



Ministry of Health Malaysia

DISINFECTION GUIDELINES

2nd EDITION
2019



Infection Control Unit
Medical Care Quality Section
Medical Development Division
Ministry of Health, Malaysia

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2nd Edition, 2019

Produced & Distributed by:
Infection Control Unit
Medical Care Quality Section
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Disinfection Guidelines

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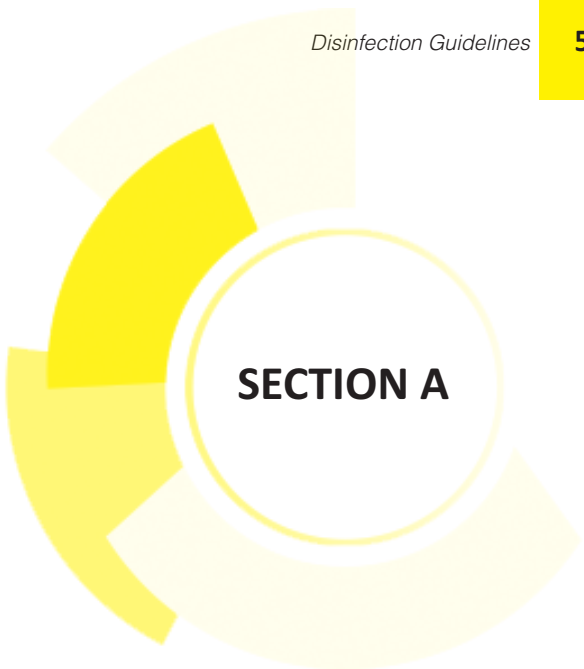
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SECTION A

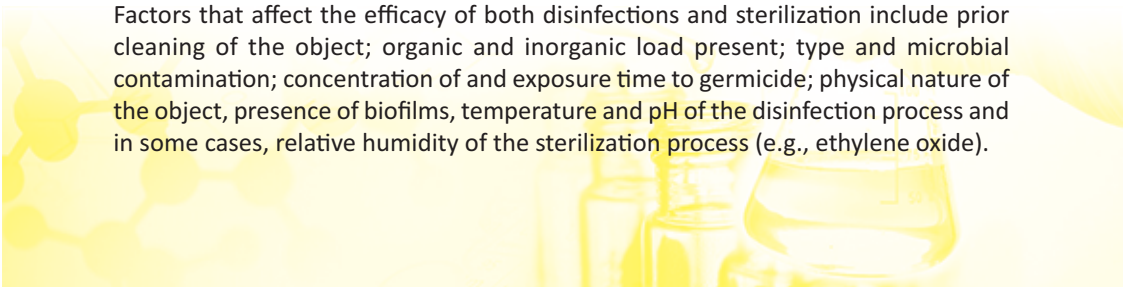
INTRODUCTION

In Malaysia, surgical procedures and even more invasive medical procedures including gastrointestinal endoscopies are performed everyday. Each procedure involves contact by a medical device or surgical instrument with a patient's sterile tissue or mucous membrane. A major risk of all such procedures is the introduction of pathogens that can lead to infection. Failure to properly disinfect or sterilize equipment carries not only risk associated with breach of host barriers but also risk for person-to-person transmission eg hepatitis B virus and environmental pathogen eg. *Pseudomonas aeruginosa*.

Disinfection is essential for ensuring that instruments and environment do not transmit infectious pathogens to patients. Because sterilization of all patient-care items is not necessary, health-care policies must identify, primarily on the basis of item intended use, whether cleaning, disinfection, or sterilization is indicated.

Multiple studies in many countries have documented lack of compliance with established guidelines for disinfection. Failure to comply has led to numerous outbreaks.

Factors that affect the efficacy of both disinfections and sterilization include prior cleaning of the object; organic and inorganic load present; type and microbial contamination; concentration of and exposure time to germicide; physical nature of the object, presence of biofilms, temperature and pH of the disinfection process and in some cases, relative humidity of the sterilization process (e.g., ethylene oxide).

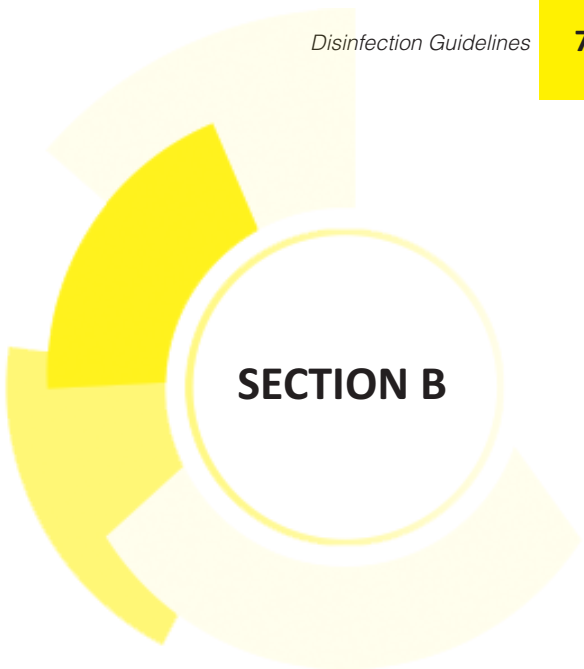


This guideline will assist healthcare facilities in the practices for disinfection of all items used. Refer to Standardization of Sterilization MOH for sterilization of equipment guidelines.

Factors that affect the efficacy of both disinfections and sterilization includes:

1. Prior cleaning of the objects
2. Organic and inorganic load present
3. Type and microbial contamination
4. Concentration and exposure time to germicide
5. Physical nature of the object
6. Presence of biofilms
7. Temperature and pH of the disinfection process
8. Humidity of the sterilization process (e.g. ethylene oxide)





SECTION B

DEFINITION

DECONTAMINATION

A process which removes or destroys microorganisms to render an object safe for further use. It includes cleaning, disinfection and sterilization. The choice of method depends on a number of factors including type of material of object, number and types of organisms involved and risk of infection to patient and staff.

CLEANING

A process which removes foreign material (e.g. dust, soil) and organic matter (e.g. faeces, blood) from an object. Cleaning is an essential prerequisite to disinfection and sterilization. Equipment shall be rinsed under running water or moistened at point of use, then send it in a clean container to the CSSU where proper cleaning can be performed. Enzymatic detergent or surfactant is highly recommended for endoscopy disinfection.

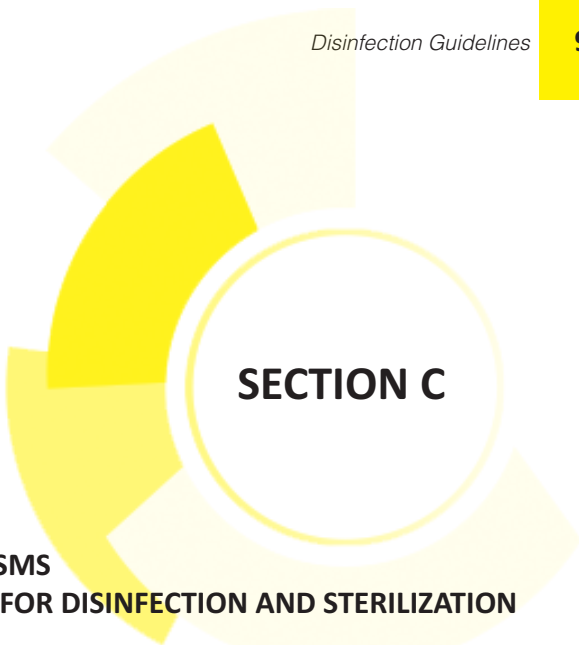
DISINFECTION

A process eliminates/reduces many or all pathogenic microorganisms, except bacterial spore.

STERILISATION

A process, which destroys all types of microorganisms including spores.

DISINFECTANT	A chemical compound used to inactivate vegetative microorganism but not all microbial forms.
ANTISEPTIC	A low-level disinfectant formulated for use on skin or tissue. Should not be used to decontaminate inanimate objects.
HIGH LEVEL DISINFECTION	Level of disinfection required when processing semi critical items. High level disinfectant destroy vegetative bacteria, mycobacteria, fungi, enveloped (lipid) and non-enveloped (non-lipid) viruses but not necessarily bacterial spores. Items must be thoroughly cleaned prior to high-level disinfection.
INTERMEDIATE LEVEL DISINFECTION	Level of disinfection required for some semi critical items. Intermediate level disinfectant kills vegetative bacteria, most viruses and most fungi but not resistant bacterial spores.
LOW LEVEL DISINFECTION	Level of disinfection required when processing non critical items or some environmental surfaces. Low level disinfection kills most vegetative bacteria and some fungi as well as enveloped (lipid) viruses but do not kill mycobacteria or bacterial spores. Low level disinfectants are used to clean environmental surfaces.

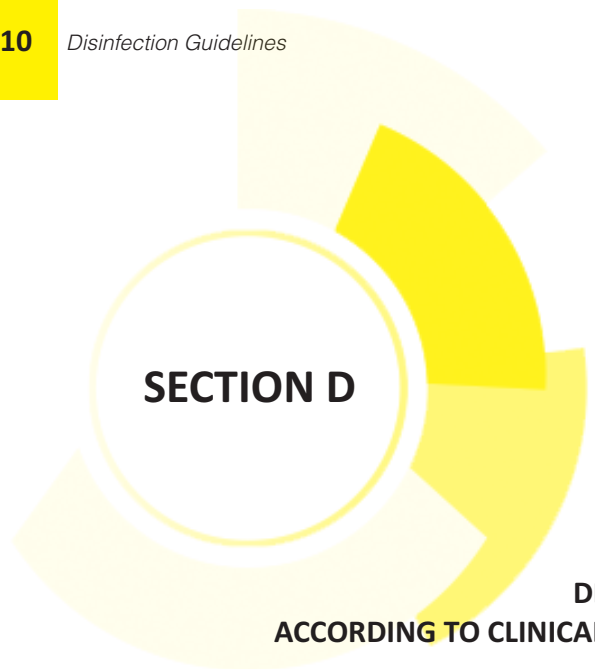


SECTION C

DECREASING ORDER OF
RESISTANT MICROORGANISMS
AND THE LEVEL REQUIRED FOR DISINFECTION AND STERILIZATION

ORGANISM	LEVEL
Resistant	
Prions (Creutzfeldt – Jacob Disease)	Prion Reprocessing*
Bacteria with spores (Bacillus anthrax, cereus, Clostridium botulinum etc)	Sterilization / High Level Disinfectant**
Coccidia (Cryptosporidium)	
Mycobacteria (M tuberculosis etc, H pylori)	High Level Disinfectant
Non lipid or small viruses (polio, coxsackie etc)	Intermediate Level Disinfectant
Fungi (Asperfillus, candida)	
Vegetative bacteria (including MDRO)	Low Level Disinfectant
Lipid or medium sized viruses (HIV, HSV, HBV, HCV, Corona etc)	
Susceptible	

* Prion Reprocessing- combination of Sodium Hydroxide and steam sterilization
**High Level Disinfectant- e.g. for endoscopy procedure, bronchoscopy



SECTION D

CLASSIFICATION OF DEVICES AND INSTRUMENTS ACCORDING TO CLINICAL USE (SPALDING CRITERIA)

CATEGORY OF DEVICES	CRITERIA	EXAMPLE OF ITEMS
Critical items	An object that enters sterile tissue or vascular system Items should be purchased as sterile or should be sterilized	• Surgical instrument
Semi critical items	An object that comes in contact with mucous membranes or non intact skin a.High level disinfection	• Flexible/Rigid scopes (Recommended to use preferred disinfectant option) • Laryngoscope blades • Respiratory therapy equipments • Nebulizer cups • Anaesthetic delivery system • Nasal specula • Ear syringe nozzles

CATEGORY OF DEVICES	CRITERIA	EXAMPLE OF ITEMS
	b Intermediate level disinfection	• Vaginal specula • Vaginal probes • Glass thermometer • Electronic thermometer • Hydrotherapy tanks • Bath tubs in burn units • Tonometer head
Non critical items	An object that comes in contact with intact skin but not mucous membranes.	• Stethoscope • Bedpans • Urinals • Blood pressure cuffs • Ear specula • Equipment surfaces e.g. incubator, trolley, monitor • Floors, walls and furniture • Intravenous poles • Wheelchairs • Beds • Basinets

SECTION E

GENERAL PRINCIPLES FOR DISINFECTANT USAGE

a. RULES FOR THE USE OF DISINFECTANTS:

- Follow the manufacturer's instructions (concentration/dilution, usage)
- Check the expiry date of the solutions
- Ensure that the optimum dilution is used.
- Always wash and clean instruments before disinfection
- Gross soil (e.g. faeces, sputum, blood) shall be removed immediately at point of use
- Adequate contact time and complete immersion
- Do not refill disinfectant containers - topping up is NOT allowed
- Where disinfectants are indicated for use on surfaces, WIPE - DO NOT SOAK

b. WHEN DISINFECTANT SHOULD NOT BE USED:

- Where cleaning is sufficient
- Where sterility is mandatory
- Where heat treatment is possible.
- On single-use (disposable) items which should be discarded after use
- For the storage container of sterile instruments (sterile instruments shall be placed in sterile container)
- As cleaning agent or deodorant

c. WHEN DISINFECTANTS MAY BE USED:

Disinfectants should only be used if reduction in microbial load is needed, disinfection by heat is impossible and cleaning is insufficient. These are usually applicable for:

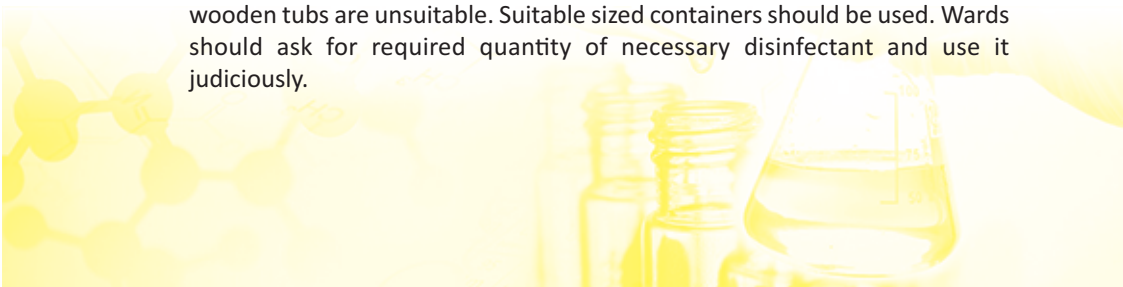
- Treatment of skin and mucous membranes (use antiseptics only)
- The disinfection of instruments when physical methods cannot be used
- Making potentially infective items safe for subsequent handling
- The decontamination of surfaces where indicated

d. THE FOLLOWING POINTS MUST BE CONSIDERED WHERE DISINFECTANTS ARE USED:**i. Making up the disinfectants**

Disinfectants must be used at their correct recommended in-use dilutions (as recommended by manufacturers). All dilution should take place preferably in the pharmacy or ready to use preparation with expiry and date of issue clearly stated. All diluents added shall be in sterile condition. Written Instructions for preparing solutions should be posted in all areas where this work is done. The instructions should state the concentration to be made up and give a detailed description of the way in which that concentration is to be measured. Disinfectants should not be mixed with detergents, as they may be incompatible with each other.

ii. Containers (including stoppers)

Containers, including stoppers used for making up, distributing and storing disinfectants should be maintained in a hygienic condition. They should preferably be made of plastic which can withstand 100% boiling water. The containers when empty should first be cleaned with low lather detergent before heat treatment (i.e. autoclave if autoclavable or filled up with boiling water, allowed to stand for 20 minutes, then pour the water away) before refilling. Cleaning alone is insufficient. Containers shall be cleaned regularly and should NOT be topped up with fresh disinfectants as the level drops. Containers which cannot easily be cleaned or which cannot withstand heat treatment shall not be used for disinfectants. Large drums, stone jars and wooden tubs are unsuitable. Suitable sized containers should be used. Wards should ask for required quantity of necessary disinfectant and use it judiciously.



iii. **Supervision**

In every department where disinfectants are used, a disinfectant record book should be kept to show the number of containers, the names of disinfectants and their concentration in use. The containers should be as few as possible and extra unofficial ones should not be allowed. In each department, a senior member of the staff should be responsible for the disinfectant record book, and for monitoring the use of the solutions once a week, preferably late in the week. The containers in the department should be counted and recorded in the book. The book should be available for regular inspection and it should be signed after inspection.

iv. **Monitoring**

In-Use testing is not recommended routinely to monitor the proper use of disinfectants. It should only be done during outbreak or investigation thereof. For in-use testing: collect aseptically about 2ml of disinfectant from containers into sterile bottles, label them and send promptly to the microbiology laboratory.

v. **Usage**

This guideline deliberately limits the number of types of disinfectants to be used so as to increase cost-effectiveness, enhance safety, encourage familiarity with the products and ensure adequacy of supplies. This guideline should be strictly adhered and only the recommended disinfectants should be used for their specific purposes.

vi. **Choice**

All disinfectants i.e. self prepared or commercially prepared shall seek approval by the hospital committee. For all medical items e.g endoscopes or bronchoscope, the vendor shall submit to the committee, the range of disinfectants that are compatible and approved by MOH.



SECTION F

RECOMMENDATIONS FOR METHODS OF DISINFECTION

ITEMS	RECOMMENDATION	MINIMUM FREQUENCY/ CLEANING PROCESS	REMARKS
Airway tubings • Nasal prong • Face mask • Venti mask • High flow mask • Nebuliser mask • Nebulizer cups	• Single use only	• Single patient use only, disposed after 24 hours	• If single use is NOT possible, wash with detergent, rinsed thoroughly with clean water and then air dried after each use. • Disinfect with low level disinfectant weekly
Spacers	• Wash with detergent, rinsed thoroughly with tap water and air dried	• Daily	
Bottle for humidifier	• Disinfect with low level disinfectant	• Weekly	

ITEMS	RECOMMENDATION	MINIMUM FREQUENCY/ CLEANING PROCESS	REMARKS
Anaesthetic delivery system	• Wash with enzymatic detergent • Rinsed thoroughly with tap (clean) water • Soak with High level disinfectant or send for sterilization	• Between patients	• Use of antibacterial filters are recommended
Removable parts - ventilator tubing - Ambu bag			
Ventilator machine	• Wipe down the controls and the entire outside of the equipment using disinfectant wipes or clean cloth soaked with Low level disinfectant	• Daily or after each patient	
Bed frames	Low-level disinfectant e.g. 0.1% hypochlorite, Iodophors (Non antiseptic formulations), Phenolics or Quaternary ammonium compounds	• Daily • Clean after each patient	
Bedpans and urinals	Mechanical washer disinfectant at 80°C for 1 min	• Clean after each use if designated to patient • Between patients	• Remove gross soil and fluids before cleaning. • In absence of disinfectant, use soap and brush. Rinse with tap water.

ITEMS	RECOMMENDATION	MINIMUM FREQUENCY/ CLEANING PROCESS	REMARKS
			May use low level disinfectant in between infectious patients e.g. 0.1% hypochlorite, Iodophors (Non antiseptic formulations), Phenolics or Quaternary ammonium compounds
Blood pressure cuffs	Wipe with low-level disinfectant e.g. 70% alcohol or hypochlorite solution or QUAD wipes	- Daily - When soiled	Ideally stays with patient until discharge
Biopsy forceps and endoscopic brushes	Preferable use disposables		Sterilized if reuse / HLD
Call bells	Wipe with soap and water except for infectious cases to use LLD	- Daily - Between patients	
Cardiac monitors	Wipe with low-level disinfectant e.g. 70% alcohol or hypochlorite solution or QUAD wipes	- Daily - Between patients	
Cast cutting - Blades - Saws	- Clean only (water & detergent) - Clean only	When soiled	

ITEMS	RECOMMENDATION	MINIMUM FREQUENCY/ CLEANING PROCESS	REMARKS
Catheters (urinary and suction)	Single use		Do not sterilized
Ceiling • Ceiling lights • Air inlet and outlet • Exhaust fan	• High dust vacuum or cleaning with cobweb brush • Wipe with clean damp cloth with detergent and water	• Twice a month • Upon request	High-risk areas e.g. ICU, SCN, OT should be carried out once a week preferable to use a vacuum cleaner
Cupboards, shelves and bedside lockers furniture and fittings	Wipe with clean damp cloth with detergent and water	• Daily • After discharge of patient • When visibly dirty • Between patients	Patient with MDRO – use low level disinfectant
Chairs	Wipe with low-level disinfectant	• Daily • When soiled	Known MDRO patients
Clippers	Sterilize		
Dressing trays and Trolleys (including medication trolleys)	Wipe with low-level disinfectant e.g. 70% alcohol and dry	After each use	Wash with water and detergent first when soiled
Diagnostic Imaging	Damp dust or Clean with water and anionic detergent	Weekly	

ITEMS	RECOMMENDATION	MINIMUM FREQUENCY/ CLEANING PROCESS	REMARKS
Portable grid / X-ray cassette	Wipe with disinfectant wipes	Weekly	Apply plastic cover for patients with MDRO or with skin lesions
Mammography – paddles	Wipe with disinfectant wipes	In between patients	Apply plastic cover for patients with MDRO or with skin lesions
Doppler • Transducers • Probes	• Dam wipe with water • Wipe with disinfectant wipes	• Daily • In between patients.	Apply plastic cover for patients with MDRO or with skin lesions
ECG machines and cables	Damp dust or clean with water and anionic detergent or low level disinfectant	• Daily • In between patients	Patients with MDRO or with skin lesions
ECG • Machines and cables	Use low-level disinfectant e.g. 0.1% hypochlorite, Phenolics or Quaternary ammonium compounds	In between patients	Remove gel prior to disinfect
Floors	• Dust mop or vacuum • Use clean water containing multi-purpose detergent for routine cleaning • Use low-level disinfectant e.g. 0.1% hypochlorite, Phenolics or Quaternary ammonium compounds in OTs, Intensive care areas and Infectious wards	• 3 times daily (all wards and patient's areas) • (ICU/CCU/PICU/NICU & A&E)- When visibly dirty • 4 times daily	• Do not use broom • Freshly laundered mop for each use

ITEMS	RECOMMENDATION	MINIMUM FREQUENCY/ CLEANING PROCESS	REMARKS
Flowmeter oxygen	Wipe with low-level disinfectant e.g. 70% alcohol or hypochlorite solution or QUAD wipe	• Daily • In between patients	
Glucometer	Wipe with low-level disinfectant e.g. 70% alcohol and dry	After each use	
Incubators / Bassinette	• Wipe interior and exterior with sterile water using clean cloths daily when in use • On discharge, wipe incubators with 0.1% hypochlorite solution followed by using clean cloth and sterile water	• Daily • When soiled • In between patients	
Intravenous – pumps, poles and warmers	Use low-level disinfectant e.g. 0.1% hypochlorite, Phenolics or Quaternary ammonium compounds	• Daily • In between patients • When soiled	
Laryngoscope • Handle • Blade	• Wipe with low-level disinfectant e.g. 70% alcohol and dry • High level disinfectant	• In between patients • When soiled	

ITEMS	RECOMMENDATION	MINIMUM FREQUENCY/ CLEANING PROCESS	REMARKS
Mattresses and pillows	- Protect with waterproof plastic covers, use mattress with PVC cover - Wipe the plastic covers with 1% hypochlorite	Clean in between patient	Change the plastic cover on patient discharge
Nebulisers Humidifier	- Single use - Discard fluid. Clean with detergent and water. Rinse with hot water	In between patients	Dry before reused
Ophthalmoscope	Wipe with low-level disinfectant e.g. 70% alcohol or Hydrogen peroxide 0.5% wipes	In between patients	
Orthopaedic equipment e.g crutches, traction etc.	Use low-level disinfectant e.g. 0.1% hypochlorite, Phenolics or Quaternary ammonium compounds	Orthopaedic equipment - crutches, traction etc.	
Otoscope Handle	Wipe with low-level disinfectant e.g. 70% alcohol or Hydrogen peroxide 0.5% wipes	In between patients	

ITEMS	RECOMMENDATION	MINIMUM FREQUENCY/ CLEANING PROCESS	REMARKS
• Ear speculum • Otoacoustic Emission screening tips	• Wipe with 70% alcohol • Disposables		
Oximeter probe	Low level disinfectant following manufacturers instruction or disposable	• Daily • In between patients	
Resuscitation cart / trolley (including defibrillator and trays)	Use low-level disinfectant e.g. 0.1% hypochlorite, Phenolics or Quaternary ammonium compounds	• Daily • After each use	Avoid taking Cart into contact precaution's room. Have a designated person to pass supplies as required
Razors for shaving	Single use only		
Suction machines	Use low-level disinfectant e.g. 0.1% hypochlorite, Phenolics or Quaternary ammonium compounds	• In between patients • When soiled	
Stethoscope	• Wipe with 70% alcohol • Option: disposable stethoscope cover	In between patients	Use designated stethoscope for infectious or high risk patients
Syringes	Use sterile disposable syringes		

ITEMS	RECOMMENDATION	MINIMUM FREQUENCY/ CLEANING PROCESS	REMARKS
Tables • Cardiac • Bedside	Use low-level disinfectant e.g. 0.1% hypochlorite, Phenolics or Quaternary ammonium compounds	• Daily • Between patients • When soiled	
Telephone	Wipe with 70% alcohol	Daily	
Thermometer	Use sheath cover or wipe with 70% alcohol	After every use	• Use an individual thermometer for each patient if possible • Store dry
Tourniquet	Advise for disposable band		
Transport Equipment • Walker • Wheelchair • Stretcher	Use low-level disinfectant e.g. 0.1% hypochlorite, Phenolics or Quaternary ammonium compounds	After each use	
Walls	Wipe with clean damp cloth with detergent and water	• Weekly • In between patients	• Wallpaper is not recommended • High-risk areas.g. ICU,SCN, OT should be carried out once a week
Wall mounted Oxygen and Suction Fixtures	Use low-level disinfectant e.g. 0.1% hypochlorite, Phenolics or Quaternary ammonium compounds	• In between patients • When soiled	

ITEMS	RECOMMENDATION	MINIMUM FREQUENCY/ CLEANING PROCESS	REMARKS
Semi critical Endoscopes: • Sigmoidoscopes • Gastrosopes • Colonoscope • Bronchoscope	• Select HLD that is compatible with the endoscope • Monitor the efficacy with test strips • Maintain a written log of monitoring test results • Follow the manufacturer's directions regarding ambient temp and exposure time of the disinfectant • Completely immerse the endoscope and components in the HLD and ensure all channels are perfused • Once completed, rinse the endoscope and flush the channels • Discard rinse water after each use / cycle	• Clean immediately after each procedure • Flush and wipe the endoscope at point of use with a soft lint free cloth/ tissue or endoscopic sponge • Use enzymatic cleaning solution • Place in a covered leak proof container and transport to the designated decontamination area • Follow manufacturers recommendations cleaning and cleaning products • Perform leak testing after each use, prior to cleaning • Disconnect and disassemble endoscope components (if possible), completely immerse in enzymatic cleaner	

ITEMS	RECOMMENDATION	MINIMUM FREQUENCY/ CLEANING PROCESS	REMARKS
		• Flush and brush all channels and lumens of endoscopes while submerged to remove debris and minimize aerosols • Thoroughly rinse endoscope and components with clean, fresh tap water and remove excess water from channel by purging with forced air. • Discard enzymatic cleaner after each use	
Critical Endoscope: • Arthroscopes • Laparoscopes • Cystoscopes • Cholelithoscope (Enters joints and sterile cavities)	Critical endoscopes shall be sterilized (autoclave) prior to use	Similar	

TYPES OF ENDOSCOPIC PROCEDURE			
Types of Endoscope	Rigid endoscope example	Flexible endoscope example	Level of contamination
Invasive-passed into normally sterile body cavities or introduced into the body through a break in the skin or mucous membrane	Arthroscope Laparoscope Cystoscope	Nephroscope Angioscope Choledochoscope	Sterilization by steam or a low temperature method. e.g. gas plasma
Non-invasive in contact with mucous membrane, but does not enter sterile cavities	Bronchoscope	Gastroscope Colonoscope Bronchoscope	High level disinfection. e.g. immersion in glutaraldehyde, paracetic acid, chlorine dioxide

- Disinfectant for Hand:
- a. Alcohol based disinfectant (ethanol, isopropanol, n-propanol)
 - b. Alcohol chlorhexidine

Steps of High Level Disinfection (HLD)

1. Pre cleaning:
 - a. Remove gross soil from instruments at the point of use:
 - i. Rinse off or wet the surfaces with a damp clean dry cloth.
 - ii. Endoscope channels flushed with enzymatic detergent
 - b. During transport, soiled instruments should be opened and kept moist (to prevent drying)
 - i. Spray with an enzymatic spray
 - ii. Do not transport in containers with water as water is a splash hazard
2. Manual cleaning
3. Inspection
4. Rinsing after cleaning - to remove detergent residues that may affect the performance of the disinfectant (tap water)
5. Drying - to expel excess fluid that may dilute the disinfectant
6. Disinfection
7. Rinsing after HLD - to remove disinfectant residues that could cause a harmful effect to the patient. What to use is controversial and has not resolved
(suggest: drinking water quality tap water/ sterile/ RO/ filtered (0.2m filter))
8. Flush all channels with alcohol (70-80%) and purge all channels with compressed air after high level disinfection
9. Drying

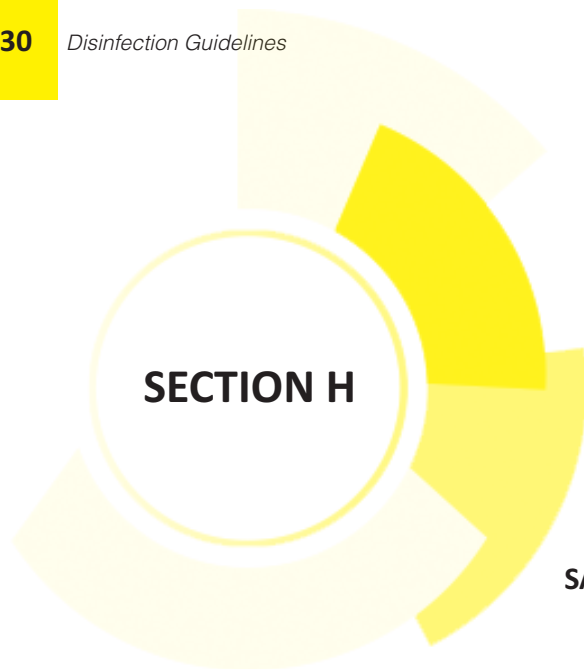


SECTION G

ADVERSE EFFECT AND CAUTION LEVELS

DISINFECTANTS	ADVERSE EFFECT	CAUTION LEVELS
Alcohol 70%	• Dry skin • Skin, eye and respiratory tract irritation • Central nervous system depression	• Volatile • Harmful if swallowed or inhaled • Evaporation may diminish concentration • Inactivated by organic material • May harden rubber or cause deterioration of glues • Use in the OR is contraindicated
Alcohol 90%		
Chlorhexidine Gluconate	• Skin,mucous membrane and respiratory irritation	• Do not use undiluted solution • Very hazardous in case of ingestion • May be combustible at high temperature

DISINFECTANTS	ADVERSE EFFECT	CAUTION LEVELS
Glutaraldehyde	• Nausea, headache, eye irritation, dermatitis • Hypersensitivity	• Use complete PPE- gloves, masks/ respirators, goggles are compulsory
Orthophthaldehyde 0.55%	• Nausea, headache, eye irritation, dermatitis • Hypersensitivity	• Room must have adequate ventilation exhaust fan or fume hood • Small spills can be neutralized with ammonia (Larger spills require trained personnel)* • Should not be disposed of by draining into a sewer system or natural waterways
Hydrogen Peroxides 20 Volume	• Nausea, vomiting • Skin, eye, respiratory, gastrointestinal irritation	• Avoid contact with eyes • Keep container closed • Wash thoroughly after handling
Hydrogen peroxide 7.35% with Peracetic acid 0.23%	• Skin and mucous membrane irritation	
Peracetic acid	• Corrosive to eyes, skin and instrument • Vapor/mist will irritate nose, throat and lungs	• Can be corrosive with aluminium
Sodium hypochlorite 2.5g and 5g tab	• Eye and respiratory irritation	• Handle tablets or granules with dry gloves • When using the solution, avoid formation of spray or aerosols



SECTION H

SAFETY PRECAUTIONS IN USE OF DISINFECTANTS

COMPOUND	PPE	PREPARATION ROOM	OTHERS
ALCOHOLS E.g. Isopropyl Alcohol Workplace exposure limit OSHA: PEL 400 ppm over 10-hour workshift NIOSH: PEL 400 ppm over 10-hour workshift PEL 500 ppm, not to exceeded during any 15 minutes work period	• Gloves • Face shields • Suits • Footwear • Headgear • Splash-proof safety goggles • Respirators (if local exhaust ventilation or enclosure is not available)	• Enclose operations • Local exhaust • Ventilation at site of chemical release • Eyewash fountains • Emergency shower facilities	• Ongoing education and training • soap • Mild detergent • Tap water

COMPOUND	PPE	PREPARATION ROOM	OTHERS
CHLORHEXIDINE GLUCONATE	• Safety goggles/glasses • Gloves • Footwear • Full-length clothing • Respirators (if local exhaust ventilation or enclosure is not available)	• Local exhaust • Eyewash fountains	• Use adequate ventilation • Wash thoroughly after handling
CHLORINE Workplace Exposure Limit OSHA: 1 ppm (not to be exceeded at any time) NIOSH: 0.5 ppm (0.3mg/m ³)	• Splash-proof safety goggles • Gloves • Face shields • Full-length clothing • Footwear • Headgear • Respirators (if local exhaust ventilation or enclosure is not available)	• Enclose operations • Local exhaust • Ventilation at site of chemical release • Eyewash fountains • Emergency shower facilities	• Ongoing education and training • soap • Mild detergent • Tap water
IODINE/ IODOPHOR Workplace Exposure Limit	• Rubber Gloves • Face shields • Apron • Chemical goggles • Full length clothing • Safety shoes • Respirator equipped with cartridge for organic/acid vapours if use condition generate mist/vapour	• Local exhaust • Ventilation at site of chemical release • Eyewash fountains • Emergency shower facilities	• Ongoing education and training • Soap • Mild detergent • Tap water

COMPOUND	PPE	PREPARATION ROOM	OTHERS
PHENOLICS Workplace Exposure Limit	• Gloves • Face shields • Splash-proof safety goggles • Respirators recommended if TLVS are exceeded	• Exhaust • Ventilation • Process enclosure • Eye wash facility • Emergency shower facilities	• Ongoing education and training • Soap • Mild detergent • Tap water
QUATERNARY AMMONIUM COMPOUND Workplace Exposure Limit	• Waterproof gloves • Splash proof goggles • Apron	• Normal room ventilation • Eye wash facility	• Ongoing education and training • Soap • Mild detergent • Tap water
GLUTARALDEHYDE Workplace Exposure Limit NIOSH: 0.2 ppm (should not be exceeded at any time) When skin contact occurs, you may be over exposed, even though air levels are less than the limit listed above	• Gloves • Apron • Clothing • Footwear • Head gear • Mask	• Enclose operations • Local exhaust • Ventilation at site of chemical release • Respirators should be worn if local exhaust ventilation or enclosure is not use • Emergency shower facility • Eye wash facility • Post hazard and warning information in the work area • Label the chemical use in the workplace **Engineering controls are the most effective way of reducing exposure	• Ongoing education and training • Soap • Mild detergent • Tap water

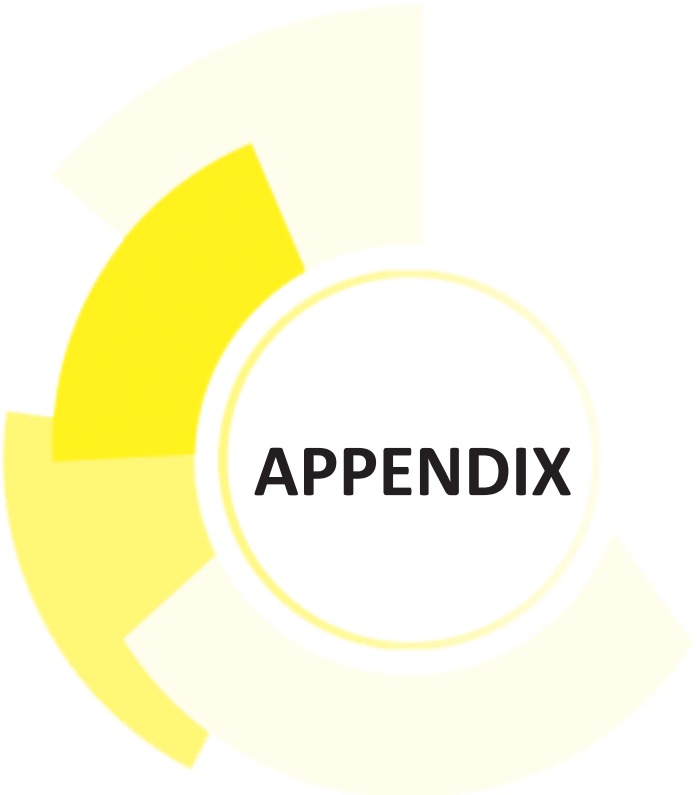
COMPOUND	PPE	PREPARATION ROOM	OTHERS
PERACETIC ACID Workplace Exposure Limit	• Goggles • Gloves • Safety glasses	• Normal room ventilation	• Ongoing education and training • Soap • Mild detergent • Tap water

PEL- permissible Exposure Limit
ppm – parts of a substance per million part of air

SECTION I : DISINFECTANTS DILUTIONS AND THEIR CHARACTERISTICS

Disinfectant Group	Use dilution	Level of Disinfection	Inactive						Important characteristics						
			Bacteria	Lipophilic Viruses	Hydrophilic Viruses	M. tuberculosis	Mycotic Agent	Bacteria Spores	Corrosive/ Deleterious Effect	Inactivated by organic matter	Residue	Skin irritant	Eye irritant	Respiratory irritant	Toxic
Chlorine	100-1000ppm free chlorine	High/ Low	+	+	+	+	+	+	+	+	+	+	+	+	+
Chlorhexidine Gluconate	0.1% - 4%	Intermediate/Low	+	+	+	-	+	+	-	+	+	+	+	+	+
Formaldehyde	3-8%	High/Intermediate	+	+	+	+	+	+	+	+	+	+	-	+	+
Glutaraldehyde	2%	High/ CS	+	+	+	+	+	+	-	+	-	+	+	+	+
Hydrogen peroxide	3-25%	CS	+	+	+	+	+	+	-	+	+	+	-	+	+
Iodophors	30-50 ppm free iodine	Intermediate	+	+	+	±	+	+	-	+	+	+	-	+	+
Isopropyl Alcohol	60-95%	Intermediate	+	+	-	+	+	+	-	+	+	+	-	+	+
Peracetic acid	0.001%-0.2%	High	+	+	+	+	+	+	+	+	+	-	+	-	+
Phenolic	0.4-5%	Intermediate/Low	+	+	±	-	±	±	-	+	+	+	-	+	+
Quaternary Ammonium	0.4-1.6%	Low	+	+	-	-	±	±	-	-	+	+	-	+	+

CS=chemostabilizer
Inactivates all indicated microorganisms with contact time of 30 minutes or less, except bacteria spores which require 6-10 hours of contact time.



APPENDIX



APPENDIX I : PREPARING AND USING CHEMICAL DISINFECTANT

CHEMICAL FOR HIGH-LEVEL DISINFECTION						
Disinfection (common solution or brand)	Effective concentration	How to dilute	Corrosive	Leaves residue	Time needed for HLD	Activated Shelf Life ^a
Chlorine	0.1%	Dilution procedures vary	Yes ^c	Yes	20 minutes	Change every 14 days, sooner if cloudy
Formaldehyde (35-40%)	8%	1 part 3-40% solution to 4 parts boiled water	No	Yes	20 minutes	Change every 14 days, sooner if cloudy
Glutaraldehyde	Varies (2-4%)	Add activator	No	Yes	20 minutes at 25°C ^d	Change every 14-28 days, sooner if cloudy
Hydrogen Peroxide (30%)	6%		Yes	No	20 minutes	Change daily, sooner if cloudy
CHEMICALS FOR DISINFECTION (alcohol and iodophors are not high-level disinfectants)						
Alcohol (ethyl or isopropyl)	60-90%	Use full strength	No	No	Do not use	If container (bottle) kept closed, use until empty
Iodophors (10% povidone-iodine) (PVI)	Approximately 2.5%	1 part 10% PVI to 3 parts water	Yes	Yes	Do not use	If container (bottle) kept closed, use until empty

^a. All chemical disinfectants are heat and light sensitive and should be stored away from direct sunlight and in a cool place (<40°C)

^b. Corrosive with prolonged (>20 minutes) contact at concentration >0.5% if not rinsed immediately with boiled water.

^c. Different commercial preparation of glutaraldehydes are effective at lower temperatures (20°C) and for longer activated shelf life. Always check manufacturers' instructions.

Adapted from: Rutala 1996

Adapted from: Rutala 1996

APPENDIX II : LIST OF DISINFECTANT CURRENTLY IN MOH DRUG FORMULARY

DISINFECTANT	INDICATION	HOW TO USE
Alcohol 70% solution	Use as antiseptic and disinfectant	Apply to the skin undiluted or when needed
Chlorhexidine Gluconate 5% Solution	i. Preoperative skin disinfection ii. Wounds or burns iii. Emergency disinfection of instruments	i and ii used in dilution of 1:10 in 70% alcohol iii used in dilution of 1:100
Chlorhexidine Gluconate 2% in Alcohol 70% solution	Use as disinfectant in central venous catheters care bundle	• Skin preparation: Use Chlorhexidine Gluconate 2% in Alcohol 70% solution and allow to dry • Catheter access: apply to catheter ports or hubs prior to accessing the line for administering fluids or injections
Chlorhexidine Gluconate 4% Scrub	Surgical hand scrub/disinfection, pre-op skin preparation	• Surgical hand disinfection: Apply 5ml to clean hands and forearms for 1 min. Rinse and repeat with another 5ml for a further 2 mins and then rinse and dry • General skin disinfection: Apply appropriate quantity to wet area and scrub for 1 min. rinse thoroughly & dry
Chlorinated Lime Powder	Antiseptic and disinfectants	Not applicable

DISINFECTANT	INDICATION	HOW TO USE
Glutaraldehyde Solution 2%	High level disinfection for heat sensitive equipments such as endoscopes	20 mins or more immersion is recommended for endoscopes before the session and between patients after thorough cleaning based on manufacturer recommendation
Hydrogen peroxide 20 volume solution	Skin disinfection, particularly cleansing and deodorizing wounds and ulcers	• For cleansing wounds: 1.5% to 6% solution, apply 2-3 times daily or when necessary • Disinfecting cleaned equipment: Immersion for 30 minutes in 6% solution
Peracetic acid and Hydrogen peroxide	High level disinfectant or sterilant for heat labile endoscopes	Immersed time based on manufacturer recommendation
Sodium Dichloroisocyanurate 2.5g & 5g tab	Low and medium level disinfectant	50-10,000 ppm av chlorine
Succindialdehyde 11% & Dimethoxytetrahydrofuran 3%	High level disinfection for endoscopes, ultrasound probes, anaesthesia equipment, etc	Immersion time is based on manufacturers recommendation
Sodium Hypochlorite Solution	Low level disinfectant and antiseptic	• Antiseptic: less than 0.5% • Disinfectant: 5%

APPENDIX III : PREPARATION OF DISINFECTANT (SODIUM HYPOCHLORITE)

CONCENTRATION OF DISINFECTANT		TOTAL 2.5gm DISINFECTANT TABLETS TO BE USED	WATER VOLUME (ml)	USAGE
10,000 ppm	1 %	7	1,000 ml	• Spillage management • Wiping & cleaning of blood/ body fluids on surfaces of Non critical items
5,000 ppm	0.5 %	4	1,200 ml	• Wiping of external surface of soiled linen bag
1,000 ppm	0.1 %	1	1,000 ml	• General cleaning

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DISINFECTION GUIDELINES



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