CHAPTER 6

Sterilisation and disinfection in hospital pertaining to obstetrics and gynaecology department

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Sterlisation: The process of destroying or removing all living microbes, including viable spores, from an object, surface, or medium. Reduction of their spores/ microorganisms by at least 10^6 CFU..

Disinfection: Process that eliminates or removes the majority, if not all, harmful organisms but may or may not kill bacterial spores. Most microorganisms are reduced by ≥103 log CFU, however spores remain unaffected. Achieved by a physical or chemical agent. Some disinfectants, known as chemical sterilants, can kill spores after extended exposure (3-12 hours). High-level disinfectants, with shorter exposure durations (e.g., 2% glutaraldehyde for twenty minutes), effectively destroy all microorganisms except bacterial spores. Low-level disinfectants may effectively kill most vegetative bacteria, fungi, and viruses within 10 minutes. Intermediate-level disinfectants may kill mycobacteria, vegetative bacteria, viruses, and fungus, but not always bacterial spores. Germicides range significantly in their antibacterial properties and speed of action.

Decontamination: Refers to the lowering of the pathogenic microbial population to a point where products may be regarded safe without protective equipment. Most microorganisms are reduced by at least 1 log CFU, although spores are not affected.

Antiseptic: Disinfectants that are safe to use on bodily surfaces (skin and mucosa) and destroy organisms present on them.

Spaulding proposed categorizing instruments and patient care items as critical, semicritical, or noncritical based on the risk of infection associated with their usage to better understand disinfection.

Category	Level of disinfectant required	Type of disinfectants	Example
Critical	Sterlisation, as they enter sterile body cavities and vascular tissue.	steam sterilized if feasible. Heat-sensitive items can be sterilized using EtO, hydrogen peroxide gas plasma, or liquid chemical sterilants if other techniques are not effective.	surgical (Teale's vulsellum, ovum forceps etc) equipment, urinary/cardiac catheters, implants.
Semicritical	High level disinfectants, as Contact nonintact skin or mucous membranes	Hydrogen peroxide, glutaraldehyde, peracetic acid with hydrogen peroxide and orthophthalaldehyde.	endoscopes, SIMS speculum, Cusco's speculum, diaphragm fitting rings, cystoscopes, Hysteroscope etc
Noncritical	Low level disinfectants, Contact with intact skin	Isopropyl alcohol, Chlorhexidine	Ultrasound probe, thermometer, stethoscope.

Laparoscopes and hysteroscopes that enter sterile tissue ought to be sterilized after each patients. Although in the US, this equipment may only be disinfected at a high level amongst patients. Because of their delicate design, some equipment, like laparoscope can be difficult to clean and disinfect or sterilize. So prior to high-level disinfection or sterilization, meticulous cleaning is essential. A research found that disassembling, cleaning, and reassembly of laparoscopic equipment used in gynecologic operations before steam sterilization poses minimal risk of infection. Perfusing high-level disinfectant into the channel of scopes, such as cystoscopes, hysteroscopes, and ureteroscopes, is crucial, according to one study. This study found that disinfection, defined as a decrease in bacterial burden of more than 7-log10 CFU, only occurred when the lumen was vigorously infused with glutaraldehyde. Inability to perfuse the conduit resulted in minimal, if any decrease in bacterial infection. Active perfusion of the channel resulted in full inactivation of 10^8 CFU of VRE and CRE.

Immersion did not diminish the level of microbiological contamination, indicating that high-level disinfectants only reached the channel when vigorously filled with a syringe. Although sterilization is desirable, there have been no reports of outbreaks caused by high-level disinfection of these scopes when thoroughly cleaned and disinfected. Newer variants of these devices may tolerate steam sterilization, making it preferred for critical instrument over high-level disinfection methods.

To disinfect or sterilize an endoscope/hysteroscope with a liquid chemical sterilant, follow these five procedures following leak testing:

1. Clean both internal and exterior surfaces thoroughly, including brushing internal passages and flushing with water, detergent, or enzymatic agents. (should be tested for leaks before immersion).

2. Submerge it in a high-level disinfecting agent or chemical sterilant and permeate it into all accessible channels, including

the biopsy/suction and water/air channels. Expose it for the recommended time for the specific product.

3. Rinse the endoscope and channels with sterile water, or high-quality tap water that fulfills federal clean water standards.

4. Dry: the inside of the tube and inner channels, clean with alcohol and use pressurized air after disinfection and prior to storage.

5. Proper storage: Hang the endoscope vertically to prevent contamination and facilitate drying.

The drying process reduces the risk of recontamination from microorganisms in rinse water. A study found that reprocessed endoscopes, including air/water and suction/biopsy channels, remained bacteria-free after 24 hours and 90% after 7 days when stored vertically in a ventilated cabinet.

Vaginal probes used for sonographic scanning comes under Semicritical devices, such as vaginal and endocavitary probes without covers, come into direct touch with mucous membranes (e.g., vagina, rectum) The CDC recommendation suggests employing a fresh condom/probe cover for each patient and to avoid risk due to tear, high level disinfectant should also be used to prevent failure. It corroborated by research indicating that sterile transvaginal ultrasonography probe coverings had a significant risk of perforation even before use (0%, 65%, and 25% breaches from three vendors). A research revealed that endovaginal probe coverings from two vendors had a significant risk of perforation following oocyte extraction (75% and 81%, respectively). further studies indicated a decreased risk of perforations after using condoms (2.0% and 0.9%). Condoms outperform commercially available probe coverings for ultrasound probe coverage (1.7% vs. 8.3% leakage). These investigations highlight the importance of regular probe disinfection between testing. Ultrasound manufacturers propose using 2% glutaraldehyde for disinfecting contaminated transvaginal transducers, although this substance may limit the transducer's life and be

hazardous to embryos and gametes. Alternatively disinfect the vaginal transducer, remove the gel, clean it with soap and water, wipe it with 70% alcohol or soak it in 500 ppm chlorine for 2 minutes, rinse it with tap water, and air dry it. Efficacy of these methods have not been demonstrated in laboratory or clinical settings. To protect staff, patients, probes, and retrieved cells, high-level disinfection with a non-toxic product, such as hydrogen peroxide, until alternative procedures against significant microbes at the cavitary site are proven effective through well-designed scientific studies.

The Ministry of Environment Forests and Climate Change, Govt. of India notified the Bio-Medical Waste Management Rules, 2016 on 28th March 2016, under the provisions of Environment Act 1986. These Rules were amended in 2018 and 2019. Central Pollution Control Board released guidelines in 2022. BMWM rules ensure the safety of the staff, patients, public and the environment.

These rules shall apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio-medical waste in any form including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories, blood banks, Ayush hospitals, clinical establishments, research or educational institutions, health camps, medical or surgical camps, vaccination camps, blood donation camps, first aid rooms of schools, forensic laboratories and research labs. The Obstretics and Gynaecology generates BMW like any other major Dept in the hospital.

Definition of BMW

Bio-medical waste means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps, including the categories as mentioned in BMWM rules, 2016 and amendment 2018, 2019.

Serial.no	Color coded bag	Type of waste
1	yellow	a) Human Anatomical waste: Fetus below viability (under MTP Act) will go in yellow bag (b) Animal Anatomical Waste C)Soiled Waste D)Expired or Discarded Medicines E)Chemical Waste: solid discarded chemicals F)Chemical Liquid Waste: G)Discarded linen: F) PVC Blood bags & Lab waste in respective category H) Masks (including triple layer mask, N95 mask, etc.), head cover/cap, shoe-cover, disposable linen Gown, non-plastic or semi-plastic cover all
2.	Red	Contaminated Waste(Recyclable) Plastics
3.	White (Translucent) Blue	Sharps waste
4.	Blue	Metal guns etc implants/ metal Glass: Medicine glass vials or broken or discarded and contaminated glass

References

1. Rutala WA, Weber DJ. Guideline for disinfection and sterilization in healthcare facilities. CDC. 2008

2. Rutala WA, Weber DJ. Reprocessing semicritical items: an overview and an update on the shift from HLD to sterilization for endoscopes. American Journal of Infection Control. 2023 Nov 1;51(11):A96-106.

3. National guidelines for infection prevention and control in health care facilities. DGHS. MoHFW, GOI. 2020.

4. Hospital Manual. DGHS. MoHFW, GOI. 2025