-to-grave management of healthcare waste

Appropriate measures must be taken at each step for IPC purposes:

- Step 1: Healthcare waste generation
- Step 2: Segregation and containerisation of waste
- Step 3: Interim storage of waste in a health facility
- Step 4: Internal transport and collection of waste in a health facility
- Step 5: Centralised storage and weighing of waste in a health facility
- Step 6: External collection of waste and removal off site by a service provider
- Step 7: Treatment and final disposal of waste by a treatment facility.

⁸³ National Department of Health. National Environmental Health Norms and Standards for premises and acceptable Monitoring Standards for Environmental Health Practitioners, 24 December 2015. Government Gazette; 2015

⁸⁴ National Department of Health. Regulations relating to health care waste management in health establishments, 23 May 2014. Government Gazette; 2014

Segregation, colour coding and labelling of healthcare waste

Segregation

Segregation and minimisation of healthcare waste are the most important steps towards successfully managing health care waste. Health care waste should be segregated by category into the appropriate colour bags/bins at the point of generation, e.g., wards, consultation rooms in primary health care facilities, and ambulances. There should be clearly visible posters displayed at the point of waste generation to indicate what types of waste goes into which colour bag or container.

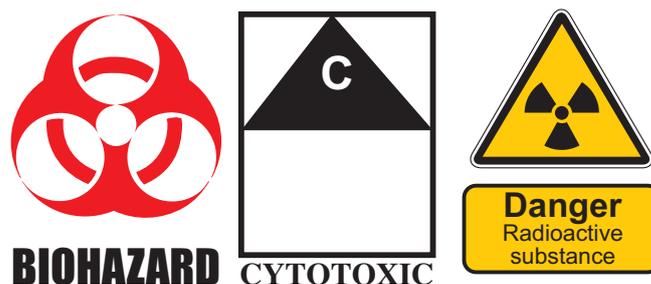
Once HCRW is placed in the designated container such as a plastic bag, it must not be decanted for any reason and must be disposed of as a single unit.

Reusable containers (which hold the plastic bags) must be effectively disinfected before reuse.

Colour coding and labelling of health care waste containers/bins

HCRW containers must have the appropriate international hazard symbol and marked as prescribed in the SANS 10248-1 - Management of Health Care Waste, Part 1: Management of health care risk waste from a health facility (see **Figure 11**).⁸⁵

Figure 11: International hazard symbols



The container must also be labelled according to the Norms and Standards Regulations and colour codes (see **Table 24**).

⁸⁵ National Department of Health. National Environmental Health Norms and Standards for premises and acceptable Monitoring Standards for Environmental Health Practitioners, 24 December 2015. Government Gazette; 2015

Table 23: Colour coding and labelling of healthcare waste^{86, 87}

Waste category	Waste sub- category	Colour coding	Labelling	Examples of waste
Infectious anatomical waste	None	RED	Have the international infectious hazard/ biohazard label Marked "infectious waste"	Tissues, organs, body parts or products of conception from surgeries and autopsies
Infectious waste	None	RED	Have the international infectious hazard/ biohazard label Marked "infectious hazard"	All microbiology laboratory wastes, waste from surgeries and autopsies and all contaminated waste produced during treatment of patients
Sharps	None	YELLOW	Have the international infectious hazard/ biohazard label Marked "Danger contaminated sharps"	Items that could cause cuts or puncture wounds; needles, hypodermic needles, scalpels and other blades, knives, infusion sets, saws, broken glass and pipettes
General waste	None	BLACK	Marked general waste Note: Provinces/ organisation should choose one colour and use only that colour throughout the province/ organisation. Transparent bags are recommended to be able to identify content	Domestic waste, building and demolition waste, business waste (waste that does not pose an immediate hazard or threat to health or to the environment)
		BEIGE		
		WHITE		
		TRANS-PARENT		
Chemical waste including pharmaceutical waste	Chemical or pharmaceutical	DARK GREEN	Have the international hazard label Marked "pharmaceutical waste-liquid or Pharmaceutical waste-solid" AND for flammable liquids or solids marked "Highly flammable" or "Flammable"	Pharmaceutical: unused medicines, medications and residues of medicines that are no longer usable as medication Chemical: Solid, liquid and gaseous products that are to be discarded and that contain dangerous or polluting chemicals that pose a threat to humans, animals or the environment, when improperly disposed off

⁸⁶ National Department of Health. National Environmental Health Norms and Standards for premises and acceptable Monitoring Standards for Environmental Health Practitioners, 24 December 2015. Government Gazette; 2015

⁸⁷ National Department of Health. Regulations relating to health care waste management in health establishments, 23 May 2014. Government Gazette; 2014

Waste category	Waste sub- category	Colour coding	Labelling	Examples of waste
Chemical waste including pharmaceutical waste	Cytotoxic or genotoxic pharmaceutical	DARK GREEN	Have the international Cytotoxic hazard label Marked "Cytotoxic waste" or "Genotoxic waste" OR Marked "Cytotoxic sharps" or "Genotoxic Sharps"	Certain expired drugs, vomit, urine, or faeces from patients treated with cytostatic drugs, genotoxin or cytotoxin contaminated sharps or pharmaceuticals
Radioactive waste	None	NO COLOUR CODING	Have the international radiation hazard label Name and contact number of the radiation officer, for emergency purposes	Liquid, solid or gaseous materials that contain or are contaminated with, radio nuclides.

Specifications for HCRW containers

HCRW containers for infectious waste

A **red plastic bag** according to SANS code 10248⁸⁸ specifications, placed inside a robust solid container (usually cardboard).

HCRW containers for Infectious anatomical waste

Anatomical waste containers are used to discard infectious anatomical waste. The containers must be:

- Manufactured from an impermeable, leak-proof material with a thickness of 80 µm or more OR if rigid containers are used it must be lined with a red plastic bag with a thickness of 60 µm. Plastic bags must be closed with non-PVC plastic ties, non-PVC plastic sealing tags of self-locking types, or heat sealers. The container must be compatible with the envisaged treatment of waste.
- Filled not more than three-quarters of the capacity of the container.
- Securely closed at all times.

Sharps container

The sharps container is used to discard needles, syringes and other used sharp objects. It is a solid yellow container which is fixed firmly to a surface, within arm's reach of its use. This could be on a procedure trolley, wall mounted or fixed to a flat surface. It should comply with SANS 452:2008 and have the following qualities:

- Be made of solid material that will not produce emissions or residues to persist in the environment after disposal.
- Be designed to fall away from the body when lifted manually.
- Have robust handles to ensure there is safe handling.
- Have secure lids which do not open once fastened into place.
- Be able to withstand hot water wash up to 90°C.
- Be able to withstand disinfectants to clean it.
- Not crack or leak during transportation or handling under any circumstances.
- Resistant to dropping (shock) or weights being placed on them.

⁸⁸ SANS 10248-1: Management of healthcare waste - Part 1: Management of healthcare risk waste from a healthcare facility

- Take the recommended weight and volume of waste.
- Should be replaced at the suppliers cost if damaged or broken.

Containers for general waste

Containers used for the temporary storage of general waste should be leak proof, intact, corrosive resistant, and have a tight-fitting lid.

2.6.5 Interim storage of waste

Healthcare general waste should be temporary stored separately from any other hazardous (biomedical and clinical waste) waste as it is disposed at municipal waste areas.

HCRW should be kept in a locked area and not be accessible to climatic conditions, rodents, stray animals and the public or unauthorized personnel. The room should have adequate ventilation and be washable with a water drainage point on the floor. There should also be proper lighting in the room and the latter should be properly marked with a “No unauthorised entry” sign, as well as a universal sign that signifies “Biohazard”. The temporary storage room must also be equipped with spill kits.

Central storage area for HCRW

The central storage areas for HCRW must comply with SANS 10248:2004, edition 2 and the National Norms and Standards for Environmental Health, 2015⁸⁹. These include a clearly demarcated and signposted area, with adequate ventilation and light, protected from direct sunlight and weather and must be vermin proof. The floors and walls must be smooth, slip resistant, and non-porous with a good drainage system connected to the council sewerage. The space must be sufficient to accommodate the volume of waste generated and refrigeration facilities for waste storage at low temperatures (**Table 24**). It must remain locked at all times, with a board clearly displaying the name and contact details of the person in charge, have signage indicating no unauthorised entry - hazardous waste and the name and contact details of the waste officer, locked at all times to prevent unauthorised entry, equipped with a fire extinguisher, spill kit and have immediate access to a handwash basin, soap and disposable drying facilities.

Table 24: HCRW storage period between generation and treatment or disposal⁸⁴

Waste category	Storage period	Storage temperature
Pathological waste	24 hours – 90 days from date of sealing Pathological waste not treated with 24 hours shall be stored at -2°C	-2°C
Infectious waste	72 hours – 90 days Infectious waste not treated within 72 hours shall be stored at -2°C	-2°C
Sharps container	90 days	Cool room temperature
Pharmaceutical waste	90 days	Cool room temperature

⁸⁹ National Department of Health. National Environmental Health Norms and Standards for premises and acceptable Monitoring Standards for Environmental Health Practitioners, 24 December 2015. Government Gazette; 2015

2.6.6 Waste transportation

Internal transportation

- Once the waste has been segregated, the plastic bag should be tied, the containers labelled and stored in a clean dry room in the clinical area ready for collection. Storage in the sluice room is not recommended.
- The waste should be collected every day from wards and consultation rooms. The waste should be transported in closed lockable containers/trolleys/carts which can hold the waste bags in place during collection and can be unloaded easily.
- These transport trolleys should be washed with detergent and water every day at the end of the collection cycle and allowed to dry.
- No disinfectant is necessary unless spillage has occurred (see blood spillage).
- Clinical waste should be stored in a dry, secured space free from vermin, and protected from the elements, ready for collection (by in-house or private contractors).
- Non-clinical waste can either be stored or dropped directly into a compactor which will reduce the bulk of the domestic waste before it goes to land fill.

External transportation

As the waste generator, the health facility is responsible for:

- adequate labelling of HCRW to be transported off site;
- ensuring that clinical waste is transported safely in closed containers for final disposal;
- registering, weighing and logging of waste before transportation;
- signing the consignment over to an authorised service provider who in turn signs over the consignment to the treatment facility.

2.6.7 Disposal of healthcare risk waste

It is the responsibility of the management of the health facility to ensure that the final disposal of health care risk waste is safe, permanent and not hazardous to the public. The disposal method must be clearly specified in the contract between the facility and contracted service provider.

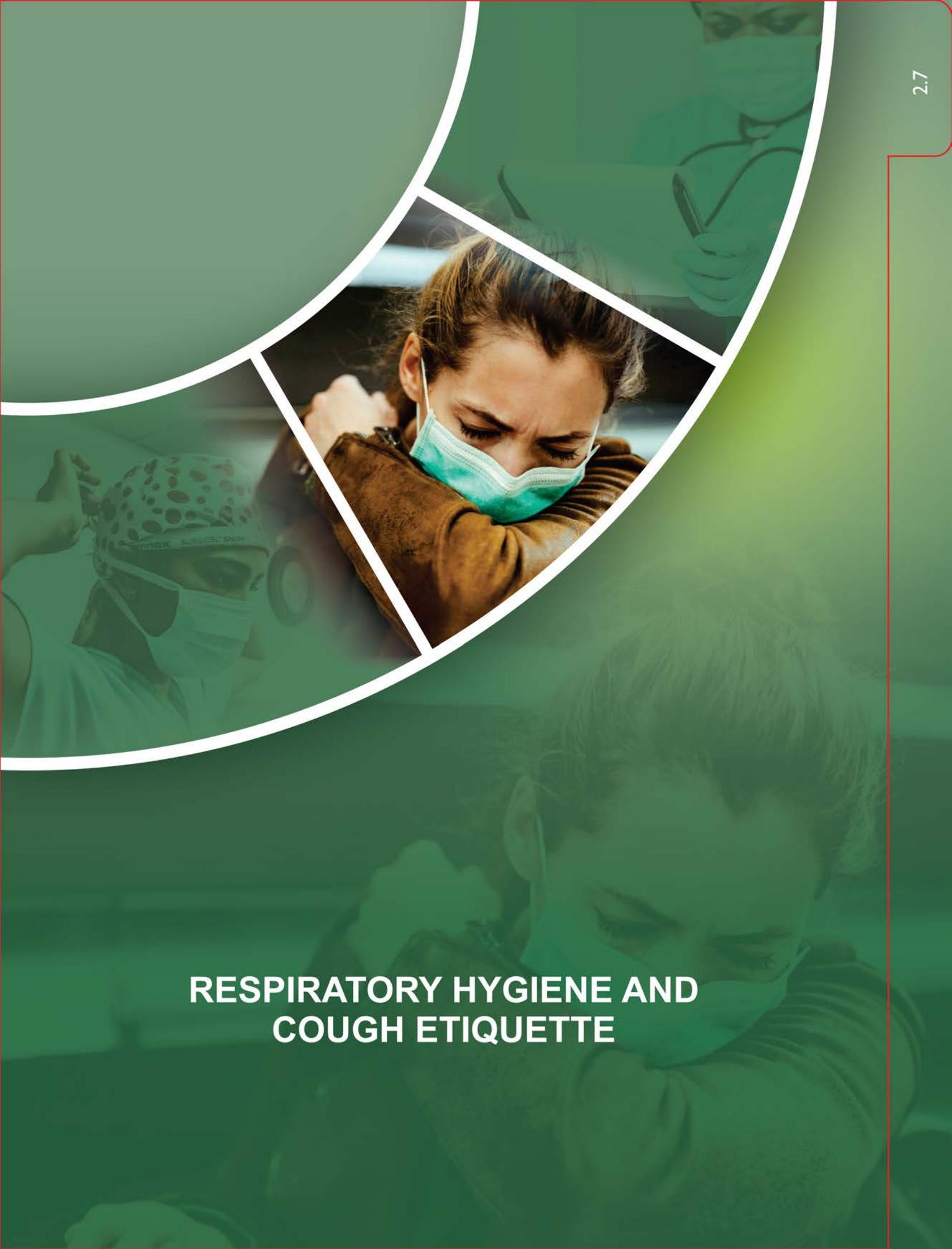
Infectious waste must be treated and disposed of only at a facility that is licensed and conforms to the provisions of the National Environmental Management: Waste Act, 2008 as amended.⁸⁹ Only licensed waste management contractors must be contracted to render treatment and disposal services for the health facility. The contracted service provider must adhere to the terms of the contract with the health facility. **Table 25** indicates the recommended treatment and disposal methods for HCRW.

⁸⁹ National Environmental Management: Waste Act (No. 59 of 2008). Government Gazette; 10 March 2009.

Table 25: Recommended treatment and disposal methods for HCRW

Treatment/ disposal method	Description of treatment/disposal	Examples of waste types
Shredding and Autoclaving (primary treatment technologies)	<p>Waste is shredded and sterilised using a dual process to convert healthcare waste into non-category, general waste which can then be disposed using the regular waste disposal system.</p> <p>Waste is shredded and autoclaved using heat, steam and pressure at an industrial autoclave where healthcare waste is processed.</p>	All waste except anatomical and pharmaceutical waste
Encapsulation	Containment is used when there is no need to remove the waste material and/or the cost of removal is prohibitive. The main purpose of containment is to prevent or control liquid or semi-liquid contaminated wastes from leaking or leaching into surrounding areas. Mainly recommended for hazardous liquid waste.	Radioactive waste and highly toxic waste
Electrothermal deactivation	Non-burn treatment method	All categories of waste, except anatomical and pharmaceutical waste
Incineration (primary treatment technology)	Waste treatment process that involves the combustion of organic substances contained in waste materials. Incineration and other high-temperature waste treatment systems are described as "thermal treatment". Incineration of waste materials converts the waste into ash, flue gas and heat.	All categories of waste

- **The facility waste contract must specify which treatment and healthcare waste disposal method will be used by the contractor.**
- **It is recommended that the healthcare risk contract should include transfer of waste and transportation to the central waste storage areas from EMS and surrounding clinics.**



RESPIRATORY HYGIENE AND COUGH ETIQUETTE

2.7 RESPIRATORY HYGIENE AND COUGH ETIQUETTE

Respiratory hygiene and cough etiquette are infection prevention measures designed to limit the transmission of respiratory pathogens spread by droplet or airborne routes. To prevent the transmission of all respiratory infections in healthcare settings the following infection control measures should be implemented at the first point of contact with a potentially infected person.

Rapid triage of patients presenting with respiratory symptoms is strongly recommended⁹¹

2.7.1 Visual alerts

Post visual alerts at the entrances, waiting areas and wards at health facilities instructing patients and persons who accompany them (e.g., family, friends) to inform health workers of symptoms of a respiratory infection when they first register for care and to practise respiratory hygiene/cough etiquette.⁹² During respiratory viral epidemics such as COVID-19, cloth face masks are compulsory, and messaging should be widespread.

2.7.2 Respiratory hygiene/cough etiquette posters (sell it)

The following measures to contain respiratory secretions are recommended for all individuals with signs and symptoms of a respiratory infection

- Cover your mouth and nose with a tissue when coughing or sneezing;
- Discard tissue in the nearest waste receptacle after use;
- Perform HH after having contact with respiratory secretions and contaminated objects/materials.⁸⁶

Health facilities should ensure the availability of consumables for adhering to respiratory hygiene/cough etiquette in waiting areas for patients and visitors.

- Provide tissues and no-touch receptacles for disposal of used tissues.
- Provide conveniently located dispensers of ABHR. Where sinks are available, ensure that supplies for hand washing (i.e., soap, disposable paper towels) are consistently available.

Posters informing patients and visitors of cough etiquette should be placed at the entrances, waiting areas and wards of health facilities. See **Appendix J**.⁹³

2.7.3 Masking and separation of persons with respiratory symptoms

Patients and visitors that are coughing should be:

- offered surgical face masks;
- encouraged to sit at least 1.5 metre away from others in common waiting areas when space and chair availability permit;
- there should be good ventilation in the waiting area;
- triaged rapidly in all health facilities and expedited to consultation rooms (it is recommended that queue marshals fast track coughing patients);

⁹¹ World Health Organization. WHO guidelines on tuberculosis infection prevention and control, 2019 update. Geneva. 2019

⁹² Centre for Disease Control and Prevention (CDC) [Internet] Available from <https://www.cdc.gov/flu/professionals/infectioncontrol/resphygiene.htm>

⁹³ Centre for Disease Control and Prevention (CDC) [Internet] Available from https://www.cdc.gov/flu/prevent/actions-prevent-flu.htm?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fflu%2Fprotect%2Fhabits%2Findex.htm

- do a risk assessment on all patients when they first present to the health facility and as part of the triage process establish the risk of transmission of a MDRO or infectious disease.

2.7.4 Droplet precautions

Advise health workers to apply droplet in addition to standard precautions, when examining a patient with symptoms of a respiratory infection.⁹⁵ See section on transmission-based precautions for more detailed information.

2.7.5 IPC guidelines for TB, MDR-TB and XDR-TB

The National Infection Prevention and Control Guidelines for TB, MDR- and XDR –TB gives guidance for health workers to minimise the risk of TB transmission in health settings. Infection control measures should be established to reduce the risk of TB transmission to the general population and to health care personnel.⁹⁶ The WHO TB-IPC guidelines (2019) are available from the WHO.⁹⁷

⁹⁵ Centre for Disease Control and Prevention (CDC) [Internet] Available from <https://www.cdc.gov/flu/professionals/infectioncontrol/resphygiene.html>

⁹⁶ National Department of Health. National Infection Prevention and Control Guidelines for TB, MDR-TB and XDR -TB. Pretoria; 2015.

⁹⁷ World Health Organization. WHO guidelines on tuberculosis infection prevention and control, 2019 update. Geneva. 2019 <https://apps.who.int/iris/bitstream/handle/10665/311259/9789241550512-eng.pdf?ua=1>



PATIENT PLACEMENT

2.8 PATIENT PLACEMENT

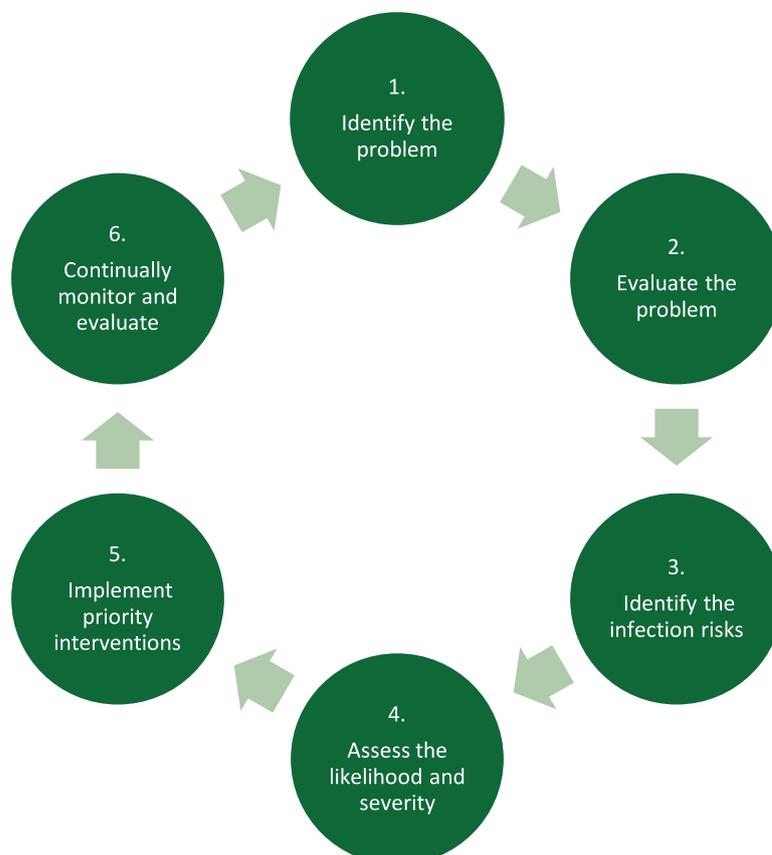
Patient placement is an element of transmission-based precautions. It is essential that health facilities have systems in place to ensure appropriate patient placement to prevent spread of transmissible pathogens.

Consider isolation, depending on resources, when:

- there is a risk of transmission of a suspected or known infectious disease;
- presence of MDRO;
- the route of transmission and risk of transmission to other patients and health workers is increased.

Depending on the route of transmission a single room or cohort (several patients with the same infectious disease) isolation is indicated. A risk assessment can be done by following the steps outlined in **Figure 12**.⁹⁸

Figure 12: Risk assessment steps for patient placement



Ask questions about possible exposure events when a risk assessment is performed:

- Travel history
- Occupation
- Hobbies
- Previous and recent exposure to healthcare facilities
- Previous infection or colonisation with MDROs
- Recent antimicrobial treatment

⁹⁸ Dramowski, A., 2014. Infection Prevention and Control A guide for healthcare workers in low-resource settings. Bettercare

- Cough (duration, weight loss, night sweat, loss of appetite, malaise, haemoptysis)
- Fever
- Rash
- Diarrhoea

Risk can be categorised as high, medium or low risk depending on the severity of the consequences of any hazard.

Carry out a risk assessment prior to patient placement based on the following formula applied to **Table 26**: *RISK = exposure x probability x severity*

For example: A patients with a draining wound who was recently admitted in a healthcare facility for surgery and is complaining of pain, fever and an open exudating wound = high risk. A patient with a draining wound obtained through a cut in the foot, without any signs and symptoms of infection or recent healthcare exposure = low risk

Table 26: Risk-assessment infection control grid

Risk-assessment infection control grid			
	HIGH	MEDIUM	LOW
Patient to staff	High Risk	Medium Risk	Low Risk
Staff to patient	High Risk	Medium Risk	Low Risk
Staff to staff	High Risk	Medium Risk	Low Risk
Patient to patient	High Risk	Medium Risk	Low Risk

Ensure adequate communication regarding the risk assessment conducted to receiving facilities nursing units, healthcare facilities and EMS.



PRINCIPLES OF ASEPSIS

2.9 PRINCIPLES OF ASEPSIS

Aseptic technique is a general term involving practices that minimize the introduction of microorganisms to patients during patient care. There are two categories of asepsis:

- General asepsis which applies to patient care procedures outside the operating theatre.
- Surgical asepsis relating to procedures/processes designed to prevent surgical site infection.

Aseptic techniques are used to reduce the risk of post-procedure infections and to minimize the exposure of health workers to potentially infectious microorganisms. Aseptic techniques include practices performed just before, during, or after any invasive procedures. Poor adherence to aseptic techniques results in considerable morbidity and mortality. To reduce procedure-related HAIs, a set of infection prevention bundles have been established which, when followed correctly, have proven to be effective in preventing HAIs.⁹⁹

2.9.1 Recommendations for asepsis:

- Several non-surgical procedures require aseptic technique in order to prevent transmission of infectious agents particularly during the placement of devices into sterile body spaces.
- The introduction of a sterile item into a patient should always be performed with a no-touch-technique. **This means that the skin in the area of insertion should not be touched after skin antiseptics has been applied.**
- Aseptic techniques are practiced for all invasive medical procedures such as insertion of central venous and peripheral line insertion, surgery, or inserting a urinary catheter.

For further information on bundles, see section on HAI.

Most HAI is attributed to actions of health workers who either ignore or are unaware of basic concepts of aseptic techniques including HH aseptic procedures.¹⁰⁰ Education and training of all health workers is essential to ensure safe practices.

⁹⁹ <http://www.ihl.org/Topics/Bundles/Pages/default.aspx#targetText=A%20bundle%20is%20a%20structured,proven%20to%20improve%20patient%20outcomes>.

¹⁰⁰ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa



INJECTION SAFETY AND OCCUPATIONAL HEALTH

2.10 INJECTION SAFETY AND OCCUPATIONAL HEALTH

2.10.1 Injection safety

WHO defines injection safety as:

- A safe injection that does not harm the recipient,
- Does not expose the provider to any avoidable risks, and
- Does not result in waste that is dangerous for the community.¹⁰¹

Injections are one of the most frequently used medical procedures. The WHO estimates that 12 billion injections are given annually, 5% of which are administered for immunization and 95% for curative purposes. Unsafe injection practices (especially needle and syringe re-use) occur and place both staff and patients at risk of infection with blood-borne viruses (BBVs). It is estimated that globally, up to 160 000 human immunodeficiency virus (HIV), 4.7 million hepatitis C and 16 million hepatitis B infections each year are attributable to these practices. The problem is complex and fuelled by a mixture of socio-cultural, economic and structural factors.¹⁰²

Promoting the occupational safety of health workers is essential and protecting health workers from occupational infection with blood-borne viruses have a range of potential benefits, including safer injection practices for patients and less discrimination against people with HIV/AIDS.^{103, 104}

2.10.2 Preventing injuries from sharp instruments

- using needles, scalpels and other sharp instruments or devices;
- handling sharps after a procedure;
- cleaning instruments;
- disposing of used needles.

ALWAYS ✓

- Use a single hand “scoop” technique if the needle must be re-capped/or use a mechanical device for holding the sheath.
- Use the safety technique of a neutral zone (“put down-pick up”) in operating theatres when passing sharps, to avoid hand-to-hand contact.
- Transport used needles safely, in a receiver (e.g., kidney dish) to the disposal area if the sharps container is not at hand.
- Discard used disposable syringes and needles, scalpel blades and other sharp objects directly into a rigid, puncture proof container which is placed within arm’s reach of the point of use.
- Close and secure sharps containers when recommended levels are reached (3/4 full).
- Ensure sharps containers are fixed to surfaces and closed to avoid spillage during transportation.

¹⁰¹ World Health Organization. WHO best practices for injections and related procedures toolkit. March 2010. Available from: https://apps.who.int/iris/bitstream/handle/10665/44298/9789241599252_eng.pdf?sequence=1

¹⁰² Unsafe injections in low-income country health settings: need for injection safety promotion to prevent the spread of blood-borne viruses (Oxford Journals Medicine, Health Promotion International, Volume 19, Issue 1 P95-103)

¹⁰³ Use of injections in healthcare settings worldwide, 2000: literature review and regional estimates- BMJ2003;327doi: <http://dx.doi.org/10.1136/bmj.327.7423.1075>(Published 6 November 2003), Cite this as:BMJ2003;327:1075 Yvan J F Hutin et al,

¹⁰⁴ WHO guidelines on the use of safety engineered syringes for intra muscular, intradermal and subcutaneous injection in the healthcare setting. 2016

NEVER ✕

- Re-cap needles or manipulate needles using both hands.
- Use techniques that involve directing the point of the needle toward any part of the body.
- Force used sharp items (trocars, needles and syringes) into an overfull sharp container.
- Remove a used needle from a disposable syringe without re-capping first (see below) or remove scalpel blades from holders without forceps.
- Insert a used needle into the mattress or anywhere else.

2.10.3 Safety Engineered Devices (SEDs)¹⁰⁵

There are two types of SEDs available for the protection of healthcare professionals as well as patients and the public. 1) 'Sharp injury protection' and 2) 'Reuse prevention', both used for delivery of medication by healthcare professionals by intramuscular, subcutaneous, and intradermal route. Both have different mechanisms of safety and clear indications for use.

SEDs are available in South Africa and should be used wherever and whenever possible to reduce needle stick injuries and to ensure that the injections are safely discarded.

2.10.4 Multi dose vials (MDVs)⁸³

MDVs are a major source of cross infection and outbreaks of hepatitis B and C in healthcare. The reintroduction of a used needle to refill the syringe as well as leaving a hypodermic needle in the diaphragm of the MDV from which a used syringe is filled is common but is an unacceptable practice. The safest way to use a MDV is to insert a spike with a non-return valve to ensure there is no contamination and that sterility of the solution is maintained.

The diaphragm or bung of the vial should always be cleaned with 70% alcohol and rubbed for 15 – 30 seconds if a spike is not used, prior to access. **Syringes should not be pre-filled from a multi dose vial and then stored.** MVD should be stored as per the manufacturer's recommendation.

2.10.5 Sharps injury

Health workers should know their hepatitis B immune status and if possible their HIV status. If an accidental sharps injury occurs:

- Allow free bleeding.
- Wash under running water immediately.
- Inform your immediate supervisor.
- Get a blood sample from the source (either a patient or sharps discarded incorrectly in waste) and a good clinical history relating to blood-borne diseases.
- Report to the Occupational Health Department or designated persons.
- It might be required to give a sample of blood if the immune status of the health worker is not known.
- Hepatitis B immunisation booster might be offered.
- Post exposure prophylaxis (PEP) will be offered after counselling.¹⁰⁶

¹⁰⁵ WHO guideline on the use of safety-engineered syringes for intramuscular, intradermal and subcutaneous injections in health care settings. 1.Injections, Subcutaneous – standards. 2.Injections, Intradermal – standards. 3.Injections, Intramuscular – standards. 4.Syringes. 5.Needlestick Injuries – prevention and control. 6.Delivery of Health Care. 7.Guideline. World Health Organization. ISBN 978 92 4 154982 0 (NLM classification: W 26)

¹⁰⁶ South African HIV Clinician Society. Corrigendum: Guideline on the management of occupational and non-occupational exposure to the human immunodeficiency virus and recommendations for post-exposure prophylaxis: 2015 Update. Available at [https://sahivsoc.org/Files/Corrigendum%20%20PEP%20guidelines%20\(March%202016\).pdf](https://sahivsoc.org/Files/Corrigendum%20%20PEP%20guidelines%20(March%202016).pdf)

- Ideally PEP should be administered as soon as possible, but definitely within 24 hours of exposure, if indicated.
- Start PEP (if necessary) while waiting for source blood results.
- Once the source blood results are back, the decision on continuation of PEP is made.

2.10.6 Medical Surveillance

Medical surveillance, as outlined in the Occupational Health and Safety Act and Regulations, should be done for all at risk staff (as determined by a health risk assessment).¹⁰⁷ Employees identified for medical surveillance should undergo evaluation at various points during employment. The frequency should be determined by the nature of the risk involved. These evaluations can include one or more of the following:

- Baseline medical examination, for example the baseline screening and testing for TB infection.
- Routine periodic medical surveillance (based on risks identified). For example, screening and testing for TB every six months. This should also be conducted as part of outbreak investigations.
- An exit examination on leaving employment. For example, screening and testing for TB disease to exclude undiagnosed TB disease at the time of leaving the facility and to ensure early treatment.¹⁰⁸
- Post-incident medical surveillance (based on a specific incident). For example, following a needle stick injury.

¹⁰⁷ Republic of South Africa. Occupational Health and Safety Act. N0 95 of 1993.

¹⁰⁸ National Department of Health. National Infection Prevention and Control Guidelines for TB, MDR-TB and XDR -TB. Pretoria; 2015



ENVIRONMENTAL CLEANING

2.11 ENVIRONMENTAL CLEANING

A clean environment plays an important role in infection prevention and control practices. The environment in health facilities refers to the surroundings in which healthcare services are provided to patients. The environment refers to rooms, surfaces, equipment, and all objects used in connection with delivering of health care services.

Microbiologically contaminated surfaces can serve as reservoirs of potential pathogens especially MDROs, and play a significant role in transmission during outbreaks, particularly where there is overcrowding in clinical areas. Pathogens settle on surfaces and can be transferred by hands or objects to patients if the environment is not cleaned properly and regularly.

The purpose of cleaning the environment is to remove visible dirt and dust. Cleaning reduces the level of microorganisms which are carried on skin scales that form part of dust, and minimises the dissemination of infectious agents in the health facility. The effect is a sanitary, and relatively contamination-free environment for patients, staff, and visitors which is expected and inspires confidence in the health facility.

This manual aims to provide uniform correct cleaning methods for the cleaning workforce, whether these are in-house or out-sourced contractors, so that environmental cleaning can be effective, carried out by trained cleaners according to a scheduled routine, uses appropriate cleaning agents and equipment and can be monitored. Also refer to *Best Practices in Environmental Cleaning* (2019)¹⁰⁹ for the latest evidence-based review.

2.11.1 Objectives:

- To understand principles and methods, procedures and appropriate equipment requirements of effective cleaning in a facility setting;
- To ensure proper use of detergents and disinfectants in the environment;
- To define and apply appropriate personal protective equipment (PPE) for environmental cleaning;
- To provide methods of monitoring and validation for environmental cleaning.



Note: The routine use of a disinfectant in the environment is strongly discouraged! It is wasteful and promotes antimicrobial resistance. The IPC practitioner or team will advise.

2.11.2 Requirements for cleaning staff¹¹⁰

- All staff must be trained in the correct methods of cleaning and disinfection relating to their job category.
- Staff must be presentable, clean and practice good personal hygiene.
- Staff must wear clean, appropriate and identifiable regulation uniforms. If the uniform becomes soiled or wet, it must be changed.
- HH must be performed (see section on HH):
 - at the beginning and end of each shift;
 - after handling contaminated items;

¹⁰⁹ CDC and ICAN. Best Practices for Environmental Cleaning in Healthcare Facilities in Resource-Limited Settings. Atlanta, GA: US Department of Health and Human Services, CDC; Cape Town, South Africa: Infection Control Africa Network; 2019

¹¹⁰ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

- before and after meals or smoking;
- after handling cleaning chemicals;
- after using the bathroom;
- after removing gloves and between tasks; and
- if hands are potentially contaminated with blood or body fluids.
- No eating, drinking, or smoking is allowed except in specific designated areas.
- Staff working in **specialised areas**, such as the operating theatres, must adhere to the specified dress code for those areas.
- Staff, including management, must be trained in the effective cleaning processes, appropriate equipment and use of detergents and disinfectants and proper cleaning methods for various areas in a facility, including infection prevention and control.
- Records of cleaning staff training must be kept and be available for inspection.



Note: Staff working in all hospital units such as isolation wards or single rooms must be trained, and a record of the training must be kept. Staff are responsible for familiarising themselves with the proper precautions required before entering the area.

PPE for cleaning staff

Cleaning staff must wear the appropriate PPE, see **Table 27**. In addition, cleaning staff working in **infectious areas** such as isolation wards or single rooms must wear appropriate PPE according to the transmission-based precaution requirements as guided by the nursing staff. Cleaning staff are within their right to refuse to work in an infectious area if appropriate personal protective equipment is not provided.

Table 27: PPE for cleaning staff¹¹¹

	<p>Domestic rubber gloves (see section on PPE) (not the examination or clinical gloves worn by health workers) for normal cleaning duties. The gloves must reach up to mid arm and offer protection against chemicals and direct contact with dirt. Gloves must be changed or washed thoroughly with detergent after cleaning each bathroom, each patient room and whenever soiled. Domestic gloves are reusable and should be changed only if damaged. Gloves are preferably colour-coded for cleaning different areas – kitchens, bathrooms and toilets.</p>
	<p>Heavy-duty gloves (see section on PPE) if in contact with chemicals which may harm the skin. Heavy-duty gloves are usually reusable and must be washed with detergent after use.</p>

¹¹¹ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

	<p>Plastic aprons for any cleaning activity that may generate splashes. They must be worn to cover the front of the uniform. The use of colour coded aprons is recommended.</p> <p>Eye Protection is not routinely recommended. It might, however, be necessary in special circumstances, depending on the activity and the anticipated risk of exposure to blood, body fluids, or strong chemicals.</p>
	<p>Surgical masks for use when entering areas where airborne and droplet precautions are required. In theatres, outpatient settings, sterile procedures.</p>
	<p>Cloth or cotton gowns for use when conducting terminal cleaning of patient rooms. Used with plastic apron underneath to reduce fluid contamination.</p>

2.11.3 Cleaning principles

- Cleaning schedules and procedures must be planned so that cleaning progresses from the least soiled to the most soiled area and from the top to the bottom of a room.
- All areas must be cleaned systematically to avoid missing areas.
- Frequently touched surfaces are a high-risk for cross-transmission and must therefore be cleaned more frequently.
- Clean from high to low areas.
- Clean from cleanest to dirtier areas.
- Only approved detergents must be used for cleaning.
- All solutions must be diluted according to manufacturer's instructions. This is essential for maximum effectiveness. Increasing the strength of disinfectants does not necessarily increase the antimicrobial activity. Decreasing the strength of disinfectants may lead to AMR.
- **The key to environmental cleaning is the physical removal of microorganisms and debris.**
- The use of soap, water and friction (action of washing/scrubbing – “elbow grease”) is effective, cheap and simple and is the first step in the cleaning process.
- No additives (such as scouring agents, disinfectant, or floor polish) are necessary since this will deactivate the active cleaning ingredients in the detergent.¹⁰⁹ These are usually applied after cleaning has taken place.
- Attention must be paid to both high touch and low touch surfaces.

2.11.4 Cleaning methods

It is essential that the correct cleaning methods¹¹² are used. See **Table 28**.

¹¹² Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

Table 28: Recommended cleaning methods

	<p>Dusting or wiping of surfaces must always be done with a damp cloth. The cloth must be dampened in clean water containing a detergent. The detergent breaks the surface tension of the water, allowing the dust particles to cling to the cloth. Then the cloth is wrung tightly to remove most of the water before being used to wipe down surfaces. In high-risk areas, when using a bucket and cloth method, solutions should be changed and buckets and cloths cleaned per bed space. Mix only enough solution for each bed space.¹¹³</p>
	<p>A damp (not wet) floor mop must be used to clean floors. Clean water and detergent must be placed in one bucket and the mop is then rinsed off in the other (dirty) side. The water must be changed frequently for every bed space in a high-risk area or as soon as the solution becomes discoloured. Mix only enough solution for each bed space.</p>
<p>Not recommended</p> <ul style="list-style-type: none"> • Dry dusting is ineffectual since it only displaces dust; therefore, it is not recommended in health facilities. Feather dusters are not to be used. • Sweeping: Sweeping with brooms is not recommended for health facilities since the individual bristles only displace the dust. 	

2.11.5 Cleaning equipment

The recommended cleaning equipment is set out in **Table 29**. A colour-coding system should be used for cleaning equipment to reduce the risk of cross contamination in multiple areas;

- ✓ **Red** colour – for highly contaminated areas, such as toilets, showers, wash-up rooms, sluice rooms, and bathroom floors;
- ✓ **Blue** colour – general areas including wards, offices and hand wash basins in public areas;
- ✓ **Green** colour – bathroom (basin, bath and showers), ward/consulting room basins;
- ✓ **White** colour - Kitchen areas (food preparation and serving);
- ✓ **Yellow** colour – Isolation areas (only applicable for hospitals as primary health care facilities rarely have to isolate patients).

All equipment, carts and accessories used by domestic cleaners must be cleaned at the end of each day or more frequently when visibly soiled.



Note: When applying chemicals to a surface, spray onto a cloth first and then wipe. NEVER spray directly onto a surface as it can cause respiratory irritation and aerosolize any

¹¹³ J Hosp Infect. 2009 Dec;73(4):378-85. doi: 10.1016/j.jhin.2009.03.030. Epub 2009 Sep 1. The role of environmental cleaning in the control of hospital-acquired infection. Dancer SJ¹

Table 29: Cleaning equipment

	<p>Two-way bucket system for mopping</p> <p>A double bucket, colour coded, blue for clean and red for used water mounted on a trolley.</p>
	<p>Colour coded mops</p> <p>Flat mop systems are preferred. “Spaghetti” mops are more difficult to wash as they easily become tangled and cannot be tumble-dried.</p> <p>If “spaghetti” mops are used (mop with a cotton string head) for cleaning of floors, they must be thoroughly wrung out and damp, NOT WET, when cleaning the floors. Mops should be washed in very hot water and dried or sent to the laundry at the end of each cleaning session.</p>
	<p>Colour coded cleaning cloths for damp dusting and wiping of surfaces.</p>
	<p>Colour coded buckets for water.</p>
	<p>Janitor trolleys are mounted on wheels with front swivel castors that allow for easy manoeuvring. They are used to keep cleaning tools and consumables secure and tidy while working in the wards.</p>
	<p>Floor polisher, scraper and buffer for polishing of floors.</p>

	<p>Static head mops for cleaning dry floors</p> <p>These are used to sweep up dry, loose contamination such as dust and sand from the surface of the floor.</p>
	<p>“Wet Floor” sign– to warn staff, patients and visitors that floors are wet to minimise the risk of falls.</p>
	<p>Window squeegee for cleaning windows.</p>
	<p>Pistol-grip spray container</p> <p>NEVER * spray directly on surfaces. Spray onto the cloth/s first and then wipe over the surface. Cleaning chemicals should be dispensed in dedicated, marked containers. No chemicals may be decanted into cold drink or other food-containing, e.g., milk bottles.</p>

Use of cleaning equipment

- Cleaning equipment must be used according to specific cleaning tasks.
- The equipment must be easy to clean; regular maintenance and replacement schedules must be available; implemented and records kept thereof.
- Wet equipment (bucket and mop) is more likely to encourage the growth of micro-organisms therefore it is important to keep all equipment clean and dry.
- Cleaning equipment and solutions must be removed from patient care and food preparation areas as soon as possible after cleaning is complete.
- The cleaning and maintenance of all equipment should be agreed upon before use.

Cleaning equipment - restocking and maintenance

- Cleaning cloths must be segregated according to the approved colour-coding system.
- Change cleaning cloths and mop heads daily or per bed space in high-risk areas and situations. Used cloths and mop heads must be washed with warm water and a detergent before reuse (if washed in a washing machine, the temperature should be at least 60°C).

- When solutions in pistol-grip spray containers have been completely used up, the reusable containers must be washed and dried before being refilled - **DO NOT TOP UP WITHOUT CLEANING THE CONTAINER!**
- Cleaning carts and buckets must be constructed of rustproof material that is easily cleaned and free of scratches, cracks and crevices. All equipment, carts and accessories used by cleaners must be cleaned at the end of each day's cleaning session.
- The equipment must be stored dry in a designated, clearly marked storage area or cleaning closet.
- These closets must be kept neat, clean and free of clutter. All equipment must be routinely maintained and kept in good repair or replaced. Scheduled inspections should be done by supervisors.¹¹⁴

2.11.6 Chemicals used in cleaning

Detergents

The majority of routine cleaning should be done with clean water and a neutral health facility grade detergent.

- The detergents should be compatible with the material they are used to clean.
- Detergents have no killing ability but do remove organic matter which contain microbes and thereby reduce environmental contamination.
 - ✓ Supplies must be in original containers.
 - ✓ Bottles used for decanting must be relabeled stating the contents and instructions for use.
- Cleaning should only be carried out with the recommended detergents in accordance with this policy. *Instructions for preparation of detergents*
 - ✓ Detergent must be freshly prepared daily.
 - ✓ Dilute accurately according to manufacturers' instructions.
 - ✓ No additives must be mixed with detergents as it will inactivate the cleaning ingredients in the detergent.

Disinfectants

- Disinfectants do not make dirt safe.
- Disinfectants are inactivated by organic matter such as dirt, blood, faeces, cotton mops and hard water (i.e., water that has a high mineral content).

Disinfectants are not recommended for routine cleaning and should only be used for spillage containing blood and high-risk body fluids - see **2.11.9 on page 123**.



Note: Refer to the detergent, disinfectant and antiseptic section for details on chemicals for environmental cleaning

2.11.7 Order of cleaning

- Ensure safety of patients, staff and visitors by placing hazard signs/notices in strategic positions during cleaning in all service areas. A verbal reminder is also helpful.
- Clear the area (by section) to be cleaned by removing all the light movable equipment, furniture.

¹¹⁴ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

- Cleaning should begin from the clean areas moving towards dirty areas, thus leaving cleaning of infectious patient areas for last. Cleaning should begin from the top to the bottom and from the furthest area to the closest entrance area.
- Cleaning of floors should be followed by cleaning of areas above it such as walls, windows, medical equipment and furniture.
- Drying of the floor should be ensured by wiping the floor dry with a well wrung-out mop then air dried.

Routine cleaning of clinical and non-clinical areas

All clinical and non-clinical areas which include floors, walls, windows, beds and other medical equipment, curtains and utensils, furniture and empty waste bins must be cleaned. **All staff must wear appropriate PPE.** A daily cleaning routine with a set frequency for cleaning of all horizontal surfaces and toilet areas is necessary to ensure that optimal cleanliness of the environment is maintained. Some of the areas are included in patient care articles (see patient care articles).

The area between the bed and mattress is often missed and must be included in routine cleaning.

A cleaning checklist must be put up in all areas. Cleaners must sign the checklist after having cleaned. After carrying out checks, supervisors must co-sign the checklists at least daily.

Cleaning schedule, methods and frequencies

Cleaning should be carried out in a planned manner and cleaning schedules should be drawn up for each area and include all equipment, fixtures and fittings. There must be clearly defined areas of (cleaning) responsibility for both the cleaners and nursing staff; cleaners are generally responsible for cleaning and maintaining non-clinical equipment while nursing staff are responsible for the cleaning of clinical equipment - unless these tasks are delegated by mutual consent. Training must be provided.

Checklists must be aligned to the cleaning schedule and include signature of cleaning staff with every session and signature of supervisor, daily for validation.

Frequently touched surfaces are a high-risk for cross-transmission because they are contaminated with the pathogens that are transferred from people's hands. Items such as door handles, light switches, patient monitors and medical equipment buttons/knobs are frequently touched by health workers and patients. Most areas of a health facility will require at least daily cleaning. See **Table 30**.

The same cleaning principles apply to ambulances. First clean all surfaces and then disinfect.

Table 30: Routine cleaning procedures

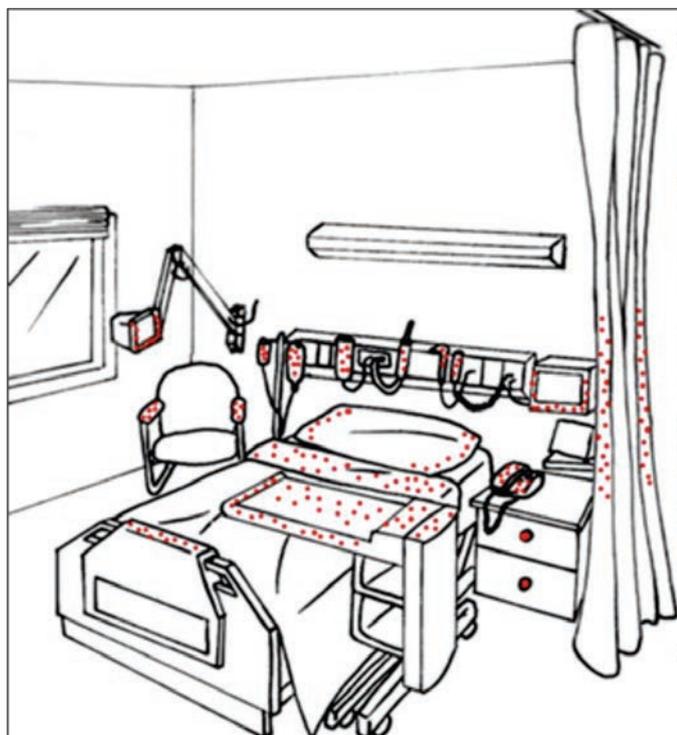
Area	Cleaning method	Equipment	Frequency
<p>Floors</p> <p>Continuous smooth flooring is recommended for health establishments</p>	<ol style="list-style-type: none"> <li data-bbox="464 259 1013 539">1. Static head mopping: Remove dirt and dust on the floors before commencing with wet mopping. Starting from the furthest area away from the door, the static head mop is run along the edges of the floor. Once all the mopping is done, all the debris is collected into the appropriate bag. <li data-bbox="464 551 1013 1003">2. Wet mopping: Immerse the mop in the water with detergent, wring out the mop, follow a systematic method, ensuring that all areas of the floor are covered paying particular attention to the corners. Rinse off intermittently throughout the mopping process. If the water becomes discoloured, and/or when moving to another area, the bucket must be emptied, washed and refilled with clean water and detergent. Dry floors to prevent slips and falls. <li data-bbox="464 1014 1013 1514">3. Scrubbing/stripping: Scrub floors frequently. Commence scrubbing from the furthest point and towards the cleaner. Mopping and scrubbing of corridors should be done first on one half of the corridor then the other side to ensure that there is a dry area where people can walk without any risk of slipping and falling. After scrubbing the main section of the floor, edges of the floor should be manually scrubbed with the scouring pad. The entire floor is then thoroughly mopped and dried. <li data-bbox="464 1525 1013 1731">4. Floor sealing and polishing: It is recommended that scrubbed floors be sealed to ensure that the floors remain clean and shiny but not slippery. Floor sealing is commonly applied to vinyl floors. 	<p>Head mop or microfiber sleeve and detergent</p>	<p>Daily and immediately after spills, excluding blood and bodily fluids</p> <p>Daily and immediately after spills, excluding blood and bodily fluids</p> <p>Monthly</p> <p>Monthly</p>
<p>Walls</p>	<p>High dusting must be performed using a clean damp duster or vacuum cleaner (for cornices). Walls must be damp-wiped or spot-cleaned as needed.</p>	<p>Clean damp duster Vacuum cleaner</p>	<p>At least weekly</p>

Area	Cleaning method	Equipment	Frequency
Windows	At least two people stand on both sides of the glass and working simultaneously to clean it. Apply glass cleaner onto the glass surface. Using a squeegee, paper or a cloth, the cleaning chemical is applied liberally onto the surface while ensuring that all edges and corners as well as the centre are cleaned. Use the cloth or paper towel for buffing and removing all smears and wetness.	A non-ammoniated, streak free glass cleaner, squeegee, paper or a cloth	As needed
Patient and communal toilets and bathrooms	Special attention must be given to the toilet, sink, fixtures and the floor. Towel and toilet paper dispensers must be refilled. Soap dispensers must be replaced as needed. All surfaces, fixtures and fittings, including doors and door handles are also washed with detergent. Mirrors are washed with non-ammoniated, streak free glass cleaner thus ensuring that all smears are removed.	Ammonia-based detergent	Bathrooms-Daily Toilets – Scheduled cleaning throughout the day
Horizontal surfaces - windowsills, chairs, over-bed tables and bedside cabinets	Wiping with damp cloth	Detergent	Daily
Sluice rooms	The flush of a sluice pan is pulled to allow entry of clean water in the basin. The area within the rim and bowl of the sluice basin is sprayed with detergent and left for a few minutes to activate. All debris is removed using a scourer, rinsed and wiped dry.	Detergent, scourer	Daily or as and when required
Food service areas	Kitchen surfaces should be clearly marked as food preparation areas - uncooked and cooked. All surfaces must be washed with warm, soapy water intermittently. At the end of a session, clean thoroughly and wipe over with a chlorine disinfectant of appropriate strength	Water, detergent, chlorine strength disinfectant, cloths,	Daily

Area	Cleaning method	Equipment	Frequency
Food service areas	Remove all items inside the refrigerators and cupboards and wipe down with a cloth and detergent at least weekly or more frequently when indicated. All the rubber seals around the door and over the outside surface should be wiped clean with a wet cloth. Dishwashers/sterilizers should be emptied, and the bottom base removed and cleaned daily.	Water, detergent, chlorine strength disinfectant, cloths,	Daily
High touch surfaces	Wiping of bed railings, doorknobs and handles (see Figure 13)	Wiping cloths, detergent-disinfectants	Daily
Low touch surfaces	Between the bed frame and mattress, and other low touch surfaces	Wiping cloths, detergent-disinfectants	Daily
Waste baskets/bins	All waste baskets/bins must be emptied and re-lined with new impervious plastic liners. Bins must be cleaned with detergent at least weekly and whenever there is seepage.	Plastic liners	Emptied at least three times a week or daily

Floors should not be polished/buffed while clinical procedures are being carried out.

Figure 13: Patient Room showing high touch surfaces in red¹¹⁵



¹¹⁵ Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Best practices for environmental cleaning for prevention and control of infections in all health care settings. 3rd ed. Toronto, ON: Queen's Printer for Ontario; 2018. <https://www.publichealthontario.ca/-/media/documents/bp-environmental-cleaning.pdf?..>

Deep cleaning

Deep cleaning (also known as terminal cleaning) involves cleaning walls, ventilation shafts and grills and storage areas, floors, windows, ceilings, etc in all clinical and non-clinical areas. In some situations, temporary closure of such areas is required whilst deep cleaning is taking place. In clinical areas, medical equipment must be appropriately moved and or disconnected.

- Curtains should be removed. Curtain hooks should be soaked in a detergent while curtain tracks are cleaned.
- Air vents, grills and light fittings are cleaned, and the walls are cleaned starting from the highest to the lowest areas.
- Floors are cleaned and scrubbed.
- **Wards** - beds are pulled out; all parts of beds, especially the mattress and the bed frame underneath the mattress, are cleaned with a clean cloth soaked in an appropriate detergent solution then left to dry. Wet mopping under the beds, particularly in difficult to reach areas, should be done whilst the bed is pulled out. Bed frames, cot sides, soft foam mattress, bedside lockers (both inside and outside), bedside tables, chairs and any other bed head appliances are cleaned using cleaning cloths soaked in an appropriate detergent solution. Hand towel holders, alcohol and soap dispensers, door handles, lights and flooring are also thoroughly cleaned. The hand basins are cleaned, and soap scum is removed with a scouring pad and detergent.
- **Bathrooms and toilets** - The walls/tiles are washed starting from the highest to the lowest areas. All dirt and soap scum are removed from sinks, basins and bathtubs using an appropriate detergent/cleaning chemical. The inside of the cistern is scrubbed using a toilet brush then water is flushed to allow entry of clean, rust free water into the cistern. The rim and bowl of the toilet is sprayed with toilet cleaning chemical and left for few minutes to activate, scrubbed with toilet brush and wiped clean. The toilet brush and holder are rinsed in running water and or detergent, and dried. **Each toilet should have a dedicated toilet brush, especially in isolation cubicles.**
- **Shower Rooms** - Starting from the highest point to the lowest point walls/tiles and ceiling are washed with water that is mixed with detergent. Ensure that shower heads are cleaned and functional.
- **Food services/kitchens** - Hazard signs are placed at entrances of corridors. As detailed in the preceding sections of this manual, walls are washed starting from the highest to the lowest and furthest to nearby areas. All edges, fixtures and fittings and surfaces, including door handles are washed with detergent.
- **PHC and EMS:** the same principles for cleaning apply. Frequency of cleaning is defined by clinical practice but should be at least once a day. Adequate cleaning materials must be available, and training of all cleaning staff undertaken. In case of blood or body fluid spillage, follow the recommendations outlined in this manual (see section 2.11.9).

Terminal cleaning¹¹⁶

Terminal cleaning is specifically carried out by cleaners after a patient with an infectious disease has been discharged either from a ward or a single (isolation) room. While the cleaning procedure is nearly the same as routine cleaning, it is recommended that transmission-based PPE should be worn before entering the room.

An appropriate disinfectant is applied to all surfaces only after thorough cleaning.

¹¹⁶ Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infection.

The use of hydrogen peroxide vapour or UV pulsed light devices for additional disinfection after terminally cleaning following discharge of a patient with MDRO is becoming increasingly common, especially during outbreaks. This is an effective additional measure but must be preceded with cleaning with a detergent and water, followed by a disinfectant. These additional measures cannot replace normal cleaning and disinfection but serve as an add-on. The manufacturer or supplier's guidance must be followed.

If terminal cleaning is required, checklists (**Table 31**) must be completed and signed by the IPC co-ordinator or unit/health facility manager before another patient can be admitted to the room.

Table 31: Checklist for terminal cleaning

Date:		Ward:		Room no:	
No	Item			(tick with a ✓)	
1.	Personal protective clothing depending on type of isolation (gloves, apron, goggles, mask)				
2.	Yellow bucket, yellow cloth, soap and water, disinfectant (Hypochlorite)				
3.	To make a Hypochlorite solution, mix chlorine granules in water to obtain a concentration of 1000 ppm – this is usually 2 sachets in 4.5L water or according to the manufacturer's instructions				
4.	Remove linen/privacy curtains around bed and place in a yellow plastic bag				
5.	Remove all waste in appropriate container (all waste regarded as medical waste)				
6.	Clean the entire room with soap and water and then disinfect with Hypochlorite solution. Pay special attention to:				
	• Switches & door handles				
	• Locker, table and chair				
	• Patient call bell				
	• Bed, rails and accessories and underneath the bed				
	• Mattress, both sides				
	• Bed wheels				
	• Basin and tap				
	• Paper towel dispenser and soap dispenser				
	• Waste bins				
	• Any other equipment, e.g., drip stand				
	• Walls, windows, doors, mirrors and all surfaces, e.g., windowsills				
	• Floor and corners				
	• En-suite bathroom and toilet				
7.	Remove and discard PPE and cloth in red liner carton box (medical waste)				
8.	Perform hand hygiene				
9.	Remove linen bag and waste containers				

Staff responsible for terminal cleaning

- Housekeeping staff are responsible for cleaning of isolation rooms.
- The staff member in charge of housekeeping will:
 - Ensure procedures are in place.
 - Ensure all housekeeping staff are familiar with the infection control policies and procedures.

The IPC Team should be available as a resource, to carry out final checks on the cleaning and disinfection of the room and to give final clearance for occupancy by the next patient.

Procedure for cleaning after discharge of an infectious patient:¹¹⁷

- Domestic cleaners must be notified by nursing when an isolation room is ready for terminal cleaning.
- **Transmission-based precautions:** Cleaning staff must observe the following precautions when cleaning the isolation room of a patient on transmission-based precautions or as directed by the IPC Team or nurse in charge of the clinical area:
 - Airborne precautions: Use respirators only for patients with TB, measles or chickenpox. Gloves and aprons should be worn.
 - Droplet precautions: Surgical face mask unless otherwise specified by nursing staff. Gloves and apron should be worn.
 - Contact Precautions: Gloves and plastic apron for housekeeping activities. Remove the gloves and apron when leaving the room and perform hand hygiene.
- The cleaning procedure for rooms of patients requiring isolation is the same as other patient rooms. Routine cleaning procedures must be performed meticulously.
- Terminal cleaning should be performed carefully with minimum dispersing of dust. **All PPE must be discarded inside the isolation area and hand hygiene carried out before exiting the room.**

Cleaning equipment:

- Only use cleaning equipment marked/colour coded for the cleaning of isolation rooms.
- Cleaning equipment must be cleaned and disinfected after cleaning each isolation room.

Cleaning of furniture:

- Clean all surfaces of the bed frame with a detergent before the bed is made.
- The beds, over-bed tables, chairs, lamps and lockers must be wiped down with soap and water, dried and wiped down with alcohol or hypochlorite solution. Ensure that both surfaces above and below (underneath) the bed are cleaned especially between the bedframe and mattress.
- The inside of the bedside cabinet and storage closet must be damp wiped with a detergent.

Linen:

- Remove all sheets, bed linen, curtains and any other washable item in the room and place in appropriate colour bags or containers.

¹¹⁷ Infectious Diseases Advisory Committee. Best practices for environmental cleaning for prevention and control

- Linen and waste bags must be closed and labelled inside the isolation room before removal and sent to the laundry.

Mattress:

Inspect the mattress and cover to ensure integrity (no tears or damage). Wipe both sides of the mattress and the edges with a damp cloth soaked in water and detergent, carefully removing all visible dirt. Wipe over with appropriate concentration of a recommended disinfectant (alcohol or chlorine). Replace mattress if torn.

- All surfaces of mattresses and pillows must be damp-wiped with a hospital-approved detergent before the bed is made.
- If plastic covers are torn or damaged, these should be replaced, and the mattresses and pillows sent for decontamination.
- If the plastic covers of the pillows and the mattresses are intact and there are no visible signs of contamination then these should be washed down with soap and water, dried and wiped off with alcohol.

Medical equipment:

Ventilators, infusion pumps, monitors, leads, drip stand, oxygen regulator, stethoscope, saturation monitors, sonar machines and ECG probes and the emergency trolley equipment must be thoroughly cleaned with detergent and water (without soaking) and wiped down with alcohol or 1000 ppm available chlorine (especially for *C. difficile*). Send the ambubag (bag-valve-mask device) and respiratory equipment to the SSD and hand the ventilator over to the technologist for further decontamination.

Other re-usable equipment:

Equipment such as suction bottles, circuits, inhalation masks, puriton bottles, other bottles, transducer domes and used procedure packs must be rinsed out with water, packed in a transparent plastic bag that is marked "infectious" and sent to SSD for cleaning and ethylene oxide sterilization. Blood pressure cuffs should be washed in warm water and detergent and dried. Thermometers should be washed, dried and disinfected.

Surfaces:

- Clean all surfaces with detergent and water. Dry.
- Wipe all surfaces with 70% alcohol (or 1000 ppm available chlorine as indicated).

Do not use ABHR containing either chlorhexidine OR an emollient to clean surfaces.

Walls and floors: must be wiped down with detergent and water and if there are any bloodstains, wipe over with hypochlorite (10 000 ppm) after the wall is clean. Windows, storage cupboards, curtain rails, doors, door handles and, handwash basins must be wiped down with detergent and water.

Lotions and solutions: Discard all the left-over lotions and solutions e.g., liquid soap and hand disinfectant. Discard containers in HCRW bins.

Patient care articles: Bedpans, urinals, bowls and jugs should be washed, and heat disinfected.

Waste: must be managed according to the healthcare waste management guidelines.



Note: The room should ideally be left unoccupied until ALL SURFACES ARE DRY. Isolation signs are not to be removed until terminal cleaning is completed. The IPC Team will remove the transmission-based precaution signs once the process has been completed and the cleanliness checked

The same principles of terminal cleaning apply to PHC and EMS. First clean thoroughly with water and detergent and then apply appropriate disinfectant as indicated.

2.11.8 Validation/evaluation of cleaning methods (check it)

There are various methods of ensuring environmental cleaning processes have been followed; some are inexpensive but also less effective than other structured validation systems. **Table 32** outlines the environmental cleaning validation methods and their possible application in South Africa.¹¹⁸ Feedback to cleaning staff and managers are essential.

Table 32: Suggested monitoring methods, staff and frequency for common routine monitoring methods

Monitoring method	Monitoring staff	Monitoring frequency
Performance observations	<ul style="list-style-type: none"> Cleaning supervisors 	<ul style="list-style-type: none"> At least weekly May be more frequent with new cleaning staff and reduce frequency after a defined time or target score has been reached
Visual assessments of cleanliness	<ul style="list-style-type: none"> Cleaning supervisors IPC or hygiene committee staff 	<ul style="list-style-type: none"> Developed at a facility-level, based on local policy and context (e.g., resources)
Fluorescent markers (e.g., UV visible)	<ul style="list-style-type: none"> Cleaning supervisors IPC or hygiene committee staff 	<ul style="list-style-type: none"> Developed at a facility-level, based on local policy and context (e.g., resources) Used to measure compliance with cleaning methodology
ATP meters		<ul style="list-style-type: none"> Expensive Used to measure microbial load after cleaning
Laboratory cultures		<ul style="list-style-type: none"> Expensive, but is the gold standard for determining residual contamination after cleaning & disinfection. Usually used during outbreaks or where specified.

It is best practice to routinely monitor environmental cleaning practices with some reoccurring frequency, for example every week, or every month. Fluorescent markers are a cost-effective way of monitoring cleaning.

It is recommended that validation of cleaning is done and recorded as follows:

- At least 5% of beds (for hospitals with ≥ 150 bed facilities) or a minimum of 15 patient care beds/areas (for hospitals with less than 150 beds) every week.

¹¹⁸ Role of infections in all health care settings. 3rd ed. Toronto, ON: Queen's Printer for Ontario; 2018.

- If resources allow, 10-15% of beds should be monitored during the first year of the monitoring programme.

It is important that the agreed upon frequency can be consistently maintained in order to establish benchmarks and track changes in practice and performance over time.

2.11.9 Cleaning of blood spillages

DO NOT pour chlorine directly over the spill - it increases spread and contamination of the area.

All spillages must be cleaned up immediately. The first person who causes, or notices, a spill of blood or body fluids must cover it immediately with paper towels to soak up the fluid and contain the spread. The person responsible for cleaning up the spillage must be called urgently.

The person cleaning up the spillage should proceed as follows:

- A pair of domestic gloves must be worn.
- A pan and brush is used to carefully remove the soaked towels covering the spill, glass or any other solid material mixed in with the blood.
- Place contaminated bits of glass carefully in newspaper and wrap well for disposal.
- Surfaces visibly contaminated with blood or body fluids should be cleaned immediately with water and a detergent.
- Inspect to ensure no signs of spillage remain.
- Wipe over with **10,000 ppm** available chlorine.
- While wearing the domestic gloves, wash the brush and pan carefully with water and detergent and allow to dry.
- Remove gloves and carry out hand hygiene.

2.11.10 Handling of waste

Domestic staff must wear thick domestic (rubber gloves) and protective clothing when handling healthcare waste.

2.11.11 Food preparation areas

All facilities where foodstuffs are handled, prepared and served must comply with the provisions of the Regulations Governing General Hygiene Requirements for Food Premises, Transport of Foodstuffs and related matters, R638 of 22 June 2018.

- Microbiological sample swabs of food preparation surfaces (counter tops, cutting boards) to be taken at least quarterly for;
 - *Bacillus cereus*;
 - *Clostridioides perfringens*;
 - Total coliform count;
 - *E coli*;
 - Total viable (plate) count;
 - *Staphylococcus aureus*;
 - Shigella spp (all).

Control samples of foodstuffs to be drawn of every batch of meals provided to patients and kept for at least 72 hours at 4°C. A record must be kept of all samples for at least 14 days.

Food hygiene and safety in a health facility must follow strict food safety systems, such as Hazard Analysis Critical Control Point (HACCP). A systematic approach for the identification, evaluation, and control of potential hazards at every stage of food preparation and serving should be implemented.

2.11.12 Pest control

Pest control does not fall directly under IPC; however, all health facilities should have a pest control programme in place which clearly sets out procedures necessary to prevent and control the breeding of pests within the health facility and to manage the use of pesticides in line with the environmental health norms and standards to prevent infections spread by pests. The programme should include a pest control schedule, based on the degree of infestation and a risk assessment. Only approved pesticides and registered service providers must be contacted for pest control services.¹¹⁶

The facility should adopt an integrated pest management approach which includes facility inspections to identify conditions that may support the harbourage of pests, proper waste management, maintaining good environmental hygiene standards, good housekeeping, structural maintenance and repairs of premises to prevent infestation of vermin.

Only approved pesticides should be used. Assistance may be obtained from a commercial pest control agency if necessary (e.g., in the case of rodents). For primary health care facilities in rural areas and facilities where insects are not a big problem, spraying with a high-performance residual insecticide spray is acceptable (example Fendona).



CHAPTER

3

TRANSMISSION-BASED PRECAUTIONS

3. CHAPTER 3:

TRANSMISSION-BASED PRECAUTIONS

Transmission-based precautions (TBP) are used to reduce the risk of transmission of potentially infectious diseases and pathogens. These should **ALWAYS** be applied in **ADDITION TO STANDARD PRECAUTIONS (SP)**.

The type of transmission-based precaution will depend on the **route of transmission** of the microbe. There may be more than one route of transmission and precautions must reflect all possible routes that can occur as this will influence the types of precautions put in place.

3.1 Categories of transmission based precautions

Contact precautions

- Microbes are transmitted by:
 - Direct contact e.g., the hands of health workers;
 - Indirect contact, via the environment and contaminated equipment.

Respiratory precautions:

Microbes are released in droplets or droplet nuclei (aerosols) when coughing or sneezing (respiratory tract activity). However, recent evidence suggests that this distinction is less clear when a cloud of different sized particles are expelled during coughing, sneezing, singing or shouting. Dilution and reduction in transmission from this cloud is dependent on good ventilation in addition to the appropriate transmission-based precautions. Currently IPC precautions are as follows. Precautions related to the respiratory route of transmission are generally divided into:

- **Airborne precautions** for particles (aerosols) $<5 \mu\text{m}$ e.g., TB
- **Droplet precautions** for particles larger than $>5 \mu\text{m}$ e.g., N. meningitidis^{120, 121}

All health workers and visitors entering isolation rooms must wear appropriate PPE

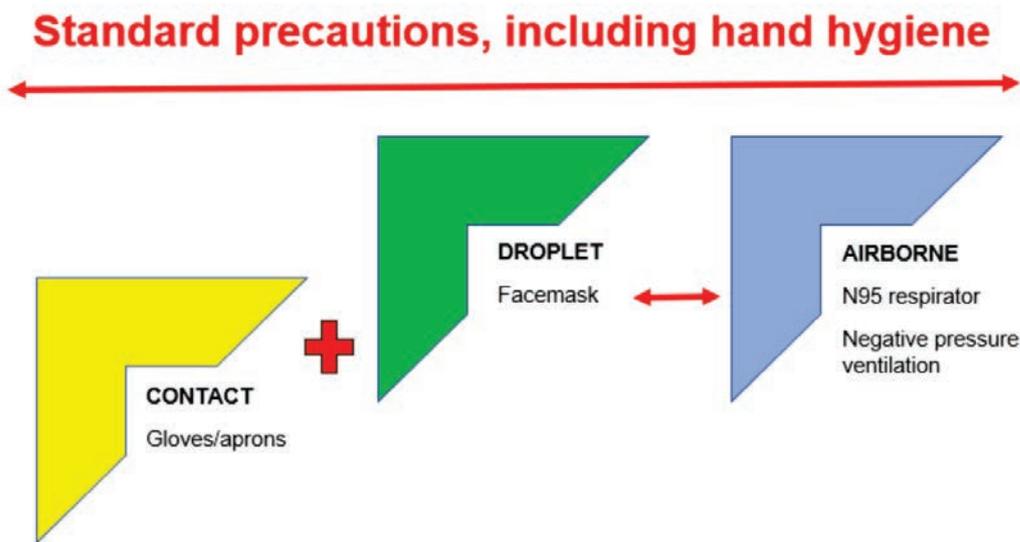
Transmission based precautions is based on risk assessment. **Figure 14** outlines the principles and additional precautions for transmission-based precautions. In summary:

- Contact precautions: protect hands and clothes.
- Airborne: remove airborne particles using negative pressure ventilation and respirators
- Droplet: protect mucous membranes from droplets and fluid exposure

Standard precautions and meticulous hand hygiene practices (following the 5 Moments of Hand Hygiene) will apply to ALL TYPES OF TRANSMISSION-BASED PRECAUTIONS.

¹¹⁷ CDC Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, 2007. <http://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf>

¹¹⁸ Nulens, E., 2018. International Society for Infectious Diseases. Guide to infection control in the hospital. https://www.isid.org/wp-content/uploads/2018/07/ISID_InfectionGuide_Chapter7.pdf

Figure 14: Essential additional IPC practices for Transmission-based precautions

Note: Standard precautions and meticulous hand hygiene applies to all.

A sign should be placed on the door of patient areas where transmission-based precautions must be applied, to remind staff of the precautions they need to apply. If the patient has to be nursed on an open ward, the sign should be placed at the head of the patient's bed. A sign should be placed outside the patient area where transmission-based precautions are in place to remind staff of the precautions they need to apply. All signs must be removed after the patient has been discharged and terminal cleaning has been completed.

3.2 Contact Precautions

Contact precautions must be applied when caring for patients with suspected or confirmed infections or colonisation with microbes transmitted by **direct or indirect contact**. Conditions and/or organisms which require contact precautions include the following:

- Antimicrobial-resistant bacteria transmitted by contact such as, but not limited to methicillin-resistance *Staphylococcus aureus* (MRSA), Vancomycin-resistant I, extended-spectrum (ESBL)- and carbapenem-resistant (CR)-Gram-negative bacteria (GNB), MDR- and XDR *Pseudomonas aeruginosa* and *Acinetobacter spp*, and drug-resistant *Candida spp* such as *C. auris*.
- Conditions: skin infections, diarrhoeal diseases.
- In addition, procedures such as wound dressing or where contact with faeces, urine, secretions or excretions is anticipated, necessitate contact precautions.

Always adhere to Standard precautions.

Specific guidelines for contact precautions are outlined in **Table 33**.

Table 33: Guidelines for contact precautions^{122, 123, 124, 125, 126}

Patient placement
<ul style="list-style-type: none"> • Place patient preferably in single room with en-suite facilities or cohort patients with the same micro-organisms/diseases. • If no isolation facility is available, initiate bed space isolation: place patient approximately two meters apart from next patient. • If dedicated toileting facilities are not possible, consider assigning a toilet or use a bed pan/commode. • Put up isolation sign: Contact precautions. • Place clean, unused PPE outside patient room/ isolation area. • Clinical notes should stay outside the patient room/zone. • Minimal stock to be placed in isolation rooms to prevent contamination and wastage. • Keep the door to the room closed
Hand hygiene
<ul style="list-style-type: none"> • Perform HH according to WHO's 5 Moments of Hand hygiene. • HH must be performed before donning and after removal of PPE.
Personal protective equipment
<p>Aprons: Worn to reduce contact exposure from the patient and patient environment:</p> <ul style="list-style-type: none"> • Do not leave the room (or patient zone) while wearing the apron • Discard into HCRW waste container in the isolation area after each use • Never re-use aprons <p>Gloves (keep a box of gloves inside the isolation room - discard box when patient is discharged)</p> <ul style="list-style-type: none"> • Don gloves before entering the isolation room • Apply a fresh pair of gloves after contact with the patient • Change gloves where applicable based on the indications to perform HH • Always perform HH before donning and after removal of gloves
Maintenance of a clean environment
<p>Concurrent cleaning:</p> <ul style="list-style-type: none"> • Wear appropriate PPE • Use dedicated cleaning equipment (yellow cloth and bucket) • Clean all surfaces daily with detergent and water and then disinfect using 70% alcohol or hypochlorite solution (1:1000 ppm) <p>Terminal cleaning:</p> <ul style="list-style-type: none"> • Remove bed linen and privacy/inter-bed curtains and place in yellow bag and send to the laundry • Clean all surfaces, including walls to hand height with soap and water and then disinfect using 70% alcohol or hypochlorite solution (1:1000 ppm) • Upon discharge clean and disinfect all equipment in either the room or in the sluice before taking it to the storage area.

¹²² CDC Guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings, 2007. Appendix A. http://www.cdc.gov/ncidod/dhqp/pdf/guidelines/Isolation2007_appendixA.pdf later version: http://www.cdc.gov/hicpac/2007IP/2007ip_appendA.html

¹²³ Preventing transmission of infectious agents in paediatric in-patients haematology-oncology settings: what is the role of non-pharmacological prophylaxis? <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3103128/>

¹²⁴ Mehtar, S. 2010. Understanding infection prevention and control. Juta and Company Ltd. Claremont

¹²⁵ Nulens, E., 2018. International Society for Infectious Diseases. Guide to infection control in the hospital. https://www.isid.org/wp-content/uploads/2018/07/ISID_InfectionGuide_Chapter7.pdf

¹²⁶ Munoz-Price, L.S., Banach, D.B., Bearman, G., Gould, J.M., Leekha, S., Morgan, D.J., Palmore, T.N., Rupp, M.E., Weber, D.J., Wiemken, T.L., Isolation Precaution for Visitors. July 2015. Vol 36 (7)

Maintenance of a clean environment

- Remove PPE and perform HH after completion of the task

Patient care equipment

- Dedicated equipment is preferred
- Ideally use disposable equipment (if possible), such as stethoscopes, blood pressure cuffs and thermometers. Should disposable equipment not be available then decontamination procedures in accordance with standard operating practices should be applied to the equipment used for infectious patients. The room should be cleaned thoroughly and disinfected daily. All linen, including bed curtains, should be removed for laundering after discharge
- Using equipment between patients poses a risk of transmission
- Any shared equipment is to be cleaned with disinfectant (e.g., disposable detergent disinfectant-impregnated wipes) after each use

Correct management of used linen

Treat all linen as contaminated and infectious:

- Place in yellow plastic bag inside room, seal and place in linen bag dedicated for contaminated/infected linen in the sluice
- Ensure prompt removal
- Double bag if a **leakage hazard** exists and ensure safe transportation
- Attach list of contents to outside of bag

Catering

- Ensure that catering staff wear adequate PPE when entering the isolation room. Meal orders, delivery and removal of trays must be performed by nursing personnel
- Crockery and cutlery:
- Wash in an automated dishwasher
- If manually cleaned wash in hot water (>55°C) and detergent and leave to air dry

Disposable crockery and cutlery are only indicated for specific conditions transmitted via saliva/secretions e.g., rabies, viral haemorrhagic fevers

Patient transport

Limit movement outside of room:

- Precautions should be maintained when patient leaves the room
- Inform receiving department in advance of the infectious status of the patient and maintain precautions
- Inform the theatre if the patient is scheduled for surgery
- Inform EMS when there is an interfacility transfer, as well as the receiving health facility

Visitors

Visitors should:

- Always announce themselves to the person in charge of the unit
- Be informed of the reason for isolation
- Adhere to the prescribed PPE
- Perform HH before entering and after leaving the room

Duration of isolation and transmission-based precautions

- Precautions to be maintained for the duration of stay or until there are confirmed negative specimens where applicable
- Decision to be made in collaboration with the IPC Practitioner/team and the clinical team

A “**Contact Precautions**” sign (**Figure 15**) should be placed on the door to remind staff of the precautions they need to apply.

Figure 15: Poster for contact precautions



3.3 Respiratory Precautions: Airborne Precautions

Airborne pathogens can be transmitted via aerosols and air currents, which are greatly reduced with good ventilation.

Diseases spread by airborne pathogens include:¹²⁷

- Measles
- Varicella (chickenpox)
- Pulmonary Tuberculosis (PTB), **including extra-pulmonary TB related to the respiratory tract (pleura, trachea, etc.)**

Patients with extra-pulmonary TB (e.g., TB bone) do not require isolation if PTB has been excluded.

Recently, studies show that the cloud exhaled from an infected person with SARS CoV 2 has varying sizes of aerosols, from large to small. Therefore SARS CoV 2 is considered an opportunist airborne pathogen¹²⁸.

Always adhere to Standard precautions.

Negative pressure air handling (ventilation) is required for isolating patients diagnosed or suspected of being infected with the above organisms and should provide no less than 6 air changes per hour (ACH). Ideally, a private negative pressure isolation room with en-suite ablution facilities should be utilised. In the absence of negative pressure ventilation and in out-patient settings or primary healthcare clinics, open the window and place a fan, facing

¹²⁷ Opportunistic aerosol transmission can occur during outbreaks of respiratory viruses such as SARS COV 2 where airborne transmission may occur where there is overcrowding, poor ventilation, and increased respiratory activity without face covers.

¹²⁸ National Department of Health, COVID-19 IPC Guidelines, V3; 2021

the open window to direct the airflow towards the open window and to reduce the microbial burden in the environment. This should achieve around 6-12 ACH. All health workers entering the room of a patient with suspected or confirmed tuberculosis should wear a fit-tested respirator or equivalent (see **page 44**). If TB patients are accommodated in an open ward due to lack of isolation facilities, the patient should always wear a surgical mask.

In addition to always adhering to SP there are specific guidelines that must be followed as set out in **Table 34**.

Table 34: Guidelines for airborne precautions^{129, 130, 131, 132, 133}

Patient placement
<ul style="list-style-type: none"> • Place patient in single room with en-suite bathroom • Patient must be accommodated in a room with negative pressure ventilation where available or in a room with open windows if possible • Always keep the door closed • Cohort patients with same diagnosis or micro-organism, but use single room for MDR/XDR-PTB cases • Put up isolation sign: Airborne precautions • Place clean, unused PPE outside patient room • Clinical notes should stay outside patient area
Hand hygiene
<ul style="list-style-type: none"> • Perform HH according to the 5 Moments of HH • HH must be performed before donning and after removal of PPE
Personal protective equipment
<ul style="list-style-type: none"> • All staff wearing respirators must have undergone a fit test to ensure that the correct size respirator is used to provide optimal protection • N95 respirators are to be donned before entering the patient room • Always perform a facial seal check after donning the respirator, prior to entering • Never share N95 respirators • The N95 respirator can be used for the duration of one shift or until damp, contaminated or deformed • Replace damp, soiled, contaminated or damaged respirators immediately • Remove respirator after exiting the patient room and either store individual respirators in a marked paper bag outside the isolation room or discard in health care risk waste container • Perform HH after removal • If a respirator does not fit properly, it is unsafe, even though it may provide a false sense of security • A respirator should not be worn by a patient whilst in isolation or during transportation outside the room. A surgical mask is adequate. • Limit visitors • respirators should not be worn by visitors. A surgical mask is adequate. • Wear gloves when in contact with the patient's secretions

¹²⁹ CDC Guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings, 2007. Appendix A. http://www.cdc.gov/ncidod/dhqp/pdf/guidelines/Isolation2007_appendixA.pdf later version: http://www.cdc.gov/hicpac/2007IP/2007ip_appendA.html

¹³⁰ Preventing transmission of infectious agents in paediatric in-patients haematology-oncology settings: what is the role of non-pharmacological prophylaxis? <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3103128/>

¹³¹ Mehtar, S. 2010. Understanding infection prevention and control. Juta and Company Ltd. Claremont

¹³² Nulens, E., 2018. International Society for Infectious Diseases. Guide to infection control in the hospital. https://www.isid.org/wp-content/uploads/2018/07/ISID_InfectionGuide_Chapter7.pdf

¹³³ Munoz-Price, L.S., Banach, D.B., Bearman, G., Gould, J.M., Leekha, S., Morgan, D.J., Palmore, T.N., Rupp, M.E., Weber, D.J., Wiemken, T.L., Isolation Precaution for Visitors. July 2015. Vol 36 (7)

Maintenance of a clean environment

Concurrent cleaning

- Wear appropriate PPE
- Use dedicated cleaning equipment (yellow cloth and bucket)
- Clean all surfaces daily with detergent and water and then disinfect using 70% alcohol or hypochlorite solution (1000 ppm)

Terminal cleaning

- Remove bed linen and privacy/inter-bed curtains and place in yellow bag and send to the laundry
- Clean and disinfect all specialised equipment which will not remain in the room prior to removal to the equipment storage area
- Clean all surfaces, including walls to hand height with detergent and water and then disinfect using 70% alcohol or hypochlorite solution (1:1000 ppm)
- Remove PPE and perform HH after completion of the task

Patient care equipment

- **Dedicated equipment is preferred**
- Using equipment between patients poses a risk of transmission
- Clean shared equipment (e.g., mobile vital signs monitor, thermometer, etc.) after patient use

Correct management of used linen

Treat all linen as contaminated and infectious

- Place in yellow plastic bag inside room, seal and place in linen bag dedicated for contaminated/infected linen in the sluice
- Ensure prompt removal
- Double bag if a **leakage hazard** exists and ensure safe transportation
- Attach list of contents to outside of bag

Catering

- Ensure that catering staff wear adequate PPE when entering the isolation room Meal orders, delivery and removal of trays must be performed by nursing personnel
- Crockery and cutlery:
 - Wash in an automated dishwasher
 - If manually cleaned wash in hot water (>55°C) and detergent and leave to air dry
- Disposable crockery and cutlery are only indicated for specific conditions transmitted via saliva/secretions e.g., rabies, viral haemorrhagic fevers

Patient transport

- Limit movement outside of room
- **Patient should wear surgical mask** when leaving the room for another department or share common patient areas such as shared bathrooms
- Provide a surgical mask for coughing patients when they are transported in ambulances
- Inform receiving department in advance of the infectious status of the patient and maintain precautions
- Inform the theatre if the patient is scheduled for surgery. Theatre staff must wear respirators.

Visitors

- Always announce themselves to the person in charge of the unit
- Inform visitors of the reason for isolation
- Restrict visitors. Preferably no children, immune-compromised visitors or those not previously exposed as a close contact of the patient
- Visitors should adhere to the prescribed PPE

Visitors

- Visitors to wear a surgical mask before entering (N95 respirators are not recommended for visitors unless they have had a fit test performed)
- Perform HH before and after leaving the room

Discontinue isolation precautions

- According to diagnosis, immune status and clinical improvement of the patient
- Incubation period of the disease
- A minimum isolation period of 2 weeks on effective treatment for sensitive PTB
- MDR and XDR-PTB must stay in isolation until transfer to a suitable facility as soon as possible or until two negative sputum specimens
- Decision made in collaboration with the IPC Practitioner/team and clinical team

Specimens

In addition to SP

- In the case of a patient with confirmed or suspected PTB, sputum should never be collected in a room shared with other patients or in a communal bathroom
- Always stand behind the patient while sputum is collected or if patient needs assistance
- Wear appropriate PPE
- Ensure that the ventilation is adequate in the area where sputum is collected

An “**Airborne Precautions**” sign (see **Figure 16**) should be placed on the door to remind staff of the precautions to be applied.

Figure 16: Poster for airborne precautions



3.4 Respiratory Precautions: Droplet Precautions

Large droplet nuclei do not remain suspended in the air for long periods and are only able to travel short distances. Transmission occurs when droplets containing microbes generated from an infected person are propelled a short distance before they fall due to gravity, landing on surfaces surrounding the patient, contaminating the environment and come in contact with another person’s conjunctivae or mucous membranes (eyes, nose or mouth). Microbes transmitted by the droplet route include influenza, SARS-CoV-2 and other respiratory viruses,

mumps, rubella, and *Neisseria meningitidis*, the cause of meningococcal meningitis. Some viruses and bacteria may survive outside the body in the presence of mucous, serum and organic matter.

Transmission from large droplets requires close contact (approximately 1 m) with the source, or through risk-prone procedures causing aerolisation and splashes.

Risk-prone procedures for droplet transmission in hospitals include:

- Coughing up or inducing sputum production for laboratory tests; collecting of throat swabs;
- Endotracheal suctioning (open and closed) of ventilated patients;
- Chest physiotherapy;
- Taking chest X-Rays from patients who are coughing, especially with poor cough etiquette;
- Bronchoscopy;
- Re-use of ventilator circuits and respiratory equipment;
- Washing and cleaning respiratory ventilation equipment in clinical areas without adequate knowledge or protection.

Always adhere to Standard precautions.

In addition to always adhering to SP, there are specific guidelines that must be followed as set out in **Table 35**.

Table 35: Guidelines for droplet precautions^{134, 135, 136, 137, 138}

Patient placement
<ul style="list-style-type: none"> • Place patient in single room with en-suite bathroom • Preferably keep door closed • Cohort patients with same diagnosis or micro-organism • If no isolation facility is available, place patient at least two meters apart from the next patient, ideally near an open window. • Put up isolation sign: Droplet precautions • Place clean, unused PPE outside patient room • Clinical notes should stay outside patient area
Hand hygiene
<ul style="list-style-type: none"> • Perform HH according to the 5 Moments of HH • HH must be performed before donning and after removal of PPE
Personal protective equipment
<ul style="list-style-type: none"> • Surgical mask is to be worn before entering the patient room • Surgical masks are single-use items and must be discarded in the HCRW container after removal, just before leaving the isolation area

¹³⁴ CDC Guideline for isolation precautions: Preventing transmission of infectious agents in healthcare settings, 2007. Appendix A. http://www.cdc.gov/ncidod/dhqp/pdf/guidelines/Isolation2007_appendixA.pdf later version: http://www.cdc.gov/hicpac/2007IP/2007ip_appendA.html

¹³⁵ Preventing transmission of infectious agents in paediatric in-patients haematology-oncology settings: what is the role of non-pharmacological prophylaxis? www.ncbi.nlm.nih.gov/pmc/articles/PMC3103128/

¹³⁶ Mehtar, S. 2010. Understanding infection prevention and control. Juta and Company Ltd. Claremont

¹³⁷ Nulens, E., 2018. International Society for Infectious Diseases. Guide to infection control in the hospital. https://www.isid.org/wp-content/uploads/2018/07/ISID_InfectionGuide_Chapter7.pdf

¹³⁸ Munoz-Price, L.S., Banach, D.B., Bearman, G., Gould, J.M., Leekha, S., Morgan, D.J., Palmore, T.N., Rupp, M.E., Weber, D.J., Wiemken, T.L., Isolation Precaution for Visitors. July 2015. Vol 36 (7)

Personal protective equipment

- Replace damp, soiled or contaminated masks immediately
- Perform HH after removal

Maintenance of a clean environment

Concurrent cleaning

- Wear appropriate PPE
- Use dedicated cleaning equipment (yellow cloth and bucket)
- Clean all surfaces daily with detergent and water and then disinfect using 70% alcohol or hypochlorite solution (1000 ppm)

Terminal cleaning

- Remove bed linen and privacy/inter-bed curtains and place in yellow bag and send to the laundry
- Upon discharge clean and disinfect all equipment in either the room, or in the sluice before taking it to the storage area.
- Clean all surfaces, including walls to hand height with soap and water and then disinfect using 70% alcohol or hypochlorite solution (1000 ppm)
- Remove PPE and perform HH after completion of the task

Patient care equipment

- Dedicated equipment is preferred
- Using equipment between patients poses a risk of transmission
- Clean shared equipment (e.g., mobile vital signs monitor, thermometer, etc.) after patient use

Correct management of used linen

Treat all linen as contaminated and infectious

- Place in yellow plastic bag inside room, seal and place in linen bag dedicated for contaminated/infected linen in the sluice
- Ensure prompt removal
- Double bag if a **leakage hazard** exists and ensure safe transportation
- Attach list of contents to outside of bag

Catering

- Ensure that catering staff wear adequate PPE when entering an isolation room
- Meal orders, delivery and removal of trays must be performed by nursing personnel
- Crockery and cutlery:
 - Wash in an automated dishwasher
 - If manually cleaned wash in hot water (>55°C) and detergent and leave to air dry

Disposable crockery and cutlery are only indicated for specific conditions transmitted via saliva/secretions e.g., rabies, viral haemorrhagic fevers

Patient transport

- Limit movement outside of room
- Patient should wear a surgical mask when leaving the room for another department
- Inform receiving department in advance of the infectious status of the patient and maintain precautions
- Inform the theatre if the patient is scheduled for surgery
- The patients must be last on the theatre list to ensure for adequate cleaning/disinfection and ventilation of the environment
- Theatre staff must wear respirators if patient has infections such as influenza, SARS or TB

Visitors

Visitors should:

- Always announce themselves to the person in charge of the unit
- Be informed of the reason for isolation
- Be restricted. Preferably no children, immune-compromised visitors or those not previously exposed as a close contact of the patient
- Adhere to the prescribed PPE
- Wear a **surgical mask** before entering
- Perform HH before and after leaving the room

Discontinue isolation precautions

- According to diagnosis and infectious period for the condition, immuno-competence and clinical improvement of patient
- Decision made in collaboration with the IPC practitioner/team and clinical team

A “**Droplet Precautions**” sign (see **Figure 17**) should be placed on the door to remind staff of the precautions they need to apply.

Figure 17: Poster for droplet precautions



Bear in mind that more than one type of transmission-based precaution may be required based on risk assessment and the type of pathogen and condition, such as during an outbreak. Advice from the IPC team is recommended.



CHAPTER 4

IPC AND BUILT ENVIRONMENT

4, CHAPTER 4:

IPC AND THE BUILT ENVIRONMENT

An appropriate environment, water, sanitation and hygiene (WASH)¹³⁹ services, materials and equipment for IPC are a core component of effective IPC programmes at healthcare facilities. Buildings must comply with the provisions of:

- the National Building Regulations, the Building Standards Act, 103 of 1977, as amended,
- regulations governing private hospitals and unattached operating, theatre units¹⁴⁰ (as applicable),
- Infrastructure unit support system (IUSS) health facility guide¹⁴¹
- National Norms and Standards for premises and acceptable Monitoring Standards for Environmental Health practitioners.¹⁴²
- applicable provincial legislation for governing the building requirements for private hospitals.

There should be a close working relationship between the IPC teams and the Engineers when dealing with the built environment.

4.1 Built environment

The built environment has a direct effect on the implementation of IPC practices and workflow. In most temperate climates, natural ventilation is preferred with mechanically controlled ventilation for specialised areas only, such as operating theatres, neonatal units, burns units and sterile preparation and decontamination areas.

4.2 The environment and layout

The air temperature, humidity and airflow in the healthcare setting should provide a comfortable environment for patients, staff and carers. Adequate airflow should be ensured to minimise the risk of transmission of airborne pathogens from infected patients and reduce risks to susceptible staff, patients and carers. The air flow can be either natural air flow or mechanical airflow. Natural ventilation is almost always more effective than mechanical ventilation. Natural ventilation can 17-40 air changes per hour, while well-functioning standard mechanical ventilation achieves around 12 air changes per hour.¹⁴³ There should be sufficient lighting, preferably natural lighting, during daylight working hours and artificial lighting during evening and night hours, to allow safe movement of staff, patients and carers, and normal undertaking of medical activities.

Buildings should be designed to be airy, light, and allow workflow activities to minimise the spread of contamination by the movement of patients, staff and carers, equipment, supplies and contaminated items, including healthcare waste removal, and to facilitate good IPC practices.

¹³⁹ Core questions and indicators for monitoring WASH in health care facilities in the Sustainable Development Goals. Geneva: World Health Organization and the United Nations Children's Fund (UNICEF), 2018.

¹⁴⁰ National Department of Health. Regulations Governing Private Hospitals and unattached operating, theatre units. No R158 of 1 February 1980

¹⁴¹ IUSS online. <https://www.iussonline.co.za/norms-standards/all-documents>

¹⁴² National Department of Health. National Environmental Health Norms and Standards for premises and acceptable Monitoring Standards for Environmental Health Practitioners, 24 December 2015. Government Gazette; 2015

¹⁴³ Reproductive Health & HIV Research Unit of the University of the Witwatersrand, South Africa. Implementing TB Infection Control in health facilities. February 2009

4.3 Patient clinical areas (wards, waiting areas, patient consulting rooms)

Healthcare settings should be built, furnished and equipped with materials that minimise infectious disease transmission and facilitate cleaning. The floors should be continuous and smooth with the floor covering extending up the wall to 2.5 cm to facilitate cleaning. Carpets are not recommended in patient areas because these are difficult to clean and harbour pathogens. The walls should be smooth and washable. Tiles are not recommended as these are difficult to clean and get easily damaged due to the high wear and tear of a busy health facility.

Layout

The layout of all patient clinical areas should minimise transmission of infectious pathogens. Sufficient space should be provided for people in wheelchairs, as well as to minimise infectious disease transmission. All surfaces must be made of material that is easy to clean and water resistant. There should be a staff workstation provided so that the clinical areas are not used for these purposes.

In hospitals the allocation of the number of beds should not be more than six to eight per room allowing for an unobstructed space of at least 1.2m² between beds to enable movement of carers and equipment.¹⁴⁴ In high care areas, this distance should be increased to 2.5 metres between beds to allow for movement of equipment and to carry out aseptic procedures comfortably.¹⁴⁵

In hospitals there should be at least two isolation/single rooms with en-suite ablution facilities per 24 beds. Hospitals that have designated infectious disease units or a high infectious diseases profile in the community (such as high TB or diarrhoea), should increase the number of isolation beds to three or four per 24 beds.

Handwash basins

In hospitals should be placed **outside** the patient zone to avoid splashing and spread of pathogens. Handwash basins should be located nearest to the door. Ideally, the ratio of basins to beds is 1:10, however in isolation rooms there should be one basin outside the entrance of the room. ABHR should be placed at the entrance of a clinical area and at the point of care.¹⁴⁶

All consultation rooms should have a handwash basin per room.

For IPC purposes, functional handwash basins should be fitted with non-touch or elbow taps and provide a supply of clean running water. Handwash basins should have a back splash made of impervious material that is easy to wash. Each handwash basin must have a wall mounted soap dispenser and single use paper towel dispenser.

Furnishings

There must be adequate clean surfaces around the patient's bed to allow carrying out aseptic procedures easily and to reduce contact with nonsterile areas (procedure trolleys are preferred). All furniture must be covered in material that can be easily cleaned and if necessary, disinfected. Chairs covered in impervious material should be provided for the patients and visitors to sit on. Visitors should not sit on beds. There should be a bedside table

¹⁴⁴ National Department of Health. National Environmental Health Norms and Standards for premises and acceptable Monitoring Standards for Environmental Health Practitioners, 24 December 2015. Government Gazette; 2015

¹⁴⁵ Guidelines on Core Components of infection prevention and control at the national and acute healthcare facility level. WHO 2016. Available from <https://www.who.int/infection-prevention/publications/core-components/en/>

¹⁴⁶ Hopman et al. Reduced rate of intensive care unit acquired gram-negative bacilli after removal of sinks and introduction of 'water-free' patient care. *Antimicrobial Resistance and Infection Control* (2017) 6:59DOI 10.1186/s13756-017-0213-0

and a separate overbed table used for clinical purposes. Ensure mattresses and pillows are covered with intact impervious chemical resistant covers for easy cleaning. Interbed (privacy) curtains should be washable and should preferably be changed with each patient discharge as part of the linen change.

Procedure trolleys

Procedure trolleys should have impervious and chemical resistant surfaces. It is preferable that all procedures are carried out using a procedure trolley that has been thoroughly cleaned and is dry. The trolley should be prepared in a clean area. Procedures should not be carried out using the patient's bed as a "sterile" work surface. However, in confined spaces, the overbed table maybe the only available surface and if used, must be cleared of clutter, wiped over with alcohol and allowed to dry before opening a sterile pack.

4.4 Support Areas

Staff rest areas and meeting rooms:

It is important to ensure the well-being of staff as well as preserving valuable clinical space from being used for such purposes.

Storage facilities

There must be provision made for linen, surgical consumables and equipment which is not in frequent use. This will require extra storage space which is easily accessible.

Sluice

There must be a separate sluice area for disposing of patient bodily fluids, urine and faeces. This is a high-risk area for transmission of MDROs (particularly gram-negative bacteria from the patient's faeces and biofilm in the drains). **It is highly recommended that bedpans, urinals and patient wash bowls are heat disinfected after each use to reduce transmission of MDROs.**

Utility room/SSD

Medical devices should not be cleaned in the ward or patient area. It is preferable that all reusable medical devices are sent to SSD or Decontamination Unit for cleaning. However, if there is no alternative, cleaning should take place in a separate designated, closed, well ventilated area, which should be fully equipped to fulfil the necessary requirements, including a deep sink, running water, detergent (as per the manufacturer's recommendations), cleaning brushes, and a drying area for the medical devices after cleaning. The staff must wear appropriate PPE. Used linen should be stored in the utility room in a designated used linen trolley for removal to the laundry area or for collection by external laundry services.

Healthcare waste

Healthcare waste in the clinical areas should be stored separately and not in the sluice area. Refer to section on healthcare waste management for the requirement of storage area for healthcare waste.

Treatment room

A separate clean area for the preparation and storage of medicines, sterile equipment and sterile fluids, and procedure trolleys should be provided. The areas must be airy, clean and dry and must have storage facilities for sterile equipment and surgical packs.

4.5 Water

The “*WHO standards for drinking water quality, sanitation and environmental health in health facilities*”¹⁴⁷ should be implemented. International guidelines on sanitation (ISO/FDIS 30500: 2018) should be followed when planning and executing water, sanitation and hygiene delivery. Quality monitoring of drinking water should be done by Environmental health practitioners.

Microbiological, chemical and physical quality of drinking water supplies water must conform to the South African National Standards 241 for all domestic use. A water quality monitoring programme must be developed. All water supply, including borehole and tankers, must be protected from contamination. The temporary storage capacity should be sufficient for 2 days.

Where borehole water is being used in a health facility, at least 15 m horizontal distance and 1.5 m vertical distance between permeable faecal sludge containers and drinking-water sources is suggested.¹⁴⁸ Faecal sludge should not be discharged into an open drain, water body or open ground.

4.6 Sanitation

There must be adequate functioning toilet facilities which cater for staff and patients separately. Patient toilets should be available for both genders and there must be provision for menstrual hygiene in female toilets. WHO recommends one toilet per 20 users for inpatient settings; at least four toilets per outpatient setting (two for staff, and two for patients: one toilet for females, one toilet for males).¹⁴⁹

More recently, the minimum number of toilets required to meet the criteria for a basic sanitation service is one toilet dedicated for staff and one gender-neutral toilet for patients that has menstrual hygiene facilities and is accessible for people with limited mobility.¹⁵⁰

The number of toilets (sanitary fittings) for primary health facilities is determined using SANS 10400-NBR based on the male and female population served.

Adequate toilet and ablution facilities should be provided at a hospital that meets the needs of patients, staff and visitors.¹⁵¹

- At least one functioning toilet and one handwash basin for not more than 20 in-patients,
- At least one functioning toilet and one handwash basin for not more than every 50 visitors.
- Separate toilet and hand washing facilities must be provided for staff members.
- At least one bath or shower for every 12 to 15 patients.
- Staff required to sleep on the premises must be provided adequate wash up facilities, including a shower/bath.
- A drainage system must be in place and approved measures are utilized for the removal of wastewater.

¹⁴⁷ Guidelines on Core Components of infection prevention and control at the national and acute healthcare facility level. WHO 2016. Available from <https://www.who.int/infection-prevention/publications/core-components/en/>

¹⁴⁸ Guidelines on Core Components of infection prevention and control at the national and acute healthcare facility level. WHO 2016. Available from <https://www.who.int/infection-prevention/publications/core-components/en/>

¹⁴⁹ Essential environmental health standards in health care. Edited by John Adams, Jamie Bartram, Yves Chartier ISBN 978 92 4 154723 9

¹⁵⁰ Core questions and indicators for monitoring WASH in health care facilities in the Sustainable Development Goals. Geneva: World Health Organization and the United Nations Children’s Fund (UNICEF), 2018.

¹⁵¹ National Department of Health. National Environmental Health Norms and Standards for premises and acceptable Monitoring Standards for Environmental Health Practitioners, 24 December 2015. Government Gazette; 2015

- An adequate supply of toilet paper, liquid soap and/or alcohol-based hand rub must be available in the facility.

4.7 Operating theatre

It is beyond the scope of this document to give a detailed account of specialised areas such as the operating theatre and intensive care units. The narrative below summarises the essential areas from an IPC perspective

Areas in the Operating Theatre

The surgical suite is usually divided into two designated areas: **semi-restricted and restricted**, defined by the physical activities performed in each area.

The **semi-restricted** area includes the peripheral support areas of the surgical suite, including storage areas for clean and sterile supplies, sterile processing rooms, scrub stations, and corridors leading to restricted areas. The semi-restricted area is limited to authorized personnel and to the patient. Surgical attire as well as headgear is recommended in this area.

The **restricted** area is primarily intended to support a high level of asepsis control. In the restricted area, which includes the preparation or layup room, operating rooms and clean core - surgical attire, head covering, and masks are required where open sterile supplies or scrubbed persons are present.

Operating rooms should be equipped with **positive pressure systems** to ensure that air travels from the operating room to adjacent areas, thus minimizing inflow of air to the operating room. This positive pressure system is challenged every time a door is opened.

Ventilation

The spread of microbes is regulated by well balanced mechanical ventilation systems which are designed to keep the operated site, or wound, safe from external contamination. The operating theatre is under positive pressure and is supplied at a minimum of 24 air changes/hour (ACH) with filtered fresh air being delivered into the operating suite. The air is removed mechanically or via leakages around the doors and windows. The temperature of operating rooms should be kept between 20°C - 24°C, with humidity of 30% to 60%.¹⁵²

Cleaning in the Operating Theatre

The inanimate theatre environment should make a negligible contribution to the incidence of SSIs. Cleaning and disinfection of the operating theatre should follow a precise schedule: for example, floors should be cleaned once a day, and at the end of each session. Horizontal surfaces and all surgical items (e.g., tables, buckets) should be cleaned between procedures. Specific blood or body fluid spillages should be dealt with immediately. Walls and ceilings are rarely heavily contaminated; therefore, cleaning them twice a year is reasonable.

For hospitals with limited resources, less expensive strategies to keep air in the operating room as clean as possible might include:

- Keep personnel to a minimum in the OR during a procedure.
- Limit idle conversations as this creates dispersion of bacteria.
- Keep doors closed, and

¹⁵² Clinical Issues. June 2009; Vol 89:6 https://www.clinicalkey.com/service/content/pdf/watermarked/1-s2.0-S0001209209003366.pdf?locale=en_US&searchIndex=. South African Society of Anesthesiologists. 2013 Practice Guidelines. S Afr J Anaest Analg 2013;19(1):S1-42

- Keep entries into the operating room to a minimum during a procedure, as the opening/closing of doors can generate significant air currents and increase the probability of bacteria being deposited in the surgical site.^{153, 154}

Microbiological commissioning and monitoring of operating theatre suites

Commissioning must occur before an operating theatre is **first used and after any substantial modifications** that may affect airflow patterns in pre-existing theatres (as part of a re-commissioning process). It is important that the IPC team is involved at all stages from pre-design through to opening and that adequate time for commissioning is built into the schedule, including an allowance of time for microbiological assessments (particle count and microbiological contamination).

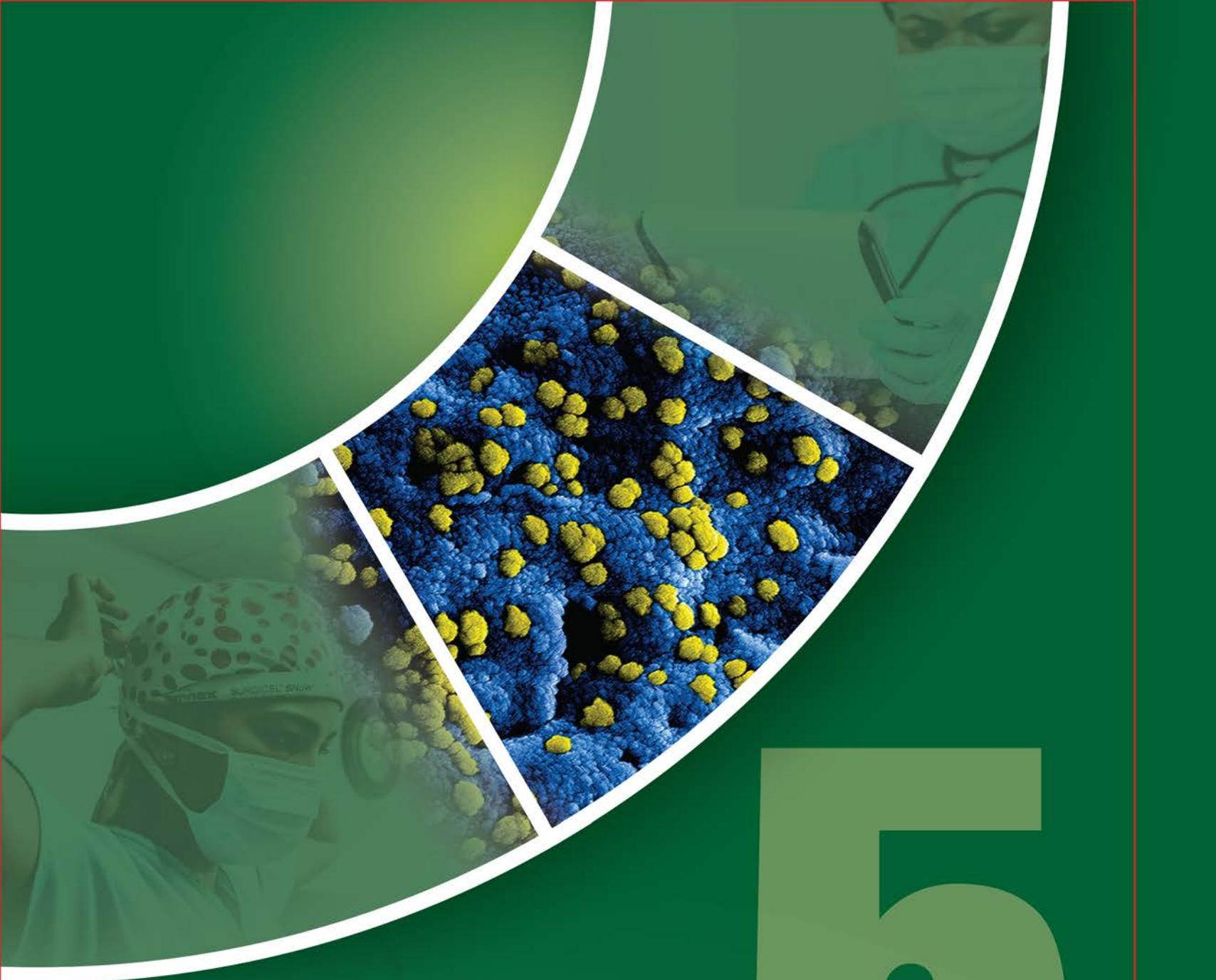
Contractual conditions should allow commissioning before handover of the theatre or allow for delayed acceptance after handover such that faults can be rectified.

- The **theatre interior** should be checked for obvious defects
- The air **distribution** within the theatre and between rooms in the theatre suite should be checked by smoke tracing
- The **air handling unit** supplying the theatre should be properly constructed, finished and functioning
- The **air change rates** in theatre and preparation room should be satisfactory (>20 ACH)
- **Airborne microbial contamination** in an empty theatre should be satisfactory
- Particle counts using a bio sampler should be done after filters have been changed

Routine culturing of the operating room environment is unnecessary because inanimate objects and surfaces are seldom the cause of SSIs.

¹⁵³ Pokrywka M, Byers K. Medscape: John Hopkins Medicine. Traffic in the operating room: a review of factors influencing air flow and surgical wound contamination. November 2015.

¹⁵⁴ Stauning MT, Bediako-Bowan A, Andersen LP, Opitam JA et al. Journal of Hospital Infections. Traffic flow and microbial air contamination in operating rooms a major teaching hospital in Ghana. Vol 99, p267-270.2008.



CHAPTER

SURVEILLANCE OF HEALTHCARE- ASSOCIATED INFECTIONS

5. CHAPTER 5:

SURVEILLANCE OF HEALTHCARE-ASSOCIATED INFECTIONS

Surveillance (of HAI) is the systematic collection, analysis, and interpretation of data on the frequency of disease. It is essential to the planning, implementation, and evaluation of public health practices and the timely dissemination of the data for public health action (prevention and control). A key step to mitigate AMR is to prevent HAIs from occurring. Successful implementation of infection prevention in health facilities can reduce HAIs.¹⁵⁵

HAIs are the most common harmful patient safety incident related to hospitalisation and have a major impact on morbidity, mortality and health care costs. The most common HAIs in low- and middle-income countries (LMICs) were reported to be surgical site infections (SSI) (29%), followed by urinary tract infections (UTI) (24%), bloodstream infections (BSI) (19%) and hospital-acquired pneumonia (HAP) (15%).^{156, 157}

The most common pathogens causing HAI are ESKAPE (*E. faecium*, *S. aureus*, *K. pneumoniae*, *A. baumannii*, *P. aeruginosa* and *Enterobacter spp*) and CCC (*carbapenemase-producing Enterobacteriaceae*, *C. difficile*, and *Candida species*) pathogens. The National Institute for Communicable Diseases' (NICD) AMR report only covers ESKAPE from blood with drug combinations in line with international requirements GLASS for the public and private sector. This is a sub-set of the HAIs that occur in health facilities. For ongoing HAI surveillance in health facilities, point prevalence studies should be conducted initially to establish a baseline. To prevent and reduce HAI, health facilities must provide clear guidance and training for the placement of invasive devices to reduce the risk of HAIs.

5.1 Classification of HAIs

Infections can be classified as probable infections based on clinical signs and symptoms alone. Or they are considered as confirmed infections if there is laboratory confirmation of diagnosis.

5.1.1 Classification of HAI

The following must be present

Requirements for classification of HAI

- It becomes clinically evident 48 hours after admission to the facility (on or after the third day of admission to the health facility where the day of admission is Day 1).

To establish the origin of HAIs, ensure that the following are recorded in the patient's record:

- ✓ Appropriate history of the patient's previous HAI.
- ✓ Information on inter-facility transfer.
- ✓ The patient's admission date on the laboratory request form.

¹⁵⁵ National Department of Health. Guidelines for the Prevention and Containment of Antimicrobial Resistance in South African Hospitals. Pretoria. November 2018

¹⁵⁶ Allegranzi B, Nejad SB, Combescure C, Graafmans W, Attar H, Donaldson L, et al. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *The Lancet*. 2011;377(9761):228-41.

¹⁵⁷ World Health Organization. Report on the burden of endemic health care-associated infection worldwide. Geneva; 2011.

- No evidence that an infection was present or incubating at the time of admission to the acute care setting or during the first two days after admission.
 - Related to an intervention or procedure during admission.
 - Includes infections acquired in the hospital, but appearing within 48 hours after discharge
- Within thirty (30) to ninety (90) days after surgery, depending on the type of surgery.

Device-associated infections

If there is, or has been an invasive device such as an endotracheal tube, central line or an indwelling urinary catheter inserted, then these are classified as healthcare-associated if:

- The device was in place for more than two calendar days prior to the infection
- An HAI occurring on the day of discontinuation of the device or the following calendar day is considered a device-associated infection if the device had already been in place for more than two calendar days.

When classifying HAI

- Repeat infection timeframe (RIT) is a **14-day period** during which no new infections of the same type are reported, excluding surgical site infections. Additional pathogens cultured during the RIT for the same infection type are added to the event and regarded as one infective episode;
- Infections occurring in newborn babies on the first two days after birth are not usually considered an HAI unless it is a known HAI pathogen such as *A baumannii*, *K pneumoniae*, or methicillin resistant *Staphylococcus aureus* (MRSA).
- Preoperative classification of surgical wounds according to United States Centers for Disease Control and Prevention (CDC) wound classification should be done as this will help gauge the risk of SSI.

Reactivation or transplacental transmission of viruses or bacteria is not considered to be a HAI.

5.1.2 Types of HAIs

- Primary blood stream infections (BSI),
- Central line-associated bloodstream infections (CLABSI),
- Peripheral line-associated bloodstream infections (PLABSI),
- Catheter-associated urinary tract infections (CAUTI),
- Surgical site infections (SSI), and
- Ventilator-associated pneumonias (VAP)¹⁵⁸

5.1.3 Standardised case definitions for HAIs

Definitions of HAIs are adapted from the CDC and Institute for Healthcare Improvement. This manual follows the CDC definitions as reference to classify infections as HAI or community acquired.¹⁵⁹ See **Table 36**.

¹⁵⁸ Centre for Disease Control and Prevention [Internet]. Available from <https://www.cdc.gov/hai/infectiontypes.html>

¹⁵⁹ CDC [Internet]. https://www.cdc.gov/nhsn/pdfs/pscmanula/pscmanual_current.pdf

Table 36: Standardised case definitions for HAIs**Primary bloodstream infections**

BSI case definition: The BSI is **NOT** related to an infection at another site and it meets one of the following criteria:

Criterion 1: Recognised pathogen cultured from at least one blood culture, unrelated to infection at another site.

OR

Criterion 2: At least one of: fever (>38°C core), chills, hypotension;
If aged < 1 year: fever (>38°C core), hypothermia (<36°C core), apnoea, or bradycardia **AND** common skin contaminant cultured from > 2 blood cultures drawn on separate occasions (within 48 hours of each other), or at different sites, unrelated to infection at another site.

Central line-associated bloodstream infections

Central line: an intravascular catheter that terminates at or close to the heart or in one of the great vessels (aorta, pulmonary artery, superior & inferior vena cava, brachiocephalic veins, internal jugular veins, subclavian veins, external iliac veins and common iliac or femoral veins; in neonates: umbilical artery or vein). Must be a lumened device which is used for infusion, withdrawal of blood or hemodynamic monitoring. May be temporary or permanent (e.g., dialysis tunnelled or implanted catheters, including ports)¹⁶⁰

CLABSI is a laboratory-confirmed bloodstream infection where a central line or umbilical catheter was in place for more than two days prior to the development of signs and symptoms of infection.

AND

A central line or umbilical line was in place on the date of the event (when infections were diagnosed or identified) or the day before.

If a central line or an umbilical line was in place for more than two days and then removed, the classification of such infection must refer to the day of removal of the line or the next day.

Peripheral line-associated bloodstream infections

A peripheral line was in place on the date of the event or the day before.

Patient has at least 1 of the following signs or symptoms: fever (>38°C), pain, erythema, or heat at the involved vascular site.

Patient has purulent drainage at involved vascular site

Report infections of an intravascular cannulation site without organisms cultured from blood as **Phlebitis**.

Report intravascular infections with organisms cultured from the blood as **PLABSI**.

Catheter-associated urinary tract infections

Indwelling catheter: A drainage tube that is inserted into the urinary bladder through the urethra **AND** is left in place **AND** is connected to a closed drainage system (*straight in-and-out catheters, condom catheters and supra-pubic catheters are not included in the definition.*)

CAUTI is an infection where an indwelling urinary catheter was in place for more than two days prior to the first signs and symptoms of infection **OR** should signs and symptoms of infections not be present, there is a positive urine culture of more than 100,000 CFU/ml with no more than two species of urine pathogens.

OR

An indwelling catheter was in place for more than two days and then removed.
Clinical signs and symptoms of infection are present on the day of removal of the catheter or from the next day in order to the infection to be classified as a CAUTI

¹⁶⁰ Institute for Healthcare Improvement, accessible at www.ihl.org

Surgical site infections

Surgical site infection is defined as an infection that occurs within 30 to 90 days after the operation and involves the skin and subcutaneous tissue of the incision (*superficial incisional*) and/or the deep soft tissue (for example, fascia, muscle) of the incision (*deep incisional*) and/or any part of the anatomy (for example, organs and spaces) other than the incision that was opened or manipulated during an operation (*organ/space*).¹⁶¹

NOTE: where decontamination of medical devices and operating theatre facilities are suboptimal, **surgery associated infections** should be considered.

There are 3 categories of SSIs:

Superficial Incisional Infection – involves only skin and subcutaneous tissue of incision. Patient has at least 1 of the following:

- a. Purulent drainage from superficial incision.
- b. Microbes isolated from aseptically obtained culture of fluid or tissue from superficial incision;
- c. Superficial incision that spontaneously dehisced or was deliberately opened by a surgeon and is culture-positive or not cultured (a culture-negative finding does not meet the criterion for a SSI) **AND** Patient has at least 1 of the following sign and symptoms: Pain/tenderness, localized swelling, redness or heat.
- d. Diagnosis of SSI by surgeon or attending doctor.

Deep Incisional Infection - involves deep soft tissues of the incision (i.e., fascial and muscle layers) Patient has at least 1 of the following:

- a. Purulent drainage from deep incision.
- b. Deep incision that spontaneously dehisces or deliberately opened by surgeon & is culture positive or not cultured. (A culture negative finding does not meet criterion.) **AND** patient has at least 1 of the following signs and symptoms: - fever (>38°C) - localized pain or tenderness
- c. Abscess or other evidence of infection involving deep incision found on direct exam, during invasive procedure, or by histopathologic exam or imaging test.
- d. Diagnosis of SSI by surgeon or attending doctor.

Organ/Space Surgical Site Infection - involves any part of the body excluding the skin incision, fascia or muscle layers that is opened or manipulated during the operative procedure. Patient has at least 1 of the following:

- a. Purulent drainage from drain that is placed into the organ/space.
- b. Organism isolated from an aseptically obtained culture of fluid or tissue in the organ/space.

Ventilator-associated pneumonia (VAP)

Ventilator: a device to assist or control ventilation continuously through an endotracheal tube or tracheostomy (hence occurs in critical care/high care units).

Lung expansion devices like intermittent positive pressure breathing (IPPB) or nasal positive end-expiratory pressure (PEEP) or continuous nasal positive airway pressure (CPAP) are NOT considered ventilators unless delivered via an endotracheal tube or tracheostomy.

VAP is a condition identified when the patient is on mechanical ventilation, delivered via and endotracheal tube or for more than two days (if the patient is admitted or transferred into the nursing unit, already intubated and ventilated, the day of admission is considered as day one).

AND

The diagnosis of VAP is based on a combination of clinical, radiological and microbiological criteria.

¹⁶¹ European Centre for Disease Prevention and control

Ventilator-associated pneumonia (VAP)

Radiological: Chest X-Ray with diffuse/patchy infiltrates or localised infiltrate. One X-ray if no underlying cardiac or pulmonary disease otherwise 2 X CXR.

Pulmonary: Onset of purulent sputum, worsening gas exchange, cough or dyspnoea or tachypnoea.

Systemic: Fever of > 38°C with no other known cause.

Microbiology: Pus cells: moderate to many; Organisms moderate to many (and consistent with gram stain).

5.2 How to calculate HAI rates

If you do surveillance of HAI in their healthcare facilities the following standardised methods for calculating HAI from various sites should be used. (Table 37)

Table 37: How to calculate HAI rates

Central line-associated bloodstream infection (CLABSI) rate

CLABSI rates are calculated by dividing the total number of CLABSI by the total number of central line days.

This number must be multiplied by 1000 to get a rate per 1000 central line days.

Number of CLABSI infections x 1000
Total number of central line days = rate of CLABSI infection/1000 central line days

Counting central line days:

Central line days are counted from the day of insertion of the device (day one) until the date of removal. Every day that the device is in situ needs to be counted to identify the total number of device days.

Only one central line per patient is counted per calendar day regardless of the number of central lines present (e.g., a CVP line and a dialysis catheter in situ).

All central lines on inpatient units should be included in device day counts regardless of whether they are being accessed (e.g., being utilised for an infusion or hemodynamic monitoring).¹⁶²

If a central line is removed and re-inserted on the same day, the central line day count should be continued. If more than one calendar day passes before a new central line is inserted, the count should start from one again.

Peripheral line-associated bloodstream infection (PLABSI) rate

Rate calculated by the number of peripheral lines inserted over a period of time, such as one month, divided by the number of peripheral sites recorded as infected x 100.

The result is expressed as a percentage.

Number of PLABSI infections x 100
Total number of peripheral lines inserted = infection rate as a percentage

¹⁶² https://www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf

Catheter-associated urinary tract infection (CAUTI) rate

CAUTI rates are calculated by dividing the total number of CAUTIs by the total number of catheter days. This number must be multiplied by 1000 to get a rate per 1000 catheter days.

$$\frac{\text{No of CAUTI infections}}{\text{Total number of catheter days}} \times 1000 = \text{rate of CAUTI infection/ 1000 catheter days}$$

Counting catheter days

Catheter days are counted from the day of insertion of the device (day one) until the date of removal. Every day that the device is in situ needs to be counted to identify the total number of device days.

If a catheter is removed and re-inserted on the same day, the catheter day count should be continued. If more than one calendar day passes (i.e., the next day) before a new catheter is inserted, the count should start again from one.

Surgical site infection rate

SSI rates are calculated by dividing the total number of SSIs by the total number of operative procedures (or by category of operation).

This number must be multiplied by 100 to get a rate per 100 operative procedures.

$$\frac{\text{No of SSI infections}}{\text{Total number of operative procedures}} \times 100 = \text{rate of SSI infection/ 100 operative procedures}$$

Ventilator-associated pneumonia (VAP)

VAP rates are calculated by dividing the total number of VAP cases by the total number of ventilator days. This number must be multiplied by 1000 to get a rate per 1000 ventilator days.

$$\frac{\text{No of VAP cases}}{\text{Total number of ventilator days}} \times 1000 = \text{rate of CAUTI infection/ 1000 ventilator day}$$

Ventilator days are counted from the day of insertion of the device (day one) until the date of removal. Every day that the device is in situ needs to be counted to identify the total number of device days.

5.2.1 Definitions used in HAI calculations

Rate is an expression of the frequency with which an event (e.g., an infection) occurs in a defined population over a given time period. Rate always includes time as a part of its expression.

A **constant** is used to put the result into a uniform quantity so comparisons between rates can be made. The constant is selected based on how frequently the event occurs; generally, it is globally agreed upon. For example, SSI or peripheral IV infection is expressed as percentages (per 100), CAUTI is expressed as number of urinary tract infection per 1,000 catheter-days, and hand hygiene compliance as percentage of hand hygiene opportunities. To summarise, there are three important things to remember when calculating a rate:

- The numerator and denominator must reflect the same population—cases that are in the numerator must also be counted in the denominator.
- All cases in the denominator are eligible to be considered for the numerator.

- Counts in the numerator and denominator must cover the same time period (APIC 2014b).

These rates can be used as indicators of monitoring HAIs. Bundle compliance rates can be calculated based on the patients receiving all components of the bundle/ total patients with a device in situ or had surgery on the day of the sample x 1000. For SSI rates, various categories of surgery can also be calculated using a particular type of surgery as a denominator.

5.3 Infection control bundles of care for the prevention of HAIs

A bundle is a structured way of improving the processes of care and patient outcomes. They consist of a small, straightforward set of evidence-based practices — generally three to five — that, when performed collectively and reliably, have been proven to improve patient safety and prevent the development of HAIs. The following descriptions of infection control bundles are sourced from The Best Care...*Always!* Campaign.¹⁶³



Remember: Principles of asepsis such as hand hygiene, appropriate PPE, and setting up and maintaining a clean/sterile field are essential for all aseptic procedures and when applying bundles.

5.3.1 Principles for implementing infection control bundles

All elements of the bundle must be executed together for maximum effectiveness.

- Compliance to the bundles is important to ensure the desired outcomes.
- Checklists are used to prompt or record the elements of care rendered.
- A bundle checklist guides the person performing the task and serve as a reminder of the essential steps required to prevent infection.
- Bundle compliance must be assessed and measured on a regular basis.
- Barriers to non-compliant elements must be resolved/addressed in order to reduce infections and improve patient outcomes.
- Both process and outcomes measures must be monitored.

Prevent central-line associated bloodstream infections (CLABSI)

Ninety percent of catheter-related blood stream infections occur with central venous catheters (CVCs). CLABSI prolongs hospitalisation by a mean of seven days. CLABSI mortality (controlled for underlying severity) is between 4% and 20%. The odds ratio for developing CLABSI is 2.2 – 6.6 times greater without maximum barrier precautions and aseptic procedures.

Intervention:

There are 5 key elements contained in the CLABSI Bundle:

- Hand hygiene
- Set up a sterile field, wearing sterile gloves and gown; face mask;

¹⁶³ Based on The Best Care...*Always!* Bundles, available from www.bestcare.org.za

- Chlorhexidine skin antiseptics of the insertion site;
- Optimal catheter insertion site selected after weighing infection risk* and possible complications;
- Daily review of necessity for line, prompt removal of unnecessary central lines.

*The subclavian route has the lowest risk of infection; the femoral site the highest (especially in obese adult patients)

Other evidence-based elements of care are not excluded and may be added to the Central Line Bundle by individual facilities, for example:

- The type of CV catheter - triple lumen, use of three way taps etc.;
- How the line is secured;
- Dressing is clean and intact.

Prevent catheter-associated urinary tract infections (CAUTI)

Urinary tract infections account for approximately 40% of all HAIs annually, and 80% of these can be attributed to indwelling catheters. Duration of catheterisation is directly related to risk of developing a urinary tract infection. Although CAUTIs are not usually life-threatening, a complication of a CAUTI (e.g., urethritis, urethral strictures, haematuria, bladder obstruction, and sepsis secondary to the UTI) does cause suffering and can increase a patient's length of stay and costs. Application of accepted evidence-based prevention guidelines has led to considerable reductions in CAUTI rates.

Intervention:

There are 4 key elements contained in the CAUTI Bundle ("Bladder Bundle"):

- Avoid unnecessary urinary catheters.
- Insert urinary catheters using aseptic technique and maintain a closed system of drainage.¹⁶⁴
- Maintain urinary catheters based on recommended guidelines.
- Review urinary catheter necessity daily and remove promptly.

The bundle elements are not exclusive and other scientifically proven elements of available evidence-based guidelines can be added by each individual health facility.

Prevent surgical site infections (SSI)¹⁶⁵

A one-day point prevalence survey was conducted at a tertiary hospital in Northern Cape, South Africa in 2016. The study included all patients who were admitted to 15 selected wards at the hospital. The Standardised Centers for Disease Control and National Nosocomial Infection Surveillance Systems criteria were used. A total of 326 patients were surveyed and the overall HAI prevalence rate was 7.67%, with SSIs predominant at 4.60%. This rate was comparable to studies done in other countries and shows a similar trend with predominance of SSI.¹⁶⁶

Intervention:

There are 4 key components to the SSI Bundle:

¹⁶⁴ World Health Organization. How to insert an indwelling catheter. Available from: <https://www.youtube.com/watch?v=7a4aNFJoZdQ&feature=youtu.be>

¹⁶⁵ World Health Organization. Global Guidelines for the Prevention of Surgical Site Infection. Geneva. 2017

¹⁶⁶ Nair, WJ Steinberg, T Habib, H Saeed & J E Raubenheimer. Prevalence of healthcare-associated infection at a tertiary hospital in the Northern Cape Province, South Africa ORCID Icon ORCID Icon Pages 162-167 | Received 19 Mar 2018, Accepted 06 Jun 2018, Published online: 26 Jul 2018

1. Appropriate use of prophylactic antibiotics (including appropriate selection, timing and duration/ discontinuation).
2. Appropriate hair removal: Avoid shaving; where depilation is necessary, use a clipper or depilatory cream.
3. Maintain post-operative glucose control (*for major cardiac surgery patients cared for in ICU).
4. Peri-operative normothermia (** for all colorectal or open abdominal surgery patients).

**Glucose control: Review of evidence shows that the degree of hyperglycaemia in the postoperative period correlates with the rate of SSI in patients undergoing major cardiac surgery. Although glucose control may benefit other surgical populations, for the BCA Campaign, this measure only applied to the cardiac surgery population for the purposes of national measurement.*

***Normothermia: Evidence suggests that patients have a decreased risk of surgical site infection if they are not allowed to become hypothermic during the perioperative period. Although temperature control may benefit other surgical populations, for the BCA Campaign, this measure only applied to the colorectal or open abdominal surgical population for the purpose of measuring compliance.*

Additional evidence-based components of good quality surgical care may be added by each individual health facility. Compliance with the SSI bundle has been most successful when all elements are executed together. Detailed tools are available to support the prevention of surgical site infections.¹⁶⁷ In South Africa, inadequate decontamination during reprocessing of medical devices and operating theatre environment can play a contributory role in SSI and should be addressed as **surgery associated infection**.

Prevent ventilator-associated pneumonia (VAP) in adults

Ventilator-associated pneumonia (VAP) is one of four commonest causes of HAI-associated mortality.

Intervention:

There are 5 key elements contained in the VAP bundle:

- Elevate the head of the bed to 45 degrees when possible, otherwise attempt to maintain the head of the bed greater than 30 degrees;
- Daily evaluation of readiness for extubation;
- Subglottic secretion drainage;
- Oral care and decontamination with chlorhexidine (0,5%);
- Initiation of safe enteral nutrition within 24- 48 hours of ICU admission.

5.3.2 Surveillance

Surveillance for HAIs is a systematic way to gather information (data) to describe the occurrence and distribution of HAIs. HAI surveillance includes the collection, compilation, analysis, interpretation, and distribution of information about HAIs. In other countries, national surveillance for HAIs, including mechanisms for timely feedback, has led to significant reductions in HAI rates.¹⁶⁸

The steps required for implementing HAI surveillance:

A standardised surveillance model (**Figure 18**)¹⁶⁹ for HAIs is essential to:

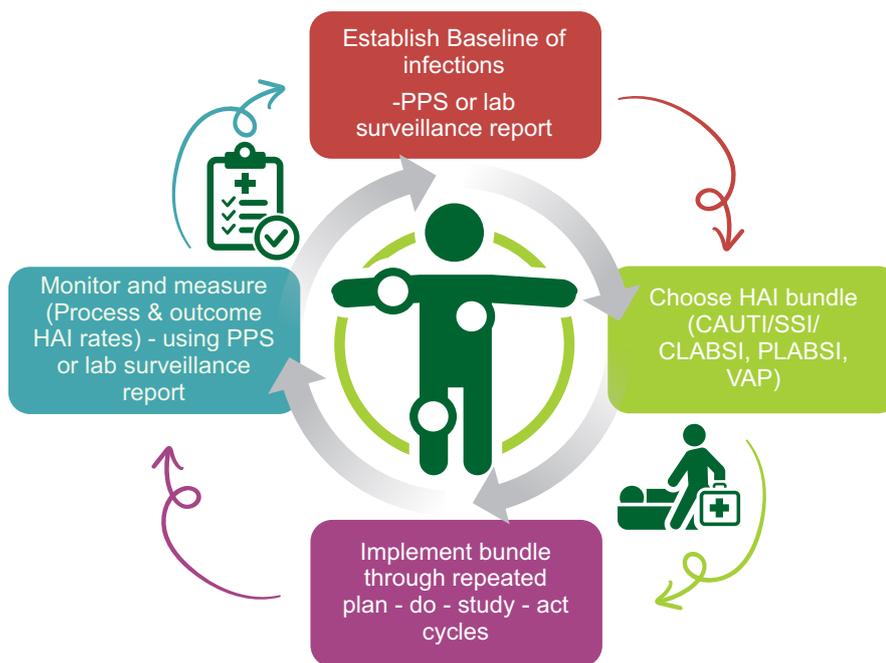
¹⁶⁷ World Health Organization. Implementation manual to support the prevention of surgical site infections at the facility level – Turning recommendations into practice. 2018. Available from: <https://www.who.int/infection-prevention/tools/surgical/en/>

¹⁶⁸ Rosenthal VD, Al-Abdely HM, El-Kholy AA, AlKhawaja SAA, Leblebicioglu H, Mehta Y, et al. International Nosocomial InfectionControl Consortium report, data summary of 50 countries for 2010-2015: Device-associated module. American Journal of Infection

¹⁶⁹ National Department of Health. Guidelines for the Prevention and Containment of Antimicrobial Resistance in South African Hospitals. Pretoria. November 2018

- Establish the baseline of HAIs in the hospital – either through point prevalence surveys (PPS) or laboratory reports from the hospital laboratory or from the NICD dashboard and identifying the most relevant AMR patterns. Complete the device capture sheet for all patients when a device has been inserted. See **Appendix K** as an example.
- Choosing an appropriate intervention or bundle of care to prevent infections;
- Implementing that bundle through repeated quality improvement cycles of plan-do-study-act (PDSA); and
- Monitoring the impact by measuring HAI rates and compliance to bundle interventions. See **Appendix L** as an example of the forms that can be used to conduct infection control bundle compliance audits.

Figure 18: HAI surveillance, intervention and improvement cycle



5.4 Indicators for HAI

The National Guideline for patient safety incident (PSI) reporting and learning in the Public Health sector of South Africa¹⁷⁰ gives guidance on reporting all PSIs, including HAIs. All PSIs follow the WHO classification system according to the incident type. There is a specific main incident type classification for HAI with sub classifications for the four types of HAIs. A PSI form should be completed for all PSIs. Refer to the National Guideline for the detailed form.

All government health facilities should record all PSIs including HAI on the web-based information system that is located at <https://www.idealhealthfacility.org.za>. The website is access restricted; therefore, staff should submit a user account request form to the provincial or district patient safety manager/s to gain obtain access to the website.

Monthly data on the number of device days/surgeries must be collected at all clinical areas to enable facilities to calculate the HAI rates. The number of device days/surgeries per month must also be recorded on the information system to allow the system to auto calculate the HAI rates. In addition to providing facilities with detailed reports on HAI rates; national, provinces and districts can also generate aggregated reports for HAI rates.

¹⁷⁰ National Department of Health. National Guideline for patient safety incident (PSI) reporting and learning in the Public Health sector of South Africa. Pretoria. 2017. Available from <https://www.idealhealthfacility.org.za/>



CHAPTER

6

ANTIMICROBIAL STEWARDSHIP

6. CHAPTER 6: **ANTIMICROBIAL STEWARDSHIP**

The South African AMR Strategic Framework consists of five interconnected objectives, including IPC and antimicrobial stewardship (AMS), to tackle AMR.¹⁷¹

AMS is a multi-disciplinary, systematic approach to optimising the appropriate use of antimicrobials to improve patient outcomes and limit emergence of resistant pathogens.

For further information on the establishment of an AMS team, please refer to the Guidelines on Implementation of the Antimicrobial Strategy in South Africa: One Health Approach & Governance.¹⁷² For further information on the implementation of AMS at hospital level, please refer to the Guidelines for the Prevention and Containment of Antimicrobial Resistance in South African Hospitals.¹⁷³

¹⁷¹ National Department of Health. South African Antimicrobial Resistance National Strategy Framework; a One Health Approach. 2018-2024

¹⁷² National Department of Health. Guidelines on the Implementation of the Antimicrobial Strategy in South Africa: One Health Approach and Governance. Pretoria. July 2017. Available online at: <http://www.health.gov.za/index.php/affordable-medicines/category/195-essential-drugs-programme-edp>

¹⁷³ National Department of Health. Guidelines for the Prevention and Containment of Antimicrobial Resistance in South African Hospitals. Pretoria. November 2018. Available online at: <http://www.health.gov.za/index.php/affordable-medicines/category/195-essential-drugs-programme-edp>



CHAPTER

7

OUTBREAK RESPONSE

7. CHAPTER 7: OUTBREAK RESPONSE

This section discusses the containment of both HAI and community-acquired outbreaks in a health facility setting rather than outbreaks in the community. However, since the principles of IPC apply to all outbreaks, should it be necessary, IPC support to community outbreaks may be offered.

Prevention and control of epidemic-prone communicable diseases remains a priority in South Africa. Again, the emergence of unknown/novel pathogens and re-emergence of infectious diseases of epidemic/pandemic potential, continue to pose a threat to the health of our communities. In order to contain and minimise their impact, alertness and epidemic preparedness is critical. The National Guidelines on Epidemic Preparedness and Response aim to assist health care workers responsible for communicable diseases control in improving epidemic preparedness and rapid response strategies to reduce morbidity, mortality and disability due to infectious diseases.

For further details on the roles and responsibilities of outbreak response teams/committees and the process to follow to investigate disease outbreaks (**Figure 19**), refer to the National Guideline.¹⁷⁴

Figure 19: Steps for investigating an outbreak



¹⁷⁴ National Department of Health. National Guidelines on Epidemic Preparedness and Response. Pretoria. 2009

Once the final steps in the process described above are complete and the source of the outbreak has been determined, it is vital to share learnings and revise standard operating procedures accordingly.

In South Africa, the following notifiable medical conditions are the most important diseases that contribute to outbreaks in health facilities (refer to notifiable medical condition section. Notifiable conditions are not limited to these below):

- Measles
- Multi Drug Resistant Gram Negative Bacilli (MDR GNB) & Carbapenemase Resistant Enterobacteriaceae (CRE)
- MRSA and *Clostridioides difficile* (see section on contact precautions, **page 128**)
- Viral haemorrhagic fevers (VHF) - these include Crimean-Congo haemorrhagic fever (CCHF) which is endemic in South Africa. Ebola virus diseases (EVD), Marburg, Lassa fever and Lujo virus, although not endemic, have been imported into South Africa on occasion. Nosocomial transmission of VHFs is well described in South African hospitals and health care settings.
- Food and water-borne diseases, e.g., gastroenteritis, cholera (see section on contact precautions, **page 128**).
- TB and respiratory pathogens (see the National Department of Health and WHO's tuberculosis infection prevention and control guidelines¹⁷⁵).

At clinics and community health centres, managers should be aware of the current infectious diseases in the community and those that may be expected to present at their facilities. Patients suspected of infectious diseases should immediately be placed in a room which has been designated for high-risk isolation (when and if required) according to the health facility/district's standard operating procedure. The appropriate PPE should be worn when treating these suspected patients. Patients should be transferred to a designated referral hospital via an ambulance as soon as possible, according to provincial/organisational protocols. The ambulance team and the hospital management of the receiving hospital must be informed of the suspected diagnosis so that they may take proper precautions and make adequate preparations for receiving the patient.

Standard and appropriate transmission-based precautions should be followed when treating patients with notifiable medical conditions.

¹⁷⁵ National Department of Health. National Infection Prevention and Control Guidelines for TB, MDR-TB and XDR -TB. Pretoria; 2015.

7.1 Measles¹⁷⁶

Note: Measles is a Notifiable Medical Condition¹⁷⁷. Table 38 sets out the IPC procedures for management of measles.

Table 38: IPC procedures for dealing with a case of measles

What is measles?	<p>Measles is a respiratory disease caused by a virus. Symptoms of measles include fever, a blotchy widespread rash and runny nose, cough and red eyes.</p> 
Who is affected?	Mostly young children, but adults may also be affected, if non-immune or immunocompromised.
How is it spread?	<p>Via breathing, coughing or sneezing (AIRBORNE).</p> <p>Measles is so contagious that anyone exposed to it who is not immune will probably get the disease (secondary attack rate > 90%).</p>
How can infection with measles be prevented?	<p>Airborne precautions AND isolation OR cohorting during outbreaks.</p> <p>Measles is a vaccine preventable illness</p>
Period of infection risk?	<p>Incubation period: 8-12 days from exposure to measles onset.</p> <p>Contagious period: 3-5 days before rash appears until 4 days after rash appears. Immune-compromised patients have prolonged virus excretion.</p>
Recommendations for PATIENTS with measles	
Patient placement	Prioritise measles patients for single room isolation. Cohort isolate if there are multiple cases. Do not transfer patients to other wards or clinical areas
Equipment	Do NOT share equipment between patients e.g., oxygen saturation probe.
Precautions	<p>Institute AIRBORNE precautions (see transmission-based precautions). Display warning sign on door.</p> <p>Keep the door to the room CLOSED at all times</p>
Recommendations for HEALTH WORKERS working with measles	
Immunity	All staff must know their measles immunity status.
Precautions for staff	<p>Health care professionals who are immune may nurse the patient.</p> <p>Staff who are either pregnant or are unsure of their immune status should avoid contact with measles unless wearing appropriate PPE.</p> <p>If possible, they should work in another clinical area for the duration of the outbreak. Refer pregnant staff members with measles exposure to Occupational Health.</p>

¹⁷⁶ Western Cape Department of Health. IPC Manual: Tygerberg Hospital, Cape Town, South Africa

¹⁷⁷ National Department of Health. Regulations Relating to the Surveillance and the Control of Notifiable Medical Conditions. Government Gazette R1434. 15 December 2017.

Personal protective equipment (PPE)	<p>Face masks are NOT necessary for health workers who are immune to measles but may be worn as part of the Airborne Precaution protocol.</p> <p>Wear gloves when dealing directly with patients or carrying out procedures.</p> <p>Wear aprons when in contact with respiratory secretions or mucous membranes.</p> <p>Discard PPE immediately in the red plastic lined HCRW box.</p> <p>Apply hand disinfection by washing with soap and water OR alcohol hand rub, after each patient or surface contact.</p>
Staff allocation	If possible, assign the same staff per shift to each measles-affected area.
Recommendations for VISITORS to measles-affected wards	
<p>Restrict visitors (parents only) and exclude pregnant women/immune-compromised visitors.</p> <p>Staff to explain precautions to parents of measles-infected patients on admission and reinforce daily.</p> <p>Ensure sufficient PPE for parents/visitors i.e., soap, water, paper towels, masks etc.</p> <p>Ensure parents/visitors' compliance with precautions and correct practices where needed.</p>	
Recommendations for CLEANING on measles-affected wards	
All waste	Place all waste in a container INSIDE the isolation area. Discard all clinical waste directly into the red bags (nappies, IV lines, all used PPE). Double-bag the waste on leaving the isolation area. (All waste from an isolation room is considered infectious waste). ¹⁷⁸
Environment	<p>Use soap and water for surface dusting and floor cleaning. Dry surfaces thoroughly.</p> <p>Wipe surfaces above the floor with undiluted 70% ethanol (alcohol)</p> <p>Terminally clean isolation/cohort rooms before admitting new patients.</p>
Measles EXPOSURES – refer to Infectious diseases	
Refer to adult/paediatric infectious diseases specialist to assist with measles prophylaxis for exposed patients, parents and staff. Immunise any non-immune contact/s who were within a metre of a measles case. Provide Intragam to measles-exposed infants < 6 months + children with severe immunosuppression - 0.2-0.25ml/kg IMI stat within 1 week of exposure.	
Public Health recommendations for measles outbreaks	
<p>If the measles source case is a visitor, parent or staff member, send him/her home immediately.</p> <p>Where possible, discharge measles exposed non-immune babies/children as a priority.</p> <p>Provide supplemental measles vaccine to ALL CHILDREN > 6 months of age without documented proof of TWO measles immunisations.</p> <p>Fast-track and isolate suspected measles cases (remove possible measles cases from waiting rooms immediately and prioritise them for assessment/discharge/transfer to isolation area).</p> <p>Ensure that all staff have received a booster of measles vaccine as a young adult.</p> <p>Ensure strict compliance with airborne precautions.</p> <p>Stable patients (without complications and > 1 year of age) should be referred for home care.</p>	

¹⁷⁸ Gauteng Province Department of Agriculture, conservation and environment conservation act, 1989 (act no. 73 of 1989).
Gauteng health Care Waste Management Regulations, 2004

7.2 Multidrug resistant Gram-negative bacilli¹⁷⁹

Extended spectrum beta-lactamase (ESBL) and carbapenemase resistant Enterobacteriaceae (CRE) and other Gram-negative bacilli (GNB) are becoming increasingly common in South African health facilities particularly in high care and intensive care units. These resistant GNB can also be found in the community. CREs include *Klebsiella*, *E.coli*, *Serratia*, *Enterobacter*, *Citrobacter*, *Proteus*, *Providencia* and *Morganella*.

Much of this resistance is carried on genetic material (plasmid) that passes rapidly between different species of GNB such as *Escherichia coli*, *Klebsiella pneumoniae*, and *Acinetobacter baumannii*.

The main IPC concern is that CRE illustrate resistance to drugs of last resort, such as carbapenems, e.g., meropenem, imipenem and ertapenem which are commonly used in the intensive care units. Further, these also confer resistance to non- β -lactam antibiotics, like the fluoroquinolones, sulphonamides and aminoglycosides. Colonisation of humans and the environment occurs readily in the healthcare setting and infections caused by these MDROs become difficult to treat.

GNB are carried in the gut of the colonised patients and the WHO advises rectal swab screening on all patients admitted to the health facility as a preventative measure, however this has not yet been universally accepted in South Africa.¹⁸⁰ The WHO Implementation guidelines to contain CRE¹⁸¹ are summarised below:

Transmission can be rapid and occurs via direct contact such as hands of staff or patients and contact with colonised sites such as the gut, skin or the environment and poorly decontaminated patient care articles.

IPC Procedures for GNB, see Table 39

The containment requires meticulous IPC contact precautions for as long as the patient is in hospital.

GNB are destroyed by heat or chemicals and therefore it is essential that any patient with MDR GNB must be isolated with contact precautions and all body fluids and faeces should be disposed of in a functioning bedpan washer disinfectant or macerator. Alternatively, discard contents down a slop hopper, wash, clean and disinfect by wiping with 70% alcohol or 1000 ppm chlorine. Do not soak in a disinfectant.

¹⁷⁹ National Department of Health. Guidelines for the Prevention and Containment of Antimicrobial Resistance in South African Hospitals. Pretoria. November 2018

¹⁸⁰ Guidelines for the prevention and control of carbapenem-resistant Enterobacteriaceae, *Acinetobacter baumannii* and *Pseudomonas aeruginosa* in health care facilities. Geneva: World Health Organization; 2017.

¹⁸¹ Implementation manual to prevent and control the spread of carbapenem-resistant organisms at the national and health care facility level. Geneva: World Health Organization; 2019 (WHO/UHC/SDS/2019.6)

Table 39: MDRO: IPC procedures

What is MDRO?	MDRO refers to gram negative and gram positive multiple drug resistant organisms, but mainly GNB. The types of resistance encountered are ESBL and CRE but resistance to other classes of antibiotics are also found.
Who is affected?	MDRO are most commonly found in health facilities particularly high care (ITU) patients who have undergone invasive procedures such as surgery, indwelling venous catheters and urinary catheters. Many of them would have been exposed to antibiotics.
How is it spread?	Via contact with contaminated hands of HCWs, and medical devices. Indirectly through contact with inadequately cleaned environmental surfaces or bedpans, urinals and patient care articles that were not properly disinfected.
How can infection with MDRO be prevented?	<p>Contact precautions (CP) applied as soon as possible after risk assessment and isolate the patient if possible.</p> <p>Inform the HCW about implementing CP.</p> <p>Take advice from IPC team regarding disinfection of the environment and terminal cleaning after the patient has been discharged.</p> <p>If well, discharge patient as soon as possible, and terminally clean the isolation area.</p> <p>The bedpans and urinals designated to the patient for the length of admission (no sharing), are heat disinfected or at the very least thoroughly cleaned and wiped over with 70% alcohol.</p>
Period of infection risk?	<p>Incubation period: unknown; some reports suggest as soon as 24 hours post admission</p> <p>Contagious period: as long as the patient is in the health facility. May be MDRO carriers for up to 2-3 months post discharge.</p>
Recommendations for PATIENTS with MDRO (CRE)	
Patient placement	<p>If possible, place patient in a single room.</p> <p>If not, cohort with full contact precautions for each patient in the bay.</p> <p>Do not transfer patients to other wards or clinical areas.</p>
Equipment	Do NOT share equipment between patients e.g., oxygen saturation probe.
Precautions	<p>Institute CONTACT precautions (see transmission-based precautions).</p> <p>Display warning sign on door</p> <p>Keep the door to the room CLOSED at all times.</p>
Precautions for staff	<p>IPC team to visit the clinical area and ensure CP signage is clearly displayed</p> <ul style="list-style-type: none"> • Hand hygiene is reinforced • Health workers must be reminded of CONTACT PRECAUTIONS - particularly hand hygiene • Set up line list • Daily follow up by IPC team

Personal protective equipment (PPE)	<p>Wear gloves when dealing directly with patients or carrying out procedures.</p> <p>Wear aprons when in contact with the patient.</p> <p>Discard PPE immediately in the red plastic lined HCRW box.</p> <p>Apply hand disinfection by washing with soap and water OR alcohol hand rub, after each patient or surface contact.</p>
Staff allocation	If possible, assign the same staff per shift to each affected area.
Recommendations for VISITORS	
Restrict visitors to close family only.	
Staff to explain precautions to visitors on admission and reinforce daily.	
Ensure sufficient PPE for parents/visitors i.e., ABHR, soap, water, paper towels, masks.	
Ensure parents/visitors' compliance with precautions and correct practices where needed.	
Recommendations for CLEANING	
All waste	Place all waste in a container INSIDE the isolation area. Discard all clinical waste directly into the red bags (nappies, IV lines, all used PPE). Double-bag the waste on leaving the isolation area. (All waste from an isolation room is considered infectious waste ¹⁸²)
Bedpans & urinals	<p>Always wear gloves and aprons when handling bedpans. Carry out hand hygiene before and after touching the bedpans.</p> <p>All bedpans must be heat disinfected in an automated washer disinfector. The cycle should run at 80oC x 10 min. A machine with a drying cycle is recommended.</p> <p>If manual cleaning is necessary, remove all faecal material into the slop hopper in the sluice and rinse. Using a soft brush and soap and water, clean thoroughly below the rim and other hard to reach areas. Once satisfied the bedpan is clean, wash thoroughly and dry. Wipe over with 70% alcohol or 1000ppm chlorine once dry.</p>
Environment	<p>Use soap and water for surface dusting and floor cleaning.</p> <p>Dry surfaces thoroughly.</p> <p>Wipe surfaces above the floor with undiluted 70% ethanol (alcohol).</p> <p>Terminally clean isolation/cohort rooms before admitting new patients.</p>
Terminal cleaning upon patient discharge	
See Terminal cleaning	

7.3 Viral haemorrhagic protocol

This protocol is based on the national protocol for viral haemorrhagic fever (2015).¹⁸³ In South Africa CCHF is endemic. EVD and other similar viruses including Lujo, Marburg and Lassa fever will be imported and rarely seen in the average health facility. For detailed Ebola and other VHF infection containment, also see WHO guidelines and South Africa's EVD standard operating procedures on Ebola.^{184,185} The EVD SOPs include case definitions, risk

¹⁸² Gauteng Province Department of Agriculture, conservation and environment conservation act, 1989 (act no. 73 of 1989). Gauteng health Care Waste Management Regulations, 2004

¹⁸³ National Department of Health. National Guidelines for Recognition and Management of Viral Haemorrhagic Fevers 2015. NDOH.

¹⁸⁴ World Health Organization. IPC Guidance Summary. Ebola Guidance package. Geneva 2014

¹⁸⁵ World Health Organization. Personal protective equipment for use in a filovirus disease outbreak: Rapid advice guideline. Geneva. 2016

assessments for EVD cases, case investigation forms, contact line lists, contact monitoring forms and guidelines for the safe disposal of human remains from persons with confirmed EVD. This section relates to IPC practices for VHF.

7.3.1 Case Definition

Case definitions (including suspected, probable and confirmed case definitions) for each of the viral haemorrhagic fever diseases, including Crimean-Congo haemorrhagic fever, Marburg virus disease, Lassa fever, Lujo virus and Ebola virus disease are available on the NICD website (www.nicd.ac.za) under the 'Notifiable Medical Conditions' page in the 'case definitions document'. As a general guide, consider VHF in the following persons:

- A person who has travelled to, or come from a VHF (Ebola, Marburg) endemic area;
- The presence of the following clinical signs including headaches, flu-like illness, fever and malaise. Additional signs and symptoms such as pharyngitis, conjunctivitis, vomiting, diarrhoea, abdominal pain, haemorrhagic manifestations, shock, jaundice, laboratory evidence of an incipient haemorrhagic state or liver failure may occur; CCHF is endemic in the Western Cape, Northern Cape, Free State and Mpumalanga.
- A history (or collateral history) during the past three weeks (14 days for Congo fever) prior to onset of illness of:
 - contact with a case of VHF
 - contact with animals or their tissues
 - handling of or being bitten by ticks or insects
 - travelling or residing in an area or country known or considered likely to be endemic for VHF (particularly if the patient has been to a rural area and had contact with animals or insects).
- High risk occupations include farmer, abattoir worker, hunter and HCW
- High risk hobbies include those involving non-domestic animals.

Refer to the VHF centre nearest to you and transfer the patient to the VHF centre. See contact details in the EVD SOP.

Inform NICD. Hotline on 082-883-9920.

At point of contact, place the person in a single room with en-suite facilities and commence Contact and Droplet precautions till transport arrives.

7.3.2 IPC protocols in Referral Unit¹⁸⁶



Note: Isolation facility refers to the hospitals that are designated receiving hospitals for VHF.

Isolation unit refers to the suite of rooms in a VHF isolation hospital dedicated for management of a VHF patient – usually consisting of an administration/rest area, ante-room, patient isolation room, stock room, waste storage area, decontamination area, etc. *Isolation room* refers to the room in which the patient with a VHF is nursed

¹⁸⁶ Western Cape Department of Health. IPC Manual (2015): Tygerberg Hospital, Cape Town, South Africa

Step 1: IPC person on call: check all protocols and checklists are up to date

- The IPC team will be informed of a transfer or admission of a suspected or known case of VHF.
- Checklists for ensuring safety of the health worker are paramount. See **Appendix M**.
- **All staff working or entering the VHF UNIT will change into scrub suits and closed toed footwear without exception.**
- All policies must be followed meticulously.

*Step 2: Isolation***The patient will be admitted directly to the VHF Isolation Facility**

- The patient will be admitted to a single isolation room with a hand-wash basin and en-suite facilities.
- The door must remain closed at all times. Visibility into isolation area – large window to monitor for events & monitor compliance.
- An intercom is desirable to prevent traffic in and out of the room.
- If en-suite toilet and bath facilities are not available, then provisions for adequate handling of bedpans and urinals must be in place.
- Ventilation – at least 6-12 ACH are required. Negative pressure ventilation is desirable.
- Engineering check of the ventilation in the unit must be recorded regularly to ensure the isolation unit is always ready to receive a patient.
- Where a washer-disinfector is available for the ward, it must be checked and its performance recorded.
- The following will be placed in the isolation room **before** the patient arrives:
 - HCRW containers;
 - Sharps container on the wall but also on the procedure trolley;
 - Procedure trolley containing all the necessary equipment to take blood safely, put up intra-venous fluid administration, and dress wounds, including sterile cotton wool and gauze/other dressings. Resuscitation trolley with equipment in centres at designated sites;
 - Safety engineered devices (SED) to administer medicines and draw blood;
 - Thermometer – disposable or electronic;
 - Alcohol rub must be placed near the patient's bedside.

Step 3: Personal Protective Equipment

Wear PPE FROM THE PACK PROVIDED ONLY IF ENTERING THE ISOLATION ROOM

DISCARD IN THE DOFFING AREA.

A buddy must assist with the donning and doffing of PPE.

The buddy checks that no skin is exposed after donning PPE and that there are no breaks or tears in the PPE.

The risk of self-contamination occurs during the doffing process.

Any suspected VHF patient – high level PPE (**Table 40**)

- Respirators - fitted to face by pushing down and sealing nasal and face contours.
- Eye shield - visors or goggles are recommended.
- Fluid resistant gowns or coveralls. Coveralls must include neck protection, seam and zip protection.
- Double latex or nitrile gloves – first pair underneath the coverall /gown sleeve cuff, the second pair of gloves over the sleeves.
- Head gear - fluid-resistant, either separate or coverall with an attached hood.
- Disposable knee-high, fluid-resistant overboots, if coverall does not have “socks” attached. Ensure disposable overboots do not have seams underneath the sole. Alternatively, white gumboots may be worn, which will have to be decontaminated after each use in a 5% hypochlorite solution. (See **Appendix I**).

NEVER SPRAY HUMANS WITH CHLORINE! IT IS TOXIC AND NOT RECOMMENDED FOR USE ON HUMANS.



THERE IS NO EVIDENCE OF EFFICACY WITH SPRAYING HUMANS WITH CHLORINE TO CONTROL OUTBREAKS OF EBOLA.

Step 4: Taking blood and other laboratory samples

- Two people should carry out this procedure. Both should be dressed in full VHF protective gear. Outer gloves must be nitrile as hands (gloves) will need to be disinfected with 0.5% hypochlorite solution prior to the sterile procedure.
- Take the prepared pack containing all the necessary sample tubes, tourniquet, swabs and SED needles and syringes, sharps container and checklist of what bloods to take and place on the procedure trolley in the isolation room. Checklist referred to is the list of bloods to be taken, which must be determined by the expert VHF microbiologist on call.
- Enter the room with the procedure trolley.
- One person opens the pack and sets up the trolley with all the necessary equipment and sample containers. Checks the list.
- Second person prepares to take bloods.
- Using a short butterfly is ideal to enter the vein painlessly and blood can be taken safely into the necessary laboratory sample tubes.
- Once the blood has been obtained, each tube is carefully placed in a kidney dish by the person taking the blood and the second person ticks it off on the checklist.
- The second person places the tubes in a robust rack to prevent accidental breakage or spillage.
- When the bloods and the checklist are completed, remove the cannula and drop it into the sharps container *immediately*.

- Place tubes in primary (absorbent) packaging issued by the laboratory and then into a plastic zip-lock bag for safe transportation.
- Carefully clear the trolley top.
- Clean the trolley with detergent and water, dry and wipe over with 70% alcohol.
- Wipe down the zip lock bag containing the tubes with disinfectant.
- Both people will remove PPE in the doffing area.
- The ziplock bag containing the blood tubes should be decontaminated again in the doffing area and then placed into secondary and tertiary packaging for transport to the designated laboratory, as per national guidelines.

Step 5: Maintenance of IPC procedures

- Review patient's condition every day - joint clinical round. Round takes place outside of the isolation room. Entry to the isolation room is restricted to carers/treating physician and family (if necessary).
- IPC Co-ordinator:
- Advises on IPC matters as required.
- Checks on decontamination of medical equipment.
- Gives on the job training for those who need it.
- Checks contact register and type of exposure.

Make sure stock of PPE and medical supplies are always topped up.

Step 6: Monitor register for health workers who have had contact with the patient

- Keep a daily check on the temperature and signs of VHF for all health workers who come into contact with the patient; and a logbook is kept of who is going in and out and any incidents that occur.

Keep all other equipment outside the isolation room:

- Emergency trolley
- Central line packs
- Urinary catheters
- Endotracheal tube
- Endotracheal suction catheters

Table 40: Viral haemorrhagic fever: Recommended PPE

ITEM	INDICATION FOR USE	WHO SHOULD WEAR IT
Scrub suit, preferably disposable and closed footwear	If a suspected or confirmed case of VHF is admitted to an isolation facility. Change clothes when entering isolation facility.	All staff entering or visiting the isolation facility. If remaining in the ante area, no further PPE is required.
Face shield, goggles for eye protection	If a suspected or confirmed case of VHF admitted to an isolation facility. When carrying out a clinical examination. Taking blood	Team dealing directly with patient - close contact. If contaminated, discard immediately.
N95 respirators	Suspected or confirmed case of VHF admitted to isolation facility.	Team dealing directly with patient - close contact. If contaminated, discard immediately.
Latex and nitrile gloves (Well fitting, non-sterile) Nitrile outer gloves for aseptic procedures. Sterile gloves if procedure indicates	When handling the patient directly. Handling bedpan or urinal.	Health worker, cleaners. Anyone in close contact with blood and body fluids.
Fluid resistant disposable gown or coverall (Discard after each use)	When entering patient's room for a 4-hour shift.	Team in direct contact with patient.
Plastic apron	When entering the patient's room.	Team in direct contact with patient.
Footwear	Wear disposable fluid-resistant, knee-length overboots over own, closed, shoes OR gumboots if disposable overboots are not available. Rinse in hypochlorite solution and dry thoroughly before re-use.	Attending staff (health worker, cleaner)
Headgear	It is recommended to procure coveralls with neck flap and attached hood. (Rationale: Splashes might occur at any stage – patient may vomit unexpectedly.)	Attending staff (health worker, cleaner)

After patient discharge

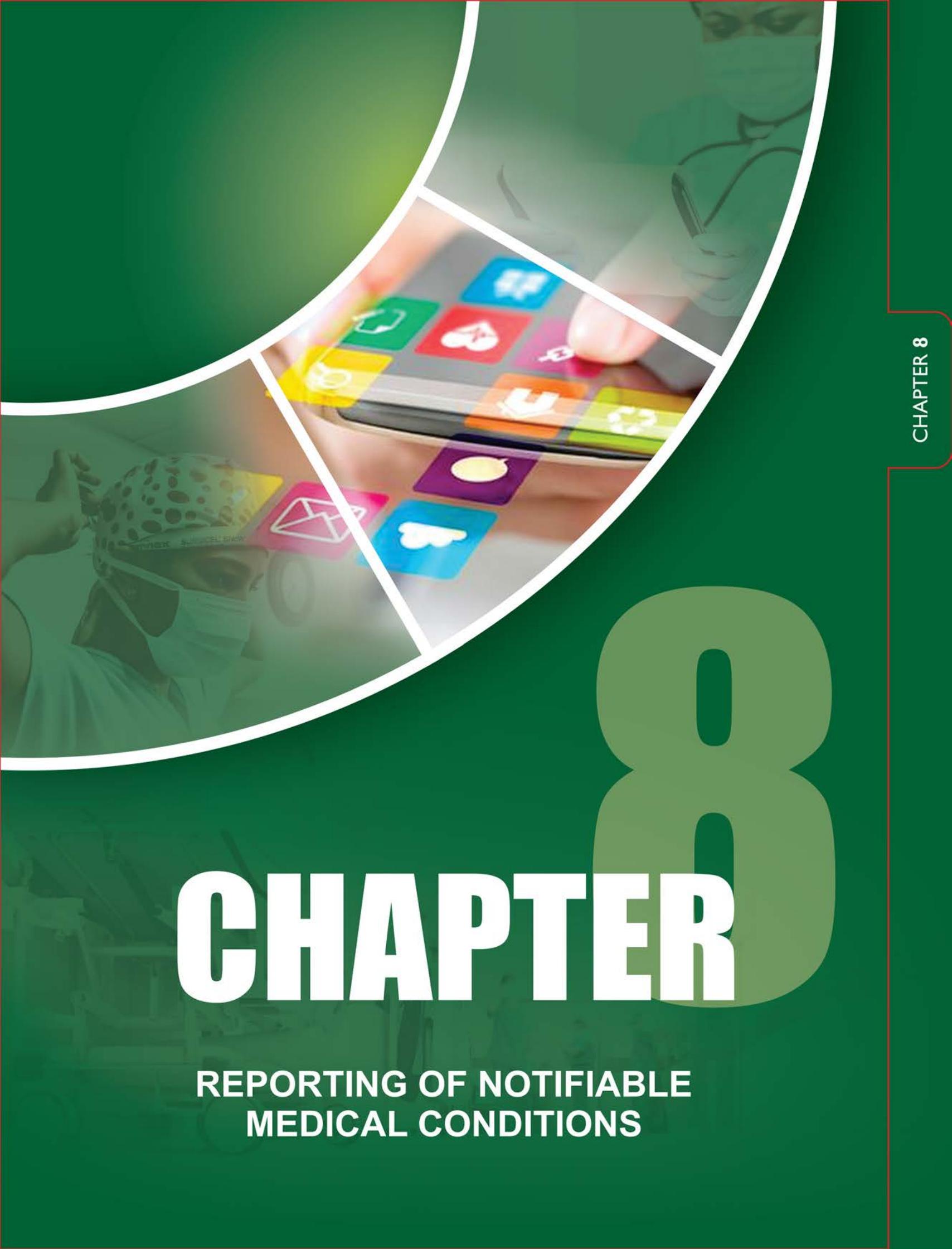
The IPC team should carry out an inspection prior to terminal cleaning

- Wear appropriate PPE.
- Carry out an inspection with a checklist BEFORE the room has been cleaned to ensure the risk areas are identified:

- ✓ Check on records of the ventilation system.
- ✓ If a bedpan washer was used, check the bedpan washer disinfectant records.
- ✓ Check sluice area.
- ✓ Check disposal of all potentially contaminated medical devices.
- ✓ Check patient care articles and the appropriate disinfection to allow reuse (or discard).
- Advise cleaning and nursing staff on how to terminally clean the isolation facility - use a checklist. See **table 31 page 119**.

Inspect isolation unit after terminal cleaning has been performed and issue a clearance certificate. The clearance certificate, issued by the IPC Team, is verification that the terminal cleaning has been carried out satisfactorily and completed after joint inspection of the isolation unit with the cleaning supervisor.

**SIGNAGE TO BE PLACED ON THE DOORS AND ENTRANCES
HIGH LEVEL ISOLATION
CONTACT + DROPLET PRECAUTIONS IN PROGRESS**



CHAPTER

REPORTING OF NOTIFIABLE MEDICAL CONDITIONS

8. CHAPTER 8:

REPORTING OF NOTIFIABLE MEDICAL CONDITIONS

Notifiable medical conditions (NMC) to be reported by health facilities are those diseases that are important to public health because they pose significant risks that can result in disease outbreaks or epidemics with high fatality rates nationally and internationally. Notification of certain medical conditions in South Africa is based on the Health Act, 1977 (Act No. 63 of 1977; and Regulation 1434: Regulation relating to the surveillance of the control of notifiable medical conditions. Regulations on Notifiable Medical Conditions prescribe the diseases in South Africa that need to be notified by every health care provider and how soon after clinical diagnosis this information is required for each condition to break the cycle of transmission.¹⁸⁷ This section provides a summary of the reporting system.

8.1 The notification procedure

8.1.1 Why notify?

- International Health Regulations (IHR) and the South African National Health Act require rapid detection, notification and prompt risk assessment of public health risks to enable timely and targeted public health response.
- Notifications serve as early warning signs for possible outbreaks hence enable efficient public health actions to contain or prevent such outbreaks.
- Notifications provide empirical data required to monitor disease distribution and trends and identify populations at risk, and for policy decisions.

8.1.2 Who should notify a Notifiable Medical Condition (NMC)?

Every doctor or nurse (health care provider) who diagnoses a patient with any one of the NMC.

8.1.3 Where to obtain information on how to report NMC?

The National Standard Operating Procedure with flow chart, case definitions and case investigation forms are available from www.health.gov.za. The NMC Notification booklet is available from the NMC focal person in the province/district.

8.1.4 What and when to report NMC?

NMCs are categorised into four categories, i.e., category 1, 2, 3 and 4. See **Table 41**.

8.1.5 NMCs reported by health facilities

- 1 **Category 1 NMC** are conditions that require **immediate reporting by the most rapid means available** upon clinical or laboratory diagnosis followed by a written or electronic notification to the Department of Health within 24 hours of diagnosis by health care providers.
- 2 **Category 2 NMC** are conditions that must be **notified through a written or an electronic notification** to the Department of Health within 7 days of diagnosis.

¹⁸⁷ National Department of Health. Regulations Relating to the Surveillance and the Control of Notifiable Medical Conditions. Government Gazette R1434. 15 December 2017.

3 Category 3 and 4 NMCs are conditions reported by private and public laboratories.

Table 41: Conditions per NMC category

Table 41: Conditions per NMC category	Category 2 NMC
Acute flaccid paralysis	Agricultural or stock remedy poisoning
Acute rheumatic fever	Bilharzia (schistosomiasis)
Anthrax	Brucellosis
Botulism	Congenital rubella syndrome
Cholera	Congenital syphilis
Food borne illness outbreak	Diphtheria
Enteric fever (typhoid or paratyphoid fever)	Enteric fever (typhoid or paratyphoid fever)
Malaria	Haemophilus influenzae type B
Haemolytic uraemic syndrome	Hepatitis A
Listeriosis	Hepatitis B
Measles	Hepatitis C
Meningococcal disease	Hepatitis E
Pertussis	Lead poisoning
Plague	Legionellosis
Poliomyelitis	Leprosy
Rabies (human)	Maternal death (pregnancy, childbirth and puerperium)
Respiratory disease caused by a novel respiratory pathogen	Mercury poisoning
Rift valley fever (human)	Pertussis
Smallpox	Soil-transmitted helminth infections
Viral haemorrhagic fever diseases	Tetanus
Waterborne illness outbreak	Tuberculosis: pulmonary
Yellow fever	Tuberculosis: extra-pulmonary
	Tuberculosis: multidrug-resistant (MDR-TB)
	Tuberculosis: extensively drug-resistant (XDR-TB)
Category 3 NMC	Category 4 NMC
Ceftriaxone-resistant <i>Neisseria gonorrhoea</i>	Carbapenemase-producing Enterobacteriaceae
West Nile virus, Sindbis virus, Chikungunya virus	Vancomycin-resistant enterococci
Dengue fever virus other imported arboviruses of medical importance	<i>Staphylococcus aureus</i> : hGISA and GISA
Salmonella spp. other than S. typhi and S. paratyphi	Colistin-resistant <i>Pseudomonas aeruginosa</i>
Rubella virus	Colistin-resistant <i>Acinetobacter baumannii</i>
Shiga toxin-producing <i>Escherichia coli</i>	<i>Clostridioides difficile</i>
Shigella spp	

8.1.6 How to report NMC?

Reporting can be done either via a paper-based or an electronic notification.

Paper-based notification

- Complete the NMC Case Notification Form which may be found on the NICD website.
- Send the NMC Case Notification Form to NMCsurveillanceReport@nicd.ac.za or fax to 086 639 1638 or send a photograph by SMS or WhatsApp or email or fax to the NMC hotline 072 621 3805.
- Send a copy to the NMC focal person at Sub-District/District (details provided on the NMC Notification booklet cover page).
- The NMC Focal Person at health facility level or Sub-District must ensure that the forms are captured electronically.

OR

Electronic notification via the NMC APP

- On the NICD webpage (www.nicd.ac.za) find the Notifiable Medical Conditions page. Follow the instructions to download the application (APP) onto your smartphone or open the APP on your laptop or PC.
- Follow the registration process. You will need to provide a HPCSA registration number (medical practitioner) or a SANC registration number (professional nurse).
- Capture the NMC case details onto the NMC APP using the patient's file and laboratory results (if available).
- The notification will automatically be sent via the APP to all relevant focal persons at facilities, Sub-District, District, Province & National levels. Category 1 conditions will be notified to focal persons by SMS to ensure immediate response.



CHAPTER

**EDUCATION AND TRAINING
OF STAFF AND IPC STAFF**

9. CHAPTER 9:

EDUCATION AND TRAINING IN IPC

IPC education of the health workforce is essential to ensure patient and health worker safety. Training should be provided for the entire health workforce and should be updated regularly. An effective IPC programme can reduce HAI, thereby driving down the health costs in the institutions. In 2010, an HAI in a general ward cost between R25,000 - R50,000 (unpublished data, S Mehtar); an HAI in the ICU cost ten times more - these included direct and indirect costs of hospital stay, investigations, antimicrobial therapy and medical devices, extra staff and PPE needed to care for such patients. By understanding the basics of transmission, all health workers can contribute towards reducing HAI by implementing simple yet effective IPC measures.

The WHO identifies three groups requiring training. 1) IPC staff; 2) health care professionals; 3) support (non-clinical) health workforce including administrators, sterile services, cleaners, and porters. A national IPC curriculum for these groups includes the link nurse programme.

The National Qualification Framework (NQF) (2017) details the necessary level of qualification for the workforce as stipulated in legislation listed below which apply to the IPC training programmes outlined in this document.

- Higher Education Act (Act 101 of 1997)
- Skills Development Act (Act 97 of 1998)
- General and Further Education and Training Quality Assurance Act (Act 58 of 2001)
- NQF Act (Act 67 of 2008)
- White Paper for Post-school Education and Training (Department of Higher Education and Training, 2013).

9.1 Undergraduate education

Basic IPC should be incorporated into all health professions undergraduate training.

The curriculum should include:

- Microbes and their transmission
- Methods of preventing transmission
- Transmission-based precautions
- Risk assessment
- SP including:
 - ✓ hand hygiene;
 - ✓ appropriate use of personal protective equipment;
 - ✓ appropriate use of antiseptics, disinfectants and detergents;
 - ✓ decontamination of medical devices;
 - ✓ safe handling of linen and laundry;
 - ✓ healthcare waste management;
 - ✓ respiratory hygiene and cough etiquette;

- ✓ patient placement;
- ✓ principles of asepsis;
- ✓ injection safety and occupational health;
- ✓ environmental cleaning;

Training should be delivered by IPC trained tutors with knowledge grounded in the most recently available evidence.

9.2 Postgraduate education

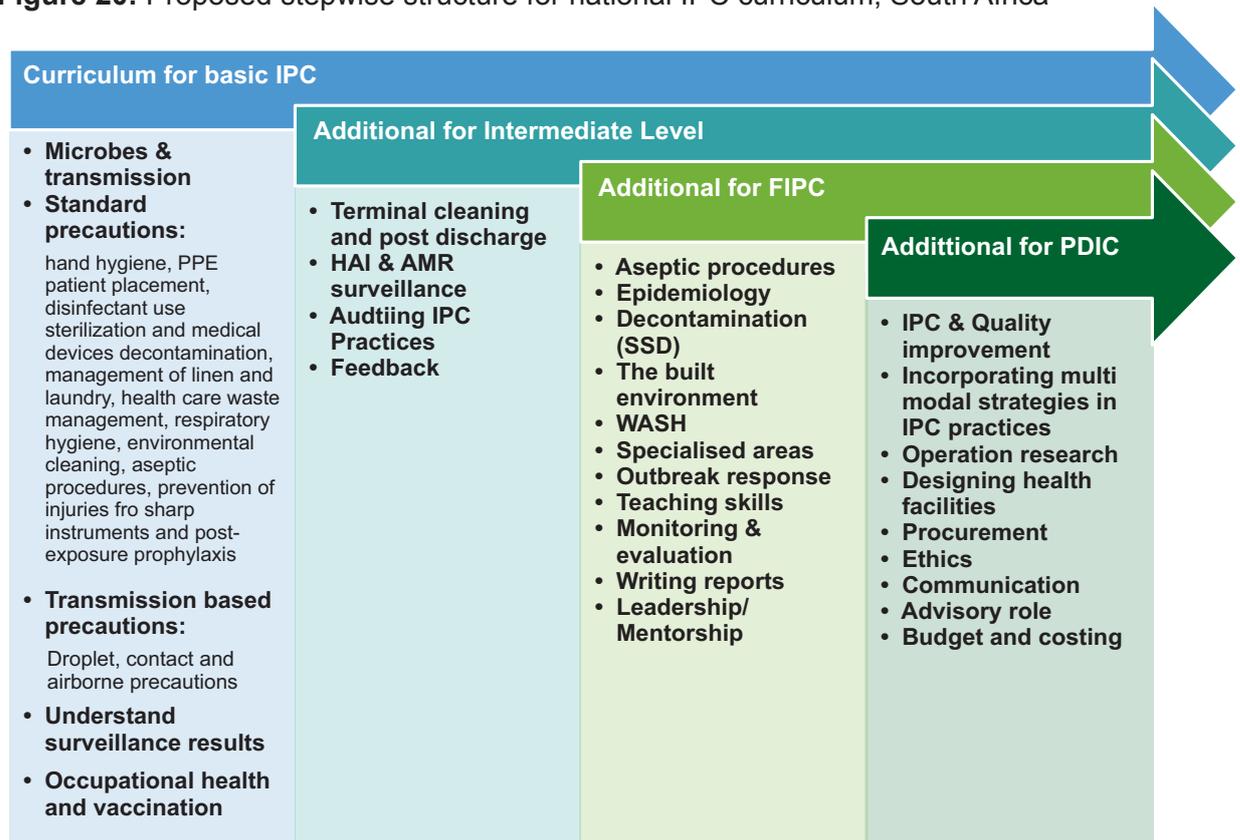
Training in IPC should progress from the essential (basics) to the specialized. IPC is a process which encompasses healthcare procedures but also requires skills such as management, communication & writing, feedback and conceptual skills to give expert input into the layout of health facilities to reduce transmission. Table 42 outlines the topics which should be covered starting with the basic curriculum and progressively becoming more complex, requiring in-depth knowledge at Postgraduate diploma in IPC (PDIC) level (**Table 42; Figure 20**).

All training must be certified for competence by a recognised body or institution.

The proposed stepwise structure for the national IPC curriculum in South Africa consists of a **Basic** IPC curriculum, **Intermediate, Fundamentals** for IPC (FIPC) and **Postgraduate** (PDIC) - See **Figure 20**.

9.3 In-service training

IPC education must be provided regularly to all health workers during their employment. Some of this training is on the job training provided during clinical ward rounds, or visits to areas of the health facility. A record of all in-service training should show attendance and topics discussed. Hand hygiene training is a common example of in-service training.

Figure 20: Proposed stepwise structure for national IPC curriculum, South Africa

9.4 Basic IPC knowledge for all health workers

This level of training is usually delivered to all clinical practitioners including nurses and doctors, allied healthcare professional, support services and ancillary workers.

All health workers should be trained in the basics of IPC such as HH, SP and transmission-based precautions. They should also be able to evaluate risk when carrying out procedures, understand the basics of surveillance data and outcomes. They should recognize the consequences of noncompliance with preventative measures such as clean environment, safely processed patient care articles and decontamination of medical devices. Finally, they should have the necessary IPC knowledge to be responsible for their personal health, protection through vaccination and appropriate use of PPE, and the impact on their personal wellbeing.

9.4.1 Basic IPC curriculum

NQF level: 5

Time spent per course: 40 hours

Credits: 4 credits

Entry level qualification: matric or equivalent (RPL accepted)

The curriculum should be delivered as a combination of didactic lectures and practical support including ward rounds, group discussion and case studies on the following topics:

- Microbes, pathogens and routes of transmission;
- Zones of patient care. Understanding the 'point of care', 'patient zone', 'healthcare zone' or 'patient surroundings' and the impact of these on transmission of pathogens;
- Antimicrobial resistance and HAI;¹⁸⁸

- HH - Why? When? What? How? Positioning of HH products to maximize appropriate use;
- SP including the appropriate use of personal protective equipment (PPE), healthcare waste management, including source segregation of healthcare waste;
- Injection safety and safe handling and disposal of sharps;
- Cough etiquette;
- Maintaining a clean and dry environment; rendering patient care articles safe;
- The importance of reprocessing of reusable medical devices (decontamination);
- Transmission-based precautions including contact, droplet and airborne precautions;
- The built environment as an amplifier of disease transmission;
- Containing outbreaks in both the health facility and community particularly for multidrug resistant (MDR) pathogens and communicable diseases.

9.5 Intermediate programmes

NQF level: 6

Time spent per course: 60 hours

Credits: 6 credits

Entry level qualification: registered nurse or equivalent

Link nurses are a resource at ward level and act as the “eyes and ears” of the IPC teams at health facility level. They should be trained to a higher level than the basic health worker so that they can provide the necessary support for the clinical teams. Link nurses can also be used to create a “pool” of possible IPC practitioners in future with further development and ensure continuity in IPC through successor planning.

9.5.1 Additional for Intermediate Level curriculum

In addition to the basic course, link nurses should learn how to evaluate IPC practices at ward level, carry out audits of essential practices such as HH, environmental cleaning, compliance to transmission-based precautions, knowledge about basic surveillance and identification of HAI and reporting of notifiable medical conditions. They should learn how to interpret surveillance data and to develop interventions to reduce HAIs, together with the nursing team and prepare simple IPC reports for discussion with the IPC team and nurse management.

9.6 Healthcare managers

Managers should provide support for IPC programmes at national and health facility level, including dedicated budgets, appropriate cost-effective procurement measures, and understand the cost of HAIs and implement measures to drive down costs by improving IPC and reducing AMR.

9.6.1 Healthcare Managers’ curriculum

NQF level: 5/6

Time spent per course: 40 hours

Credits: 4 credits

Entry level qualification: none

¹⁸⁸ National Department of Health. South African antimicrobial resistance national strategy framework; a one health approach 2018 – 2024. Pretoria

The curriculum for managers should include elements of the Basic IPC course with an emphasis on cost-effective measures and leadership. The legal requirements and legislation relating to IPC as part of quality improvement should be covered and emphasized

- Legislation, ethics, leadership and governance
- Policy writing and development
- Assessing the outcome of IPC systems through audit
- Applying the quality improvement PDSA cycle to improve patient care and staff health
- Cost effective IPC practices
- Understanding surveillance data and outcome indicators

9.7 IPC practitioners

All IPC focal persons appointed or seconded to a position in accordance with the WHO Core Component 1 recommendation should be trained in accordance with the national IPC curriculum based on national (AMR) guidelines and international (WHO) evidence-based policies.

9.7.1 IPC Practitioners national curriculum

Newly appointed IPC practitioners should attend competency-based training courses within one year of taking up their post. They should be competent in evidence-based IPC practices. They should be able to provide mentorship to the health facility workforce towards preventing transmission of HAI pathogens, and implementation skills towards reducing AMR through surveillance and feedback, monitoring and evaluating IPC systems through audit and feedback, while ensuring high quality service delivery.

Fundamentals in IPC (FIPC) (short course)

NQF level: 6/7

Time spent per course: 6 months

Credits: 60 credits

Entry level qualification: diploma or degree in a relevant specialty.

A six-month part time course which ensures IPC competence, mentorship and implementation skills. Infectious disease, paediatrics and neonatal clinical teams will also benefit from such training. The curriculum should cover topics included in the basic IPC course but more in depth with practical clinical ward rounds, group discussion and case studies.

This course should cover the following:

- Microbes and routes of transmission. Essentially, to understand the point of care, patient zone, patient surroundings and the impact these have on transmission;
- Antimicrobial resistance and HAI¹⁸⁹ surveillance. Understanding the data and using the information to implement and support IPC systems at health facility level;
- HH - why? When? What? How? Positioning of HH products;
- SP as applied to risk assessment including:
 - appropriate use of personal protective equipment (PPE), which PPE to use and when;

¹⁸⁹ National Department of Health. South African antimicrobial resistance national strategy framework; a one health approach 2018 – 2024. Pretoria

- safe handling and disposal of sharps;
- cough etiquette;
- Healthcare waste management and source segregation of healthcare waste and end point disposal systems;
- Environmental cleaning, terminal cleaning and disinfection;
- Caring for patient care articles and rendering them safe for use;
- Reprocessing medical devices (decontamination);
- Transmission based precautions including contact, droplet and airborne precautions;
- HAI surveillance and what the results mean. How the findings can be used to improve outcomes of HAIs and quality improvement;
- Multimodal improvement strategies in IPC;
- Being part of project teams for revitalization and new health facility buildings;
- The built environment including placing of essentials such as hand wash basins, ward layout, isolation facility design and ventilation, ensuring the safe provision of water, sanitation, and a continuous power supply;
- Monitoring and evaluation of IPC systems with regular audits;
- Feedback to managers and health workers to support quality improvement;
- Specialized areas such as operating theatres, intensive care units, neonatal units, burns units and Accident and Emergency services including ambulance and Emergency medical services;
- Outbreak response - both for the community and health facilities;
- Writing clear and concise reports;
- Develop teaching skills and undertake education and training with confidence;
- Leadership, mentorship and communication skills;
- Basic Data analysis and interpretation;
- Quality improvement.

Postgraduate diploma in IPC (PDIC)

NQF level: 8

Time spent per course: 1 year full time or 2 years part-time

Credits: 120 credits

Entry level qualification: diploma or degree in a relevant specialty

This is a postgraduate diploma level course (NQF level 8) aimed at IPC practitioners who have been in a post for approximately two years. The content of this course builds upon the Fundamentals in IPC (FIPC) (**Figure 20**) and prepares IPC practitioners in leadership, to take charge of IPC programmes in health facilities at a higher level and grade within the IPC career path (**Figure 20**). In addition to the topics covered in the FIPC course the following is included:

- In-depth knowledge and understanding of microbiology and transmission of pathogens including human and microbial defence mechanisms;
- How to carry out audits in HAI, AMR and IPC process and outcome indicator audits;
- Ethics in the workplace;
- Applying and evaluating healthcare bundles;

- Designing and applying multimodal improvement strategies for the workplace;
- Leadership, management and mentorship skills;
- Operational research methodology;
- Epidemiology, basic statistics and interpretation of data;
- Outbreak response management both for the community and health facilities;
- Decontamination of medical devices (sterile services);
- Advise procurement and cost-effective purchasing;
- Advising management and government structures on IPC related matters;
- Teaching of health workers using the most recent international and national guidelines;
- Designing health facilities with appropriate ventilation, and layout of clinical areas;
- Using the internet to keep up to date with most recent IPC related publications;
- Risk assessment;
- Data analysis and report writing;
- Problem solving skills; and
- Quality improvement.

9.7.2 Specialised courses relating to IPC

There should be IPC related courses run for specialities in other fields emphasizing reduction of transmission of pathogens through best practice.

Decontamination of medical devices (sterile services)

All health workers working with the reprocessing of medical devices should be trained. The Sterile Services Department is pivotal to the health facility and contributes towards reducing surgical site infection and infection caused by invasive procedures. The reprocessing of sterile medical devices should be to the highest standard and each step and cycle must have evidence of validation.

Basic course in decontamination

Level: operators or nurses who work in reprocessing any medical device (Decontamination Unit or Sterile Services Department)

NQF level: 5

Duration: five to ten days

Topics:

- Transmission of microbes
- Personal protection
- Workflow in decontamination
- Point of use cleaning
- Cleaning methodology
- Inspection, assembly and packaging
- Sterilization - steam or chemical
- Storage and transportation

Advanced course in Decontamination

The courses must be accredited by a recognised body or organisation.

NQF level: 6/7

Level: supervisors and managers who are responsible for running a section or a whole decontamination unit. They should have completed the Basic Course in Decontamination.

Duration: eight to 10 weeks including didactic lectures, practical demonstrations, group work and discussions, case studies and problem solving.

Topics

- The layout and building of an SSD to improve workflow;
- Infrastructure including ventilation in clean and dirty areas; water quality and how to monitor and improve it;
- Workflow from dirty to clean;
- Point of use cleaning of medical devices;
- Transport of used medical devices;
- Receiving used trays - checking and recording;
- Cleaning – material and methods of cleaning narrow lumen devices;
- Automated and manual cleaning methods - validation;
- Inspection of devices - what to keep and what to discard or replace;
- Assembly of devices, trays and checking systems;
- Packaging - what works and what does not;
- Steam sterilization – how it works;
- Steam sterilization - trouble shooting;
- Chemical sterilization - how it works;
- Validation of sterilization systems;
- Cooling off area and sterile stores;
- Dispatch and records;
- Transportation to point of use;
- Managing a SSD;
- Procurement of appropriate materials & equipment;
- Budgeting skills.

9.7.3 Other IPC related courses*Engineering and the built environment including WASH*

IPC should be part of the project teams when building a new health facility or renovating an existing one. IPC education of engineers, architects and building designers on the requirements for good ventilation, WASH¹⁹⁰, infrastructure including IPC facilities such as HH requirements¹⁹¹, isolation facilities¹⁹². A short course lasting five days should be adequate to cover most of these topics.

¹⁹⁰ Core questions and indicators for monitoring WASH in health care facilities in the Sustainable Development Goals. Geneva: World Health Organization and the United Nations Children's Fund (UNICEF), 2018

¹⁹¹ World Health Organization. WHO guidelines on hand hygiene in health care. Geneva. 2009. Available from: https://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf?sequence=1

¹⁹² World Health Organization. WHO guidelines on tuberculosis infection prevention and control, 2019 update. Geneva. 2019

Train the trainers

Training others is an integral part of IPC training and knowledge transfer. A short 5 day course for those who are required to train others in IPC is recommended. The attendees should have at least attended the basic IPC course and will be instructed in methods of adult learning.

Pharmacy

Most pharmacy courses include some elements of IPC such as conditions during preparation of sterile fluids, mixing of drugs as well as checking on prescription charts for antibiotic prescribing. The course should also cover chemicals used in cleaning and HH, the use of disinfectants and supporting AMS practices and IPC programmes.

Food and catering

The people working in food preparation areas should be trained in hygienic practices during food storage, preparation, transportation to the wards, reprocessing used cutlery and crockery, maintaining a clean environment, pest and vermin control. They should be aware of HH, use of PPE and disposal of waste.

Environmental Cleaning

All those involved in cleaning, including managers, supervisors, and cleaners should be trained in the structure, methods, frequency, chemicals and materials of general cleaning, as well as terminal cleaning. Care of cleaning equipment, colour coding, managing waste containers and occupational health requirements must be included in a five-day certified course. On the job training and practical demonstrations are essential for all groups.

9.7.4 On the job training

The IPC team should provide on the job training with a NO BLAME culture during clinical ward rounds or site visits, as part of the audit or assessment during the visits. This training could be related to any clinical or non-clinical matters requiring attention.

9.7.5 Stepwise training

Table 42 summarises the topics which will be covered in each level for IPC training. Some topics such as standard precautions (SP) are covered as concepts at the basic level but in more depth to create a deeper understanding of what SP means, how it differs from transmission-based precautions and how SP should be implemented.

For example, at the Basic level (X), microbiology will cover what microbes are and how they are transmitted. At PDIPC level (XXX), the students will be expected to go to the laboratory, look at gram stains, agar plates with growth on them, antibiograms, and understand results produced by the various automated systems. At the Basic level the students will cover microbiology and transmission in one day, whilst at the Postgraduate level, this section will take two weeks!

Table 42: Summary of topics covered at various levels of IPC training in South Africa

Recommended topics for stepwise training in IPC	Basic IPC	Intermediate	FIPC	PDIC
Microbes and transmission	X	X	XX	XXX
Antimicrobial resistance	X	X	XX	XXX + AMS
SP	X	X	XX	XXX
HH	X	X	XX + Audit	XXX + Audit
Personal protective equipment	X	X	XX	XXX
Environmental cleaning	X	X	XX	XXX
Safe patient care articles	X	X	XX	XXX
Interpreting HAI surveillance	X	X	XX	XXX
Patient environment, zone & surroundings	X	X	XX	XXX
Safe handling & disposal of sharps	X	X	XX	XXX
Healthcare waste management	X + Source segregation	X	XX	XXX
Linen and laundry management	X		XX	XXX
Transmission-based precautions	X	X	XX	XXX
Cough etiquette	X	X	XX	XXX
Occupational health and vaccination	X	X	XX	XXX
Terminal cleaning post discharge	X	X	XX	XXX
Decontamination of medical devices		X	XX	XXX
HAI & AMR surveillance		X	XX	XXX
Aseptic procedures & bundles			XX	XXX
Epidemiology & basic statistics			XX	XXX
IPC & the built environment, including ventilation			XX	XXX
Health facility layout and workflow			XX	XXX
WASH			XX	XXX
Specialized areas				
OT, Burns, NNU, isolation, Maternity, A & E, Ambulance			XX	XXX
Outbreak response - community & health facility		X	XX	XXX
Teaching & training skills		X	XX	XXX
Writing reports			XX	XXX
Monitoring & evaluation			XX	XXX
Feedback and reports			XX	XXX
Leadership/ mentorship			XX	XXX
Data collection		X	XX	XXX
IPC with a QI focus				XXX
Operational research methodology				XXX
Designing healthcare facilities				XXX
Procurement				XXX
Costing of an IPC service				XXX
Ethics				XXX
Communication with public				XXX
Active membership of committees				XXX
Advisory role to MOH & managers				XXX



CHAPTER

MONITORING AND EVALUATION

10. CHAPTER 10:

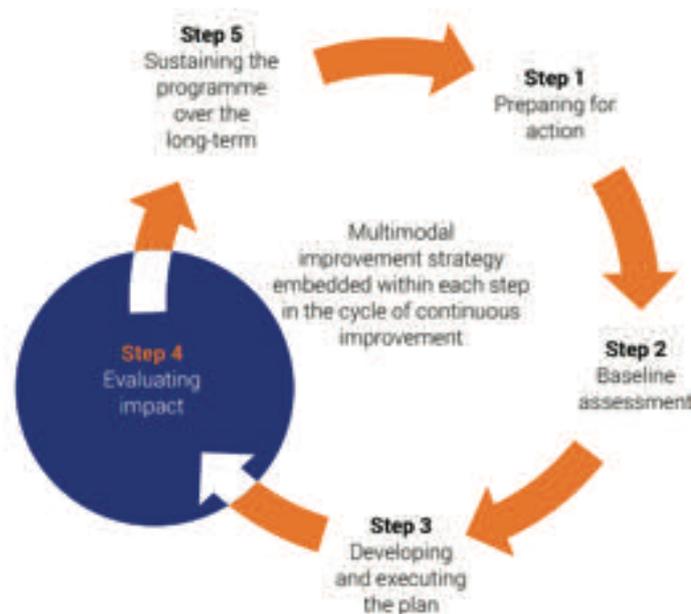
MONITORING AND EVALUATION

There is little value in monitoring or auditing without timely feedback to managers and health workers at unit/ward level. Regular feedback promotes best practices and over time results in behaviour or system change towards improved quality of care and patient safety, with a goal to reduce HAI and AMR through a MMS approach. As an example, The Best Care...Always! Campaign, which actively guided the implementation of bundles using quality improvement science in South Africa between 2009 and 2016, reduced HAI in public and private hospitals where the approach was implemented.¹⁹³

Monitoring and feedback is also aimed at engaging stakeholders, creating partnerships and developing working groups and networks. As part of quality improvement, monitoring, audit and feedback are important tools for informing and convincing health workers and managers of an existing problem and providing expert input into potential solutions that can then be tested (using PDSA cycles). This should take place in a blame free environment.

The WHO developed a five-step cycle of improvement to support guideline implementation which is grounded in the principles of successful change and improvement in health care. Step four of the cycle is to evaluate the impact of the improvement, thus using the data collected to drive improvement and implement changes where required. See **Figure 21**.¹⁹⁴

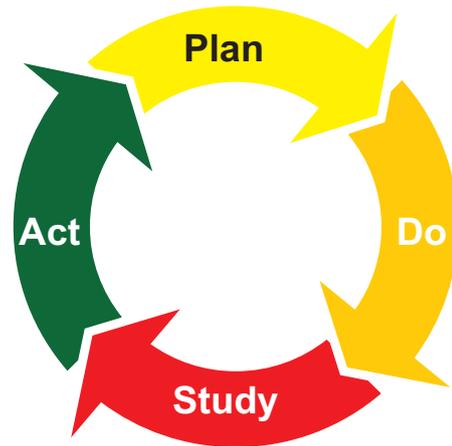
Figure 21: WHO's five-step cycle of improvement



Audit provides a tool for assessing progress and identifying gaps which can be improved in a stepwise manner by testing changes using PDSA (Plan, Do, Study, Act) cycles (**Figure 22**). Time invested in monitoring, audit and timely feedback are driving forces towards improvement - data is used to drive behaviour change.

¹⁹³ Based on the Best Care...Always! Bundles, available from www.bestcare.org.za

¹⁹⁴ Improving infection prevention and control at the health facility: Interim practical manual supporting implementation of the WHO Guidelines on Core Components of Infection Prevention and Control Programmes. Geneva: World Health Organization; 2018 (WHO/HIS/SDS/2018.10)

Figure 22: Plan-Do-Study-Act Cycle

10.1 Regulations for IPC in South Africa

The Norms and Standards Regulations applicable to different categories of health facility should be used to monitor IPC practices as set out in Section 7, 8 and section 9.

Section 7 of the Regulations for clinical management stipulates the following:

- 1) The health facility must establish and maintain clinical management systems, structures and procedures that give effect to national policies and guidelines.
- (2) For the purpose of sub-regulation (1) a health facility must:
 - (b) establish and maintain systems, structures and programmes to manage clinical risk.

Section 8 of the Regulations for infection prevention and control programmes stipulates the following:

- (1) The health facility must maintain an environment, which minimises the risk of disease outbreaks, the transmission of infection to users, health care personnel and visitors.
- (2) For the purposes of sub-regulation (1), a health facility must:
 - (a) ensure that there are HH facilities in every service area;
 - (b) provide isolation units or cubicles where users with contagious infections can be accommodated;
 - (c) ensure there is clean linen to meet the needs of users; and
 - (d) ensure that health care personnel are protected from acquiring infections through the appropriate use of personal protective equipment and prophylactic immunisations.

Section 9 of the Regulations for waste management stipulates the following:

- 1) The health facility must ensure that waste is handled, stored, and disposed of safely in accordance with the law
- (2) For the purposes of sub-regulation (1), the health facility must:
 - (a) have appropriate waste containers at the point of waste generation;
 - (b) implement procedures for the collection, handling, storage and disposal of waste.

10.2 Assessment Tools for IPC

Various tools are available for the assessment of IPC, globally and in South Africa. The recommended tools and frequency of use available to assist health facilities to comply with the Regulations is set out in **Table 43**.

Table 43: Recommended assessment tools for IPC and frequency of use

Tools	Frequency of assessment
WHO HH audit tool	Quarterly
Infection Control Assessment Tool (ICAT) manual for hospitals and PHC facilities. (Management Sciences for health and DOH, 2013)	At a minimum annually as a risk assessment. In an outbreak situation use as indicated
WHO HH Self-Assessment Framework, 2010.	Annually
WHO IPC assessment framework at facility level, (IPCAF) 2018.	Annually

Hospitals should monitor the compliance rate for the implementation of infection control bundles for the prevention of HAIs and HAI rates. See section on HAI surveillance.



Appendices

11. APPENDICES

11.1 Appendix A: Key terms and definitions

Antibiotic: Any class of organic molecule that inhibits or kills microbes by specific interactions with bacterial targets, without any consideration of the source of the particular compound of class.

Antimicrobial: A general term referring to a group of medicines, that includes antibiotics, antifungals, antiprotozoal drugs and antivirals that inhibit the growth of pathogenic microbes.

Antiseptics: An antimicrobial substance that inactivates micro-organisms or inhibits their growth *on living tissue (skin)*. It can be applied to living surfaces such as the skin or mucous membranes. Disinfectants and antiseptics are not interchangeable.

Antiseptic hand rubbing: Refers to the application of antiseptic hand rub (an alcohol-based formulation) to reduce or inhibit the growth of microorganisms without the need for an exogenous source of water and requiring no rinsing or drying with towels or other devices.

Bioburden: The amount of microbes found on a surface (living or inanimate surfaces).

Biohazard: Matter or items that contain living microorganisms that might be/have been hazardous to a handler's health.

Body fluids: Any substance/fluid from the body: blood, excrement (namely urine, stools, vomit, meconium, lochia), secretions (namely, saliva, mucous, sperm, milk and colostrum, tears, wax, caseosa (until first bath)), trans/exudate (namely pleural fluid, cerebrospinal fluid, ascites fluid, synovial fluid, amniotic fluid, pus, sweat), and any biological samples taken from the body (including tissue sample, placenta, cytological sample, organ, bone marrow).

Body Fluid Exposure Risk: Any situation where contact with body fluids may occur leading to contamination risk to either health worker or the environment.

Cleaning: The physical removal of soiling/contamination, such as organic matter, from surfaces or objects, making them safer for use.

Clean/aseptic procedure: Any care activity that implies a direct or indirect contact with a mucous membrane, non-intact skin or an invasive medical device. During such a procedure no organisms should be transmitted.

Colonisation: Colonisation is the presence of micro-organisms in, or on a host but without any clinical signs of an infection or immune response. No antimicrobial therapy is required.

Interbed (privacy) curtains: Curtains that go around a patient's bed to ensure patient privacy.

Contamination: The presence of an infectious agent on a living or non-living surface, often invisible to the naked eye.

Detergent (containing surfactant): Compounds that possess a cleaning action. They are composed of a hydrophilic and a lipophilic part and can be divided into four groups: anionic, cationic, amphoteric, and non-ionic. Although products used for handwashing in healthcare may contain various types of detergents, the term "soap" will be used to refer to such detergents in these guidelines.

Deep cleaning: Deep cleaning (often referred to as spring cleaning) involves cleaning walls, ventilation shafts and storage areas, floors, windows, ceilings, etc in all clinical and non-clinical areas. In some situations, temporary closure of such areas is required whilst deep cleaning is taking place. In clinical areas, medical equipment has been appropriately moved and or disconnected.

Disinfectant: Antimicrobial agents that are applied to non-living objects to destroy micro-organisms, excluding spores. They are used on inanimate objects (furniture and the environment) and surfaces because they have adverse effects on living tissue.

Disinfection: Process of removing microorganisms (except spores).

Efficacy/efficacious: The (possible) effect of the application of a chemical such as HH formulation when tested in laboratory or in vivo situations.

Effectiveness/effective: The clinical conditions under which a HH product has been tested for its potential to reduce the spread of pathogens, e.g., in field trials.

EMS: An organisation or body that is dedicated, staffed and equipped to operate an ambulance, medical rescue vehicle or medical response vehicle in order to offer emergency care.

Endogenous flora: Bacteria which reside within the human body.

Exogenous flora: Bacteria which do not reside within the body and are usually found in the environment or have been introduced by other means such as hands or medical devices.

Fomites: Any articles which have been in contact with a patient that may transmit infectious microorganisms.

General linen: Linen that has gone through proper laundry processing to be rendered safe to handle by staff and ready for general patient use.

Hand Hygiene: A general term referring to any action of hand cleansing. Hand rubbing with an alcohol-based hand rub (ABHR) or handwashing with soap and water aimed at reducing or inhibiting the growth of micro-organisms on hands.

Handwashing: Refers to the action of washing hands with plain (non-antimicrobial) soap and water. Hands must be dried thoroughly after washing

Healthcare-associated Infections (HAI): These infections occur as a result of receiving healthcare, whether in a hospital or an out-of-hospital setting and not present or incubating at the time of admission. Generally, they do not manifest within the first 48 hours after contact with healthcare services. Some surgical site infections may only manifest after discharge, 30 days post-operatively and up to 90 days in the case of a prosthesis or implant. Occupational-related infection and iatrogenic infections are also classified as HAI.

Healthcare area/zone: Refers to all regions outside of the patient zone. Also referred to as the “patient surroundings”, i.e. other patients and their patient zones and the wider healthcare environment. This includes the curtains, partitions and doors between separate patient areas. The healthcare zone can include shared patient areas. Organisms found within the healthcare zone are foreign to the patients and potentially harmful to all patients. For EMS, the healthcare area could include the front cab of the ambulance including door handles any clean or sterile supplies located in the ambulance compartments including, PPE, clean linen, the EMS bag and portable oxygen bag, portable radios and crew phones.

Health facility (establishment): The whole, or part, of a public or private health institution, facility, building or place, whether for profit or not, that is operated or designed to provide treatment; diagnostic or therapeutic interventions, nursing, rehabilitative, palliative, convalescent, preventative or other health services such as emergency medical services (EMS).

Health care general waste: The non-hazardous components of waste generated by a generator and can include liquids, but excludes healthcare risk waste; and healthcare waste generated from isolation wards.

Healthcare risk waste (HCRW): The hazardous portion of waste (solid and liquid) generated in a health establishment, that includes waste generated from the treatment, prevention and diagnosis of disease in humans, infectious waste, infectious sharps and pharmaceutical waste (expired, unused, spilt or contaminated drugs, medicines and vaccines, including packaging materials).

Healthcare waste: Waste generated at a health facility and includes both healthcare general waste and healthcare risk waste.

Healthcare waste disposal: The burial, deposit, discharge, abandoning, dumping, placing or release of any waste into, or onto, any land.

Health worker: Any person who delivers healthcare and services (directly or indirectly) in a health facility to users. It includes healthcare professionals and support staff (cleaners, food service

workers, laundry staff, administrative staff etc.).

Healthcare professional: A person providing health services in terms of any law, including in terms of the following Acts:

- (a) Allied Health Professions Act, 1982 (Act No. 63 of 1982);
- (b) Health Professions Act, 1974 (Act No. 56 of 1974);
- (c) Nursing Act, 1978 (Act No. 50 of 1978);
- (d) Pharmacy Act, 1974 (Act No. 53 of 1974); and
- (e) Dental Technicians Act, 1979 (Act No. 19 of 1979).

High touch surfaces: Frequently touched surfaces.

High-risk settings: Operating theatre, Neonatal unit, Intensive care units, Maternity units, Dialysis Units.

Infection Control Bundles: A set of evidence-based practices (generally three to five) that have been proven to improve patient outcomes when performed consistently all the time.

Infectious linen: Linen used in the care of patients with communicable disease or colonised/infected with multidrug-resistant organisms (patients nursed with isolation precautions).

Infested linen: Linen used on patients with parasites like scabies, lice, fleas and bedbugs.

Low touch surfaces: Areas that are touched less often.

Major waste generator: A generator (facility) that generates more than 20 kilograms per day of health risk waste, including the container, calculated monthly as a daily average.

Medical surveillance: is a planned programme or periodic examination (which may include clinical examinations, biological monitoring or medical tests) of employees by an occupational health practitioner or, in prescribed cases, by an occupational medicine practitioner.

Minor waste generator: A generator (facility) that generate less than 20kilograms, example PHC and EMS.

Multimodal improvement strategies: Comprises of several components implemented in an integrated way with the aim of improving an outcome and changing behaviour. It includes tools, such as bundles and checklists, developed by multidisciplinary teams that considers local conditions. The five most common components include: (i) system change (availability of the appropriate infrastructure and supplies to enable IPC good practices); (ii) education and training of healthcare workers and key players (for example, managers); (iii) monitoring infrastructures, practices, processes, outcomes and providing data feedback; (iv) reminders in the workplace/communications; and (v) culture change within the health facility or the strengthening of a safety climate.

Negative pressure ventilation system: Negative pressure is used in areas where it is essential to prevent the escape of contaminated air from an isolation room through the door or other gaps towards other patient areas. It is created by extracting more air from a room than is supplied to the room so that the infectious droplet nuclei are contained within a room by a continuous air current being pulled into the room under the door. The air in the room is kept at negative pressure compared to the other areas and the air must be safely removed from the room to the outside.

Patient: Refers to a person receiving or registered to receive medical treatment.

Patient Zone: Includes the patient and the patient's immediate surroundings. The patient zone is the area that is temporarily and exclusively dedicated to an individual patient for their care. This typically includes the patient and all inanimate surfaces that are touched by or in direct physical contact with the patient such as the bed rails, bedside table, bed linen, infusion tubing and other medical equipment. It further contains surfaces frequently touched by health workers while caring for the patient, such as monitors, knobs and buttons, and other touch surfaces. Since the patient's flora rapidly contaminates the entire patient zone, it should be thoroughly cleaned

after one patient leaves, before the next patient arrives. Within the patient zone there are two critical sets of sites, a) clean sites (e.g., intravenous/ IV access point) that need to be protected against microorganisms, and b) body fluid sites (e.g., indwelling urinary catheter) that may lead to exposure to body fluids. Point-of-care products should be accessible without having to leave the patient zone. For emergency medical service (EMS) the patient zone (in an ambulance) is the entire area where the patient is housed and transported including the stretcher with a patient on it, linen, patient care equipment including monitor patient belongings, paper/electronic patient care report and transfer documents, contact surfaces in the ambulance during patient transport, and door internal handles.

Persistent activity: The prolonged or extended antimicrobial activity that prevents the growth or survival of microorganisms after application of a chemical such as antiseptic. Also called “residual”, “sustained” or “remnant” activity. Both substantive and non-substantive active ingredients can show a persistent effect significantly inhibiting the growth of microorganisms after application.

Plain soap: Detergents that contain no added antimicrobial agents or contain antimicrobial agents solely as preservatives.

Point of Care: The place where three elements come together: the patient, the healthcare worker and care or treatment involving contact with the patient or his/her surroundings (within the patient zone).

Procedure: An act of care for a patient where there is a risk of direct introduction of a pathogen into the patient’s body.

Positive pressure system: In a positive pressure system, the room is in positive pressure and the air in the room is leaked out through the doors, windows or other openings. This allows airborne microorganisms that may infect the patient to be kept away from the patient, an example of its use is in operating theatres.

Segregation of health care waste: Systematic separation of health care waste into designated categories.

Single-use devices: “Single use” in terms of a medical device means one use of a medical device on an individual or one use of an in vitro diagnostic medical device (IVD) on a sample during a single procedure and then the medical device or IVD is disposed of and is not reprocessed and not used again (9 Dec 2016 Regulations relating to medical devices and IVDs).

Soiled linen: Linen that is visibly soiled with blood, other body fluids, and/or faecal matter.

Soiling: The visible presence of dirt or offensive matter on a living or non-living surface that should be clean.

Theatre linen: Cotton drapes that are used for sterile fields in the operating theatre and are sterilized by the SSD after they have been laundered.

Terminal cleaning: The process of rendering a patient room free from the possibility of transmitting infection after a patient has left the room.

Used linen: Linen that has been used in patient care but is not visibly soiled.

Visibly soiled hands: Hands on which dirt or body fluids are visible.

11.2 Appendix B: Poster - Five moments of hand hygiene

July 2020

Hand hygiene

Remember the 5 moments for hand hygiene

1 Before touching a patient

2 Before doing a procedure

3 After exposure to body fluids

4 After touching a patient

5 After touching patient surroundings



11.3 Appendix C: Poster - How to hand rub

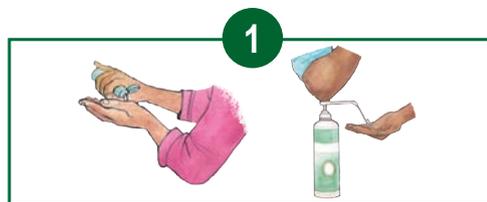
July 2020

How to hand rub

- Use 70% alcohol-based hand rub (ABHR).
- If hands are visibly soiled, rather use soap and water.
- Keep nails short and clean. Avoid artificial nails as they do not allow for adequate cleaning/disinfection.

20
seconds

Clean your hands for at least 20 seconds using steps below:



- Apply palmful of ABHR to cupped hand.
- Use elbow to dispense where able.



Rub tips of nails against palm. Swap hands.



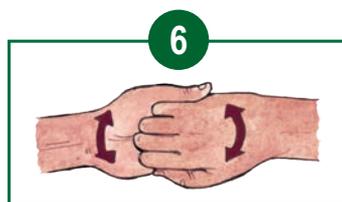
Rub palms together.



Place one hand over back of other, rub between fingers. Swap hands.



Rub fingers between each other.



Grip fingers and rub together.



Rub each thumb with opposite palm. Swap hands.

Once dry, your hands are safe.

11.4 Appendix D: Poster – How to wash your hands

July 2020

How to wash your hands

- Wash visibly soiled hands with soap and water, otherwise use alcohol-based hand rub.
- Keep nails short and clean. Avoid artificial nails as they do not allow for adequate cleaning/disinfection.

Wash your hands for 40-60 seconds using steps below:

40-60
seconds



1
Wet hands in clean water and apply soap to palm.



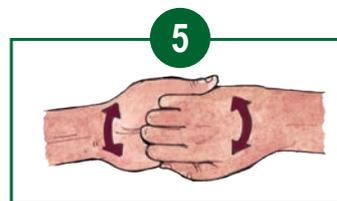
2
Rub palms together.



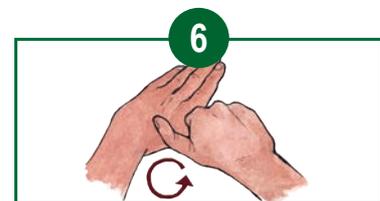
3
Place one hand over back of other, rub between fingers. Swap hands.



4
Rub fingers between each other.



5
Grip fingers and rub together.



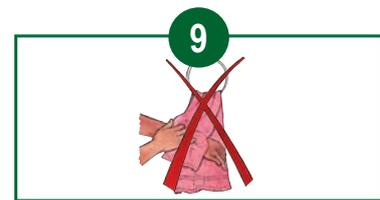
6
Rub each thumb with opposite palm. Swap hands.



7
Rub tips of nails against palm. Swap hands.



8
Rinse hands with water.



- Avoid shared towels.
- Dry using paper towel.
- Use paper towel to turn off tap.

Once dry, your hands are safe.

11.5 Appendix E: Poster – Surgical hand preparation

July 2020

Surgical hand preparation

Save lives: clean your hands

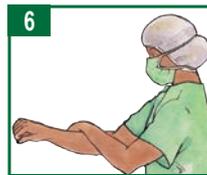
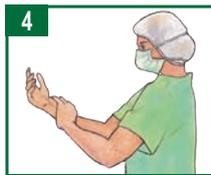
- The handrubbing technique for surgical hand preparation must be performed on perfectly clean, dry hands.
- After the operation when removing gloves, hands must be rubbed with alcohol-based hand rub (ABHR), or washed with soap and water if necessary.
- Surgical procedures may follow each other using ABHR as a surgical hand preparation if the following handrubbing technique is followed:



1 Dispense ± 5mL (3 doses) of ABHR into palm of left hand.



2 Dip fingertips in ABHR to decontaminate under nails (5 seconds).



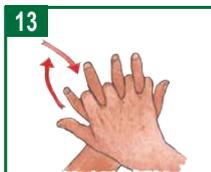
Smear ABHR over right forearm up to elbow until fully evaporated (10-15 seconds).



Repeat for other hand and arm.

Dispense another ± 5mL into clean hands.

Rub palms together.



13 Place one hand over back of other, rub between fingers. Swap hands.



14 Rub fingers between each other.



15 Grip fingers and rub together.



16 Rub each thumb with opposite palm. Swap hands.



17 The surgical hand rub is complete.

Source: NDoH. *Practical manual for implementation of the National Infection Prevention and Control Strategic Framework. 2020*

Adapted from the Infection Control Society of South Africa (ICSSA) and World Health Organization (WHO) and sponsored by the Knowledge Translation Unit (KTU).

Pires, D., Bellissimo-Rodrigues, F., Soule, H., Gayet-Ageron, A., & Pittet, D. (2017). Revisiting the WHO "How to Handrub" Hand Hygiene Technique: Fingertips First? *Infection Control & Hospital Epidemiology*, 38(2), 230-233. doi:10.1017/ice.2016.241



11.6 Appendix F: Poster – Donning of PPE

July 2020

Put on PPE correctly (donning)

1 Clean hands for at least 20 seconds



2 Put on apron/gown

- If apron, place loop over head and tie behind back.
- If gown, cover front and tie at back of neck and waist.
- When fastening, use a bow (not a knot) for easy release.



3 Put on mask/respirator

- Secure ties or elastic bands at middle of head and neck.
- Mould flexible band to nose bridge (do not pinch).
- Ensure mask is pulled down under chin.
- If respirator, check good fit by breathing in and out: mask should move in and out with breath (air should not leak).
- If reusing N95 respirator, put on clean non-sterile gloves before replacing it. Once on face, remove gloves, clean hands and continue to step 4.



4 Put on goggles/visor

- Place over face and eyes.
- Adjust band to fit comfortably.



5 Put on gloves

- Hold edge of glove as you pull it over hand.
- Extend to cover wrist.
- Once gloved, avoid touching other surfaces.



See a video on how to put on PPE correctly here:
www.medicine.uct.ac.za/news/covid-19-resources

11.7 Appendix G: Poster – Doffing of PPE

July 2020

Remove PPE correctly (doffing)

1 Remove gloves

- Using a gloved hand, grasp the palm area of the other gloved hand and peel off first glove.
- Slide fingers of ungloved hand under remaining glove at wrist and peel off second glove over first glove.
- Discard in medical waste bin.



Clean hands

2 Remove apron/gown

- If wearing a visor (not goggles), remove visor as below *before* removing apron/gown.
- Unfasten gown/apron ties.
- If gown: pull gown away from neck and shoulders, touching only inside of gown. Turn gown inside out.
- If apron: touching only inside of apron, pull over head and roll downwards and discard in medical waste bin.



Clean hands

3 Remove goggles/visor

- Remove goggles/visor from the back by lifting head band.
- Place in designated container/area for disinfecting.



Clean hands

4 Remove mask/respirator

- Untie or break bottom ties, followed by top ties or elastic.
- Remove by handling the ties/elastics only and discard in medical waste bin.

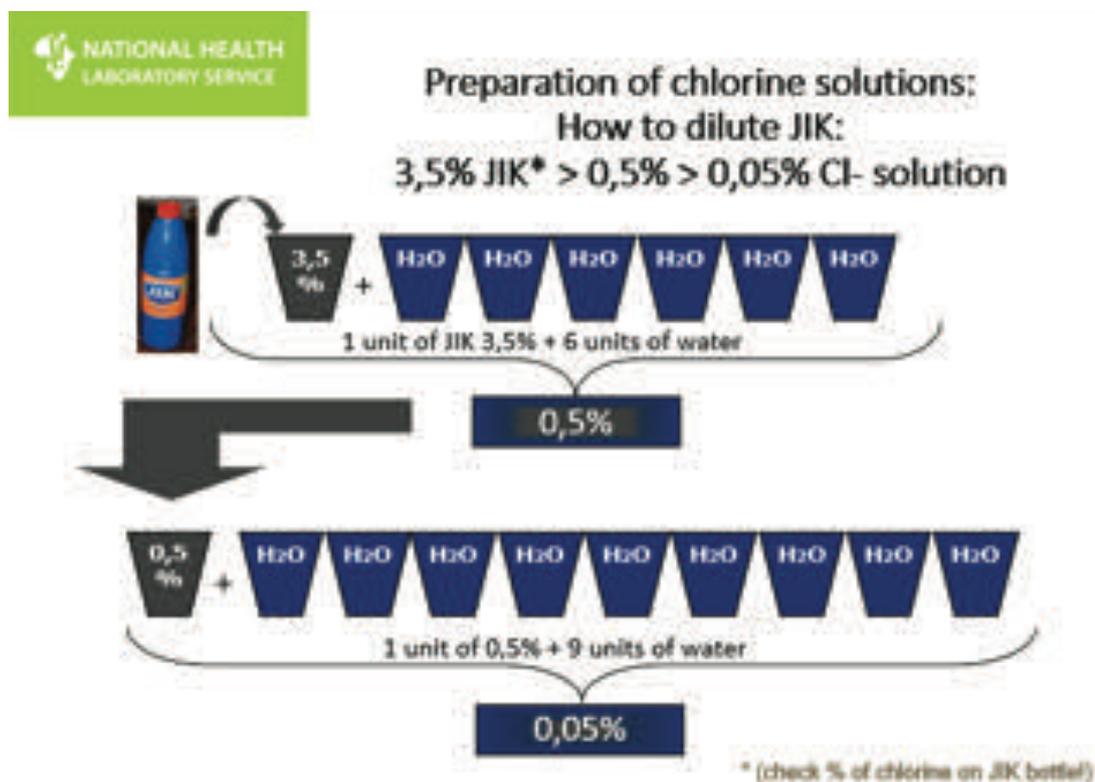
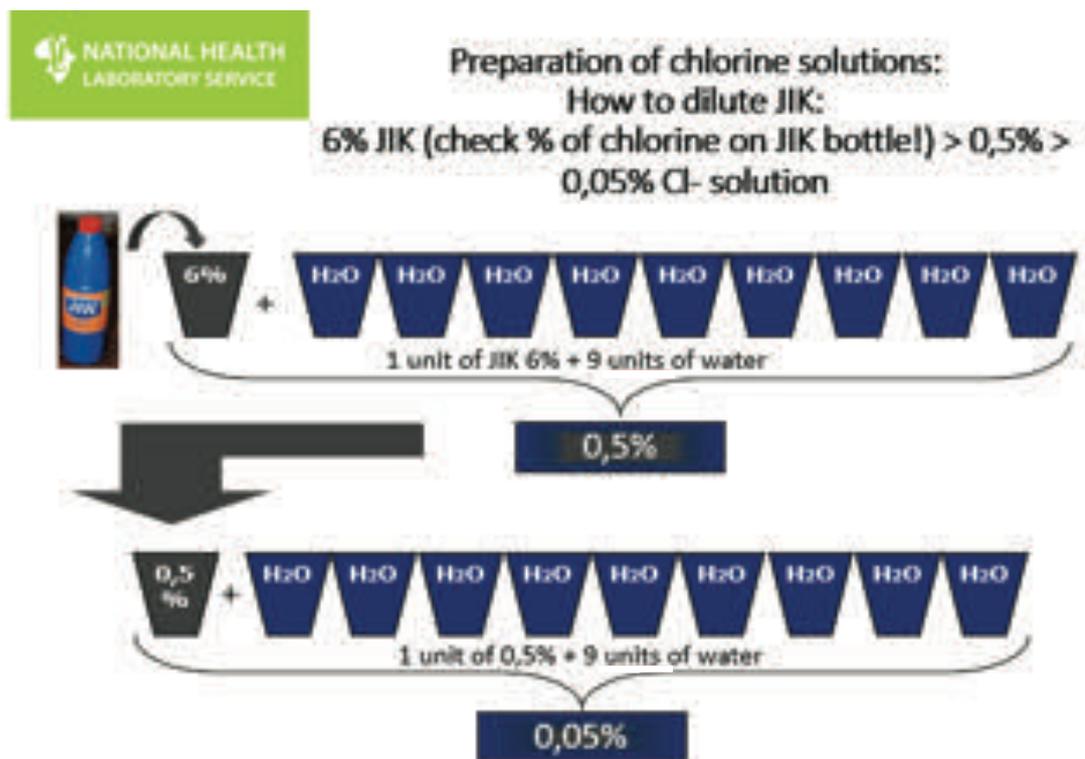


5 Clean hands for at least 20 seconds



See a video on how to remove PPE correctly here:
www.medicine.uct.ac.za/news/covid-19-resources

11.8 Appendix H: How to make up chlorine solutions of different strengths¹⁹⁵



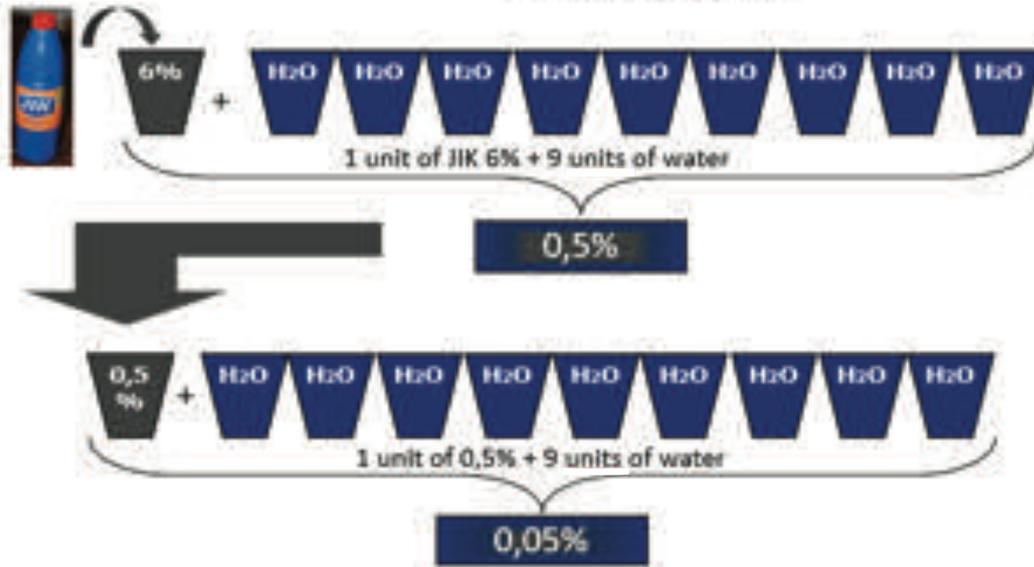
¹⁹⁵ Courtesy Prof Adriano Duse, Head of department of Clinical Microbiology and Infectious Diseases at University of the Witwatersrand, Johannesburg.



Preparation of chlorine solutions:

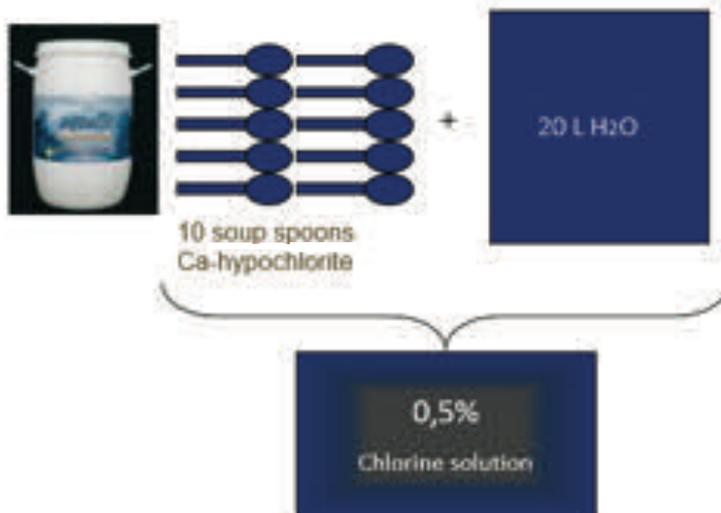
How to dilute JIK:

6% JIK (check % of chlorine on JIK bottle!) > 0,5% > 0,05% Cl- solution



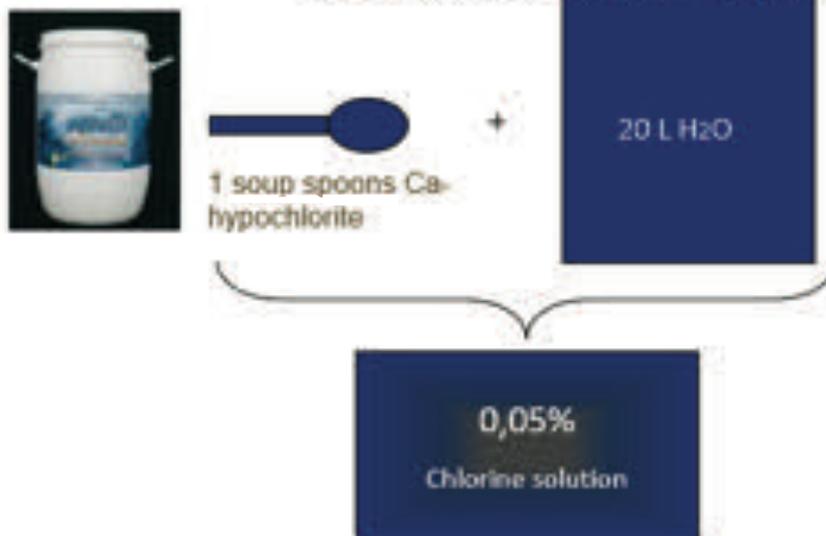
Preparation of chlorine solutions:

How to dilute calcium hypochlorite

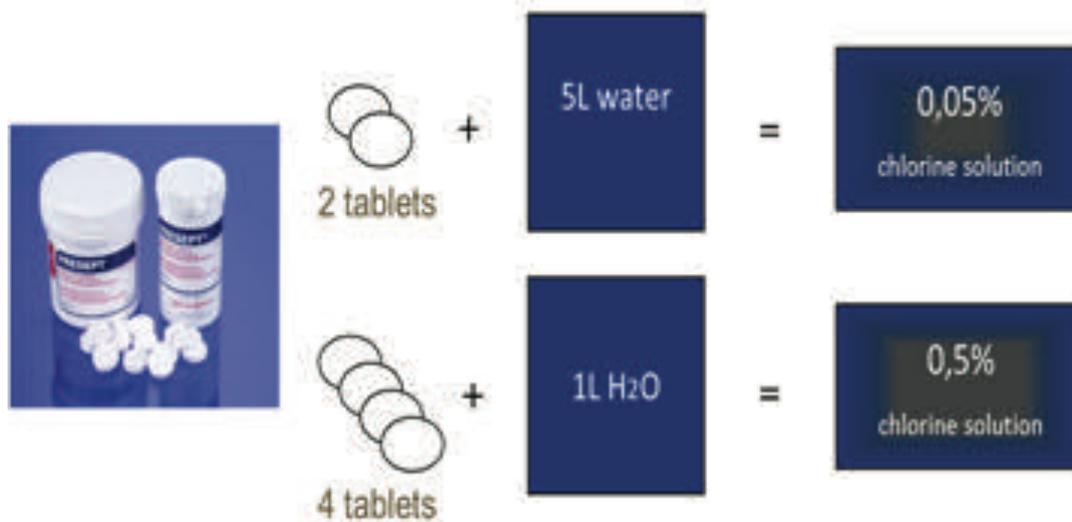




Preparation of chlorine solutions: How to dilute calcium hypochlorite



Preparation of Chlorine Solutions



11.9 Appendix I: Care of Patient Care Articles

Items or site	Preferred method	Alternative methods/ comments
ALL ITEMS SENT FOR DISINFECTION OR STERILISATION TO THE SSD MUST BE THOROUGHLY CLEANED PRIOR TO PROCESSING. This cleaning should be done at SSD and not at ward level.		
PATIENT CARE ARTICLES		
Bed and cots	Wipe with warm water and detergent to remove all visible signs of dust and dirt. Allow to dry.	Ensure the cot is dry after cleaning and before putting back the mattress. Apply disinfectant if indicated (for outbreaks).
Bed frames	Wipe with warm water and detergent. Dry.	NO disinfectants routinely required
Bed locker	Wipe with warm water and detergent. Dry Clean inside locker once patient has been discharged.	NO disinfectants routinely required
Bedpans and urinals	Wear non-sterile gloves. Empty contents directly into the ward washer disinfector (80°C x 1 min). Inspect for cleanliness after removal. Clean if necessary and store inverted to dry.	Macerators with paper mâché bedpans and urinals. <i>Manual cleaning:</i> wear gloves. Empty contents into sluice and rinse. Clean bedpans thoroughly with a soft scrubbing brush and detergent. Rinse. Invert to dry. Wash hands.
Bowls (patient wash bowls)	Wash with detergent, rinse and store inverted to dry.	Modern automatic ward washer disinfectors can also wash bowls. Use fresh water and towels for each patient.
Commodes	Wash seat daily with detergent and hot water and dry with a disposable paper towel. Wipe the commode seat with a large alcohol wipe after each use.	If visibly contaminated, remove visible soiling with toilet paper. Wash with warm water & detergent. Dry Enteric disease: wipe the commode with hypochlorite (1000 ppm) after each use
Crockery and cutlery	Wash at 80°C in dishwasher Manual Cleaning: wear gloves and hand wash in detergent and hot water (60°C), rinse and dry.	Wear domestic gloves for manual cleaning. <i>Infected patients:</i> unless instructed by IPC Team treat as routine. Disposable crockery is rarely indicated.
Curtains, window	Change when visibly soiled or routinely every 4 weeks. Isolation room curtains (infectious cases) should be changed with each terminal clean.	Blinds, both vertical and horizontal are difficult to clean and wash regularly and gather dust. These should not be used in ward areas.

Items or site	Preferred method	Alternative methods/ comments
ALL ITEMS SENT FOR DISINFECTION OR STERILISATION TO THE SSD MUST BE THOROUGHLY CLEANED PRIOR TO PROCESSING. This cleaning should be done at SSD and not at ward level.		
PATIENT CARE ARTICLES		
Curtains, Interbed/privacy	Change when visibly soiled or routinely every 4 weeks. Isolation room interbed curtains should be changed with each terminal clean. Critical care unit interbed curtains must be changed weekly.	
Duvets	An impermeable cover should be used and changed after each patient.	If an impermeable cover is not available, a duvet inner needs to be dry cleaned or laundered after each patient use.
Feeding bottles (baby)	Heat pasteurised in the SSD at 60-65°C x 30 min.	Wash thoroughly. Rinse and soak in a fresh hypochlorite solution (125 ppm available chlorine) x 30 min. Remove, rinse thoroughly and dry. Microwave bottles filled with water to sterilise.
Feeding cups	Wash and clean thoroughly. Dry	May be pasteurised (see feeding bottles)
Infant incubators	Wash all removable parts and clean thoroughly with detergent. Dry with paper towel.	Infected: after cleaning, wipe over with 70% ethanol alcohol or hypochlorite (125 ppm). Leave incubator to stand unused for 6 hours (aeration), depending on the manufacturer's guideline. Disinfectant impregnated wipes may also be used.
Lamps, examination	Wipe with damp cloth daily	Remove all visible blood and body fluid stains. Clean thoroughly with a detergent and water (damp cloth) and disinfect.
Linen	Automated methods preferred	See section on linen management
Mattresses and pillows	Water and detergent to remove visible soiling. Wipe over with an appropriate disinfectant (see adjacent)	Mattress and pillows should have an intact covering, that is fluid and chemical resistant. Both sides of the mattress and pillow must be cleaned after each patient. Chlorine will require rinsing off (wipe off with water) after application because of toxic residue. Alcohol is usually preferred.
Nail brushes	Not recommended - surgical sponges preferred for surgical scrub.	Surgical sponges are single use. Send for heat disinfection if reused.
Nasogastric (feeding) tubes	Disposable	Cannot be reused.

Items or site	Preferred method	Alternative methods/ comments
ALL ITEMS SENT FOR DISINFECTION OR STERILISATION TO THE SSD MUST BE THOROUGHLY CLEANED PRIOR TO PROCESSING. This cleaning should be done at SSD and not at ward level.		
PATIENT CARE ARTICLES		
Patient toilet articles	Patients should bring their own soap, towels, shaving equipment and other personal items which should never be shared.	Razors and sharp items should never be shared between patients.
Pillows	Use waterproof cover.	See section on mattresses.
Rectal thermometer	Wash in detergent after each use. Wipe with alcohol and store dry.	Disposable probe covers.
Scissors	Wipe over with 70% alcohol before and after each use. Store dry	
Sheepskin	Not recommended for routine use unless clinically indicated. Restrict to one patient use only.	Synthetic: laundry Natural: wash in detergent and dry
Soap, liquid (hand washing)	Wall mounted dispenser containers. Single use sachets of liquid soap. OR Containers must be sent for thorough cleaning and heat disinfection if reprocessed; and are refilled under aseptic conditions.	Tablet soaps are not recommended and should never be used between patients. NEVER TOP UP CONTAINERS WITHOUT THOROUGH CLEANING AND HEAT DISINFECTION - increased risk of MDR-GNB colonisation.
MEDICAL DEVICES AND EQUIPMENT USED ON THE WARDS AND CLINICAL AREAS		
Dressing trolleys*	Remove all items daily and wipe surface with warm water and detergent. Dry. Wipe over with 70-80% alcohol. Discard all previous contents of open jars and bottles. Replace with unopened containers.	If open jars are used, keep the volume small so that the containers can be heat disinfected when empty. DO NOT TOP UP OPEN DISINFECTANT CONTAINERS.
Thermometer	Wash and dry after each patient use. Wipe with 70% alcohol swab and store dry. NEVER soak thermometers in disinfectants.	Disposable thermometers
Electronic thermometer with probe cover	Change cover/sleeve after each use. Never use electronic thermometers without a cover/sleeve.	

Items or site	Preferred method	Alternative methods/ comments
ALL ITEMS SENT FOR DISINFECTION OR STERILISATION TO THE SSD MUST BE THOROUGHLY CLEANED PRIOR TO PROCESSING. This cleaning should be done at SSD and not at ward level.		
PATIENT CARE ARTICLES		
Nebulisers ¹	Wash and dry the nebuliser components (chamber and compressor) and mask after each patient use. Store dry and protected from dust. Never cover with a glove. Gloves retain moisture, which is the ideal environment for the duplication of Gram-negative bacilli.	During an outbreak, wipe over with 70% alcohol if indicated.
Airways and endotracheal tubes	Single use disposable OR Heat disinfection at 80°C	Use disposable for airborne diseases if heat sterilisation not available.
Bag-valve-mask/manual resuscitator	Send to SSD for heat disinfection.	Ethylene oxide disinfection. Do not soak in a disinfectant such as glutaraldehyde. OR Single patient use disposable.
Bowls (dressing, surgical)	Return to SSD.	Disposable
Endo-tracheal suction catheters	Decontaminate hands thoroughly before carrying out suction. Disposable – closed in-line suction can be used for 24 hours on the same patient. Flush silicone/PVC suction tubing with sterile water after each use. The sterile water bowl is washed and dried after each suction procedure. Fill bowl with sterile water just prior to use.	Decontaminate hands thoroughly before carrying out suction. Do not share suction catheters between patients. DO NOT RECYCLE SUCTION CATHETERS
Humidifier, bubble ¹	Single use disposable (not refilled) OR Single use disposable (but refillable) - empty and refill daily with sterile water only.	<i>Humidifiers used by EMS that are not disposable must be heat disinfected; refer to IPC practitioner for site-specific methods.</i>
Instruments (surgical)	To SSD for decontamination	Rinse at point of use prior to transport to the SSD

Items or site	Preferred method	Alternative methods/ comments
ALL ITEMS SENT FOR DISINFECTION OR STERILISATION TO THE SSD MUST BE THOROUGHLY CLEANED PRIOR TO PROCESSING. This cleaning should be done at SSD and not at ward level.		
PATIENT CARE ARTICLES		
Laryngoscope blade	Removable heat stable blades with detachable bulbs are sent to SSD	Wash with detergent, rinse and dry. Wipe over with alcohol
Laryngoscope handle	Clean with a soft brush and detergent, wipe with a damp cloth and then wipe with 70% alcohol to disinfect. Handles have grooves, which make it difficult to clean and handles are often contaminated with body fluids.	Do not soak the handle in a disinfectant solution
Oxygen masks	Disposable (single use).	If reusable (must be stipulated by the manufacturer): wash thoroughly until visibly clean or use heat disinfection (SSD). Dry. OR Wipe with alcohol. Discard when damaged.
Suction devices	Disposable single use inner liner disposed in medical waste when full or after each patient. OR Empty the reservoir in the sluice after use, wash with warm water and detergent and store dry. Disposable suction tubing recommended. Clean the surface and cover after each use.	PPE – non-sterile gloves and apron Never leave fluid (secretions or disinfectant) in the reservoir if not in use. Suction tubing cannot be adequately cleaned or sterilised because it has a narrow lumen, and it is too long for steam to penetrate.
Respiratory/ventilator tubing	Disposable preferred OR Reprocessed in SSD in an automated washer disinfectant specifically designed for respiratory tubing.	NEVER use glutaraldehyde to disinfect respiratory equipment.
Ultrasound probe	Clean with a detergent and a damp cloth and disinfect with 70% isopropyl alcohol between each patient use Intra-vaginal: in addition to cleaning after each patient use, cover the probe with a new condom for each patient.	The ultrasound gel is difficult to remove and must be totally removed before the probe can be disinfected.

Items or site	Preferred method	Alternative methods/ comments
ALL ITEMS SENT FOR DISINFECTION OR STERILISATION TO THE SSD MUST BE THOROUGHLY CLEANED PRIOR TO PROCESSING. This cleaning should be done at SSD and not at ward level.		
PATIENT CARE ARTICLES		
Ventilators	<p>These are complex and should be cleaned and disinfected according to manufacturer's instruction by a trained health worker.</p> <p>Sometimes there are technicians in the health facility who do the maintenance. These persons should be trained by the manufacturer.</p>	<p>Remove tubing and send for heat disinfection to SSD (80oC x 3 min) or ethylene oxide.</p> <p>Clean all connections.</p> <p>Change both sets of filters.</p> <p>Check efficiency of air movement. Reassemble.</p> <p>Clean the outside of ventilator.</p> <p>Document in logbook with the name of the previous patient, date of disinfection and the name of the person who did it.</p>
Wound suction (closed drainage)	<p>Remove lid and carefully remove inner liner containing fluid. Dispose of in infectious waste container or sluice.</p> <p>Wash and clean the outer cover, dry and replace bag. Check the valves and connectors are clean and functioning.</p>	<p>Send for heat disinfection after each patient use.</p>
X-Ray equipment	<p>Daily damp dust. Wipe X-Ray film holders with alcohol between each patient.</p>	

**Open containers are a high-risk area for transmission from hands of staff; and contamination from the environment and should be avoided.*

1 = Respiratory equipment ideally should be disposable (risk of TB). If reused, then ensure the items are sent to the SSD for automated processing and heat disinfection. Soaking of respiratory equipment at ward level is unacceptable.

2 = Ventilators should be protected with internal and external filters and cleaned after patient use.

11.10 Appendix J: Poster Cough etiquette

July 2020

Cover your cough and sneeze



DON'T

Don't cough or sneeze without covering your mouth and nose.



Cover your mouth and nose with a tissue and throw it away immediately after use.

DO



Cough or sneeze into your upper sleeve.



Cough or sneeze inside your shirt or top.



Wash your hands with soap and water immediately after coughing or sneezing.

11.11 Appendix K: Device capture sheet

a. Device Capture Sheet for Wards

Ward name: _____

Year: _____ Month: _____

Patient name and surname	Number of days device inserted
Central Line-Associated Blood Stream Infection (CLABSI)	
Total number of central line days	

Patient name and surname	Number of days device inserted
Peripheral Line-Associated Blood Stream Infection (PLABSI)	
Total number of peripheral line days	

Patient name and surname	Number of days device inserted
Catheter-Associated Urinary Tract Infections (CAUTI)	
Total number of catheter days	

Patient name and surname	Number of operative procedure days
Operative procedures (for Surgical site infections (SSI))	
Total number of operative procedure days	

Patient name and surname	Number of days device inserted
Ventilator-Associated Pneumonia (VAP)	
Total number of ventilator days	

Or alternatively a combined capture sheet can be used:

Day of the month	Total patients ventilated (exclude non-invasively ventilated)	Total patients with CVP lines	Total patients with indwelling urinary catheters (exclude Supra pubic & Condom Catheters)	TOTAL patients with devices
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Total				

b. Aggregated Device Capture Sheet for the Health Facility

Name of health facility: _____

Year: _____ Month: _____

Name of ward	Total Number of device days per ward
Central Line-Associated Blood Stream Infection (CLABSI)	
Total number of central line days for facility	

Name of ward	Total Number of device days per ward
Peripheral Line-Associated Blood Stream Infection (PLABSI)	
Total number of peripheral line days for facility	

Name of ward	Total Number of device days per ward
Catheter-Associated Urinary Tract Infections (CAUTI)	
Total number of catheter days for facility	

Name of ward	Total Number of operative procedures for facility
Operative procedure days (for Surgical site infections (SSI))	
Total number of operative procedure days for facility	

Name of ward	Total Number of device days per ward
Ventilator-Associated Pneumonia (VAP)	
Total number of ventilator days for facility	

11.12 Appendix L: Bundle compliance audit forms for VAP, SSI, CAUTI, CLABSI

a. Bundle Compliance audit form for VAP

Criteria	DAY (mark '1' if compliant)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Head of bed elevated 30 - 45°															
2. Mouth care done and recorded 6 hourly															
3. Appropriate antiseptic used – chlorhexidine 2% (adults); saline / sterile water (babies)															
4. Readiness to extubate assessed daily															
5. Utilization of endotracheal tubes with subglottic secretion drainage															
6. Initiation of safe enteral nutrition within 24-48h of ICU admission															
Total bundle compliance for VAP (score out of 6)															
% Compliance (=Total/6)															

b. Bundle Compliance audit form for SSI

Criteria	Days (mark '1' for compliant)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Prophylactic antibiotics															
1. Were antibiotics commenced within 1 hour before surgical incision (where indicated)															
Hair removal															
2. No hair removal or hair removed by clipper or depilatory cream= compliant															
3. Hair removal by shaving= non-compliant															
Glucose control-major cardiac surgery patients only															
4. Were serum glucose levels below 11.1mmol/L on the first 2 days post-operation?															
5. Was a glucose control protocol used- sliding scale or insulin IV?															
Post-operative normothermia-any major open abdominal procedure.															
6. First temperature taken on return to ICU is within the range 36-38 degree Celsius?															
7. Was temperature recorded peri-operatively?															
8. If patient's core temperature peri-operatively was at or below 36 degrees Celsius, were warming procedures used e.g., forced-air blankets, warmed IV fluids, warming blanket under patient on operation table, hats and booties?															
Total bundle compliance for SSI (score out of 8)															
% Compliance (=Total/8)															

c. Bundle Compliance audit form for CAUTI

Criteria	Days (mark "1" if compliant)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Avoid unnecessary urinary catheterization															
2. Has the catheter necessity been reviewed today and documented if necessity is not obvious to the auditor? See insertion checklist below															
3. Aseptic insertion of catheter															
4. Has a sterile pack been used – evidence on charge sheet?															
5. Maintain urinary catheter based on recommended guidelines. At the time of the audit:															
5.1 Is the bag below the patient's bladder?															
5.2 Is the catheter appropriately secured?															
5.3 Is there unobstructed flow of urine?															
5.4 Has peri-urethral care been documented at least 12 hourly and after bowel movements?															
Total bundle compliance for CAUTI (score out of 8)															
% Compliance (=Total/8)															

Urinary Catheter Insertion Checklist (urethral, indwelling catheter)

AIM: to prevent catheter-associated urinary tract infection.
This is a high – impact intervention checklist.

Date: ____ / ____ / ____ Start time: _____ Nursing Unit: _____

Form complete by: _____ Catheter inserted by: _____

Please attach a patient sticker	YES	NO
Have the alternatives to dwelling catheterisation been considered?		
Indicate the reason for catheterisation:		
H. Haematuria		
O. Obstruction – patient cannot empty bladder completely		
U. Urology surgery or pelvic or abdominal surgery necessitating catheterisation		
D. Decubitus ulcer: The patient has open wounds or pressure sores around the buttocks that are frequently soiled / contaminated		
I. Intake and output measuring necessary		
N. Nursing end of life or patient is severely ill, / injury that makes moving or changing very painful		
I. Immobility		
Has the operator been deemed competent in performing this procedure, or is this procedure being supervised by a competent person? Supervisor:		
Operator & Supervisor:		
A. Bare-Below – Elbows: no long sleeves, rings, bangles, amulets, wristwatches		
B. Clean plastic apron donned		
C. Hand hygiene performed		
D. Aseptic technique maintained throughout		
Has the smallest gauge catheter for effective drainage of urine been selected?		
Type.....		
Size.....		
Is this the catheter positioned below level of the bladder on a clean stand that prevents any part of the catheter drainage system coming into contact with the floor?		
Is the catheter firmly secured to the urine collection bag to ensure the system remains closed?		
Is the catheter secured to the leg to prevent traction on the urethra?		

d. Bundle Compliance audit form for CLABSI

Criteria	Days (mark "1" if compliant)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Item 1: Optimal siting of central line															
1. Has the insertion site been risk assessed?															
Item 2: Central line Insertion															
2. Has Hand Hygiene been documented on the insertion checklist?															
3. Central line insertion checklist is placed in the patients file? (see next page)															
4. Central line insertion trolley is ready for use? (including stock, drapes etc)															
Item 3: Daily review of line necessity															
5. Is the indication for line necessity recorded if not obvious to the auditor on the day of the audit? (e.g., If patient is on inotropes, CVP is needed)															
Item 4: Line Dressing															
6. Is the line dressing visibly clean and intact at time of the audit?															
Total bundle compliance for CLABSI (score out of 6)															
% Compliance (=Total/6)															

Central line Insertion Checklist

AIM: to prevent central line-associated bloodstream infection.
This is a high-impact intervention checklist.

Date: ____ / ____ / ____ Start time: _____ Nursing Unit: _____

IS THIS AN EMERGENCY PROCEDURE? **YES** **NO**

Please attach a patient sticker	YES	NO
Insertion site risk assessed beforehand		
Patient positioned correctly for procedure prior to gloving and gowning		
For the practitioner inserting the line and assistant:		
• Non-sterile cap (covering head and facial hair) and mask donned		
• Hand hygiene performed		
• Sterile gown and gloves donned		
Skin prepped with chlorhexidine in 70% isopropyl alcohol before draping		
• Solution generously applied using a back and forth friction rub for around 30 seconds		
• Solution allowed to dry before skin is punctured		
Patient's head and body covered with sterile drapes as per theatre draping technique		
Sterility maintained throughout procedure		
Sterile dressing applied to cover insertion site		
Was a correction required to ensure compliance with Safety & Infection Prevention practices? Explain.		

Insertion site specifics:

- Subclavian
 Internal Jugular
 Femoral
 Other:

Rationale _____

Form completed by: _____ **Signature:** _____

Please place completed checklist in patient's file.

Thank you.

11.13 Appendix M: Checklist for ensuring safety of the health worker treating patients with VHF

EVERYONE entering the isolation facility should complete one of these forms ON EACH ENTRY INTO THE PATIENT’S ROOM.¹⁹⁶

Report to Nurse or Doctor in charge Yes/ No.

Signed in _____ Signed out _____

Date: _____

Name: _____

Doctor/ Nurse/ Physio/ pharmacist/ anaesthetist (circle one)

Speciality (such as ID/IPC) _____

Reason for entering the room _____

Time of entry _____ Time of exit _____

Items	Mark Yes/No	Items	Mark Yes/No
Changed into scrubs		Changed into gumboots	
Put on balaclava (wrap around hood & neck)		Hair tucked in	
Put on waterproof full body cover - with leggings if foot not included		Put on waterproof gown with plastic apron on the outside	
Put on goggles – comfortable but firm- good seal		Face cover (surgical or respirator) to cover maximum part of the face and exposed skin	
Wear a shield or face guard			
Checked gloves for perforations		Put on two pairs of gloves (one inside and the other outside the sleeve)	
THE NURSE IN CHARGE WILL CHECK THE APPROPRIATE WEARING OF PPE AND TICK THE FORM			
The laboratory pack is handed over		All medical devices used on the patient are recorded below	
Complete list below BEFORE entering the patient’s room example shown below	Provided Yes/ No	Check list AFTER leaving the patient’s room	Used Yes/No
Needles and syringes			
IV Cannulae			

¹⁹⁶ Viral Haemorrhagic Fever (VHF) / Ebola Viral Disease (EVD) Protocol for Tygerberg Hospital

Complete list below BEFORE entering the patient's room example shown below	Provided Yes/No	Check list AFTER leaving the patient's room	Used Yes/No
Report upon leaving the Patient's room			Yes/ No
Exposure to blood or body fluids (tick as appropriate)			
• Needle stick Injury			
• Splashing			
• Secretions, saliva			
• Cough			
• Vomit			
• Faeces			
Linen change - bagged and labelled			
Waste removal - bagged and labelled			
Bedpan given			
Urinal given			
Blood samples taken			
Removal of PPE as prescribed			
Hand hygiene - with soap and water AND alcohol rub			
Other comments - completed clinical notes			

Signed by Nurse in charge before filing

Date

Observation of VHF Contact for 21 days from last date of potential exposure to infection¹⁹⁷

Name of facility: _____ Name of contact person: _____
 Residential address: _____ Date of last exposure to infection: _____
 Name of observation officer: _____ Nature of exposure to infection: _____

Day of observation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Date																						
Seen by																						
am temperature																						
pm temperature																						
Headache																						
Neck rigidity																						
Mood changes																						
Muscle pain																						
Joint pain																						
Backache																						
Chest pain																						
Abdominal pain																						
Sore throat																						
Nausea																						
Vomiting																						
Diarrhoea																						
Jaundice																						
Rash																						
Bruising																						
Bleeding (specify)																						
Other (specify)																						

¹⁹⁷ Viral Haemorrhagic Fever (VHF) / Ebola Viral Disease (EVD) Protocol for Tygerberg Hospital

