

Decontamination and sterilisation of surgical instruments and medical devices

Ann-Marie Ablett is a Theatre Nurse and Team Leader who volunteers with Orbis. This has allowed her to gain a wealth of experience on ophthalmic procedures, nursing in under-privileged parts of the world, leadership, management and use of scarce resources. She shares her experience on decontamination and sterilisation of instruments and medical devices, something we all take for granted.

Decontamination is a term used to describe a combination of processes including cleaning, disinfection and / or sterilisation used to make a re-useable item safe for further use. You cannot sterilise an instrument without decontamination.

Important processes / definitions:
Cleaning is carried out manually to ensure that the instrument is free from contaminants, dust, dirt, secretions, marks, stains or unwanted matter etc. Cleaning must be thoroughly performed before disinfection or sterilisation is attempted.

Disinfection is a process in which most or nearly all micro-organisms, whether or not pathogenic, are killed through the use of chemicals, heat or ultraviolet rays.

Sterilisation is a process of making objects free from bacteria or other micro-organisms usually by heat or chemical means. Sterilisation is distinct from disinfection, sanitisation and

pasteurisation, in that sterilisation kills, deactivates, or eliminates all forms of life and other biological agents which are present. Means of sterilisation include heat, chemicals, irradiation, high pressure and filtration.

Medical devices are all products used in healthcare for diagnosis, prevention, monitoring or treatment, i.e. tonometers, slit-lamp, surgical instruments, hospital beds, MRI scanners – the list is endless.

Manual cleaning should only be used if mechanical or automated methods are not available. Automated methods minimise the risk of staff exposure to pathogens and prions.

Manual cleaning method: use hot soapy water, when not available rain / distilled water. A soft toothbrush is used for cleaning instruments. Needle holders / scissors / forceps, must be completely opened to clean inside the jaws. Cannulae must be flushed through (may contain lens matter, vitreous or visco-elastic which may block the cannulae permanently) [1].

Lubricant: Lubricant 'surgical milk' is vital for **hinged** instruments only, the instruments are dipped one at a time into the lubricant – **not soaked**, should a milk lubricant not be available the instruments should be rinsed in clean water. Excess lubricant or soap should be rinsed off and the instrument left open and dismantled on a clean absorbent cloth [1,2].

Ideally, and as is the practice in developed countries, all dirty instruments should be removed from the theatre area through a dedicated hatch to an adjacent area.

Complex instruments, i.e. phaco handpieces, and where used, reusable irrigation handpieces, should be disassembled (following manufacturer's recommendations) prior to sterilisation.

It is common practice for scrub staff to start the cleaning process off, by flushing the instruments out with distilled water

before been taken for decontamination and sterilisation. Saline is not recommended for flushing as rust may form over time, reducing the working of the instruments by corrosion and causing metal fatigue (sodium nitrate is an anti-rusting agent – but always follow manufacturers recommendations) [1].

The Flying Eye Hospital

Orbis has, as its flagship, a plane (MD11) the 'Flying Eye Hospital', which has been converted into a state of the art hospital (with hospital accreditation). Their focus is on treating and preventing blindness / eye disease in developing countries, they do this by training local staff (doctors, nurses, anaesthetists, bio-medical engineers, healthcare support workers, outreach practitioners, preachers, teachers and the village elders) on topics from complicated surgical procedures to the need for personal protective equipment (PPE), fixing previously mothballed instruments because of lack of bulbs or tools, to cleaning of instruments with 'Control of Substances Hazardous to Health' (COSHH) regulations in mind. All recommended practices have been adopted in several developing countries, ensuring best practice and care is delivered to all [1,2].

Disinfection

This may be carried out using liquid chemicals / moist heat. Moist heat is usually the choice, assuming the device can withstand high temperature. Chemical disinfectants may not be effective when used on dirty instruments, due to inability to make contact with the micro-organisms or the surface to be decontaminated, re-enforcing the need for adequate cleaning first.

Inspection

Inspection of instruments for damage or inadequate cleaning should be performed



Figure 1: Steriliser in the developing world.

by all staff where necessary, and for fine instruments with the aid of a magnifying glass / microscope. Forceps / needle holders should meet at the tips; scissor tips should be smooth and aligned.

Damaged instruments should be sent for repair and this should be documented to ensure their return as good quality instruments are a luxury in many parts of the world.

In some parts of our developing world, instruments, with the foresight of resourceful staff, have many usages (e.g. we didn't have a retinal pick, so we got a 23g hypodermic needle and bent it! I was there).

It is also important that we use the instruments according to the manufacturer's recommendations [1,2].

Ultrasonic cleaning

This is advisable (following the manufacturer's recommended cycle time, usually 5-10 minutes). Instruments should again be open, fully submerged; ensuring blades do not touch other instruments. Following ultrasonic cleaning the instruments must be rinsed with water to remove ultrasonic cleaning solution [2,3].

Drying

Instruments should be dried thoroughly before being stored (if put away damp they will rust) a hair dryer is very effective for drying joints and crevices (been there, done that!) [2].

Oiling

With repeated sterilisation instruments will become stiff. A good quality oil – silicone oil or sewing machine oil – should be used weekly, especially on hinged instruments, and in very hot dry climates [2].

Ensure all surplus oil is wiped away, as this will inhibit sterilisation. Oiling is still necessary even though surgical milk is used.

Repairs

Where possible, it is preferable and more economical to repair instruments, as micro-instruments are a rare commodity in some parts of the developing world. A good repair is always cheaper than buying, assuming the biomedical engineer has the skills and the necessary tools (Orbis offers a biomedical engineers training programme).

Packaging and storage

Instrument packaging should be done in a clean and low contamination area using approved products (wrappers, pouches, containers). Storage on glass shelving is preferable as it is easy to keep clean.

The instruments should be housed in a dry, well ventilated cupboard; silicone

gel – a drying agent – can be placed on the shelves to absorb moisture. The storage area should be above floor level and away from sunlight. Packs should be handled carefully to prevent damage and loss of sterility.

Autoclaving

Delivering good quality patient care within the theatre environment in severely resource stricken countries is often very challenging for a variety of reasons, lack of autoclaves, lack of washing machines for gowns (single use far too costly), re-sterilisation of gloves / sutures (Videne soak for 10 minutes), lack of electricity (smartphones a necessity!), lack of scrub brushes, surgical scrub liquid – soap is regularly used and is far from ideal, but staff members continue to do their very best for their patients.

Tongs are used to remove gowns / gloves and instruments for above sterilisers. Because of the lack of instruments to make up complete sets, the instruments are laid on a trolley with sterile sheets underneath and above to maintain sterility and are taken to the surgical field as and when necessary.

To ensure the autoclave is effective and to prolong its life, regular checks should be carried out, this involves the Bowie Dick test – this test demonstrates that the 'air has been adequately removed' from a pre-vacuum autoclave, which can act as a barrier preventing steam from penetrating the load, thus rendering the load unsterile.

The autoclave chamber should not be overloaded, as again pockets may form which do not allow steam penetration [2,3].

Transport of instruments

The containers to transport sterilised surgical equipment should fully protect their contents and the individual handling them.

They must therefore be secure, tamper proof, waterproof and clearly labelled. Before use, the packages should be checked to ensure that the package is intact, the sterilisation indicator confirms sterilisation and that the expiry date has not passed [3,4].

References

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TAKE HOME MESSAGE

- Chemical disinfectants may not be effective when used on dirty instruments, due to inability to make contact with the micro-organisms or the surface to be decontaminated, reinforcing the need for adequate cleaning first.
- Where possible, it is preferable and more economical to repair instruments.
- Complex instruments, i.e. phacoemulsification hand-pieces, and where reusable, irrigation hand-pieces should be disassembled (following manufacturer's recommendations) prior to sterilisation.

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