Medical equipment related to oxygen therapy

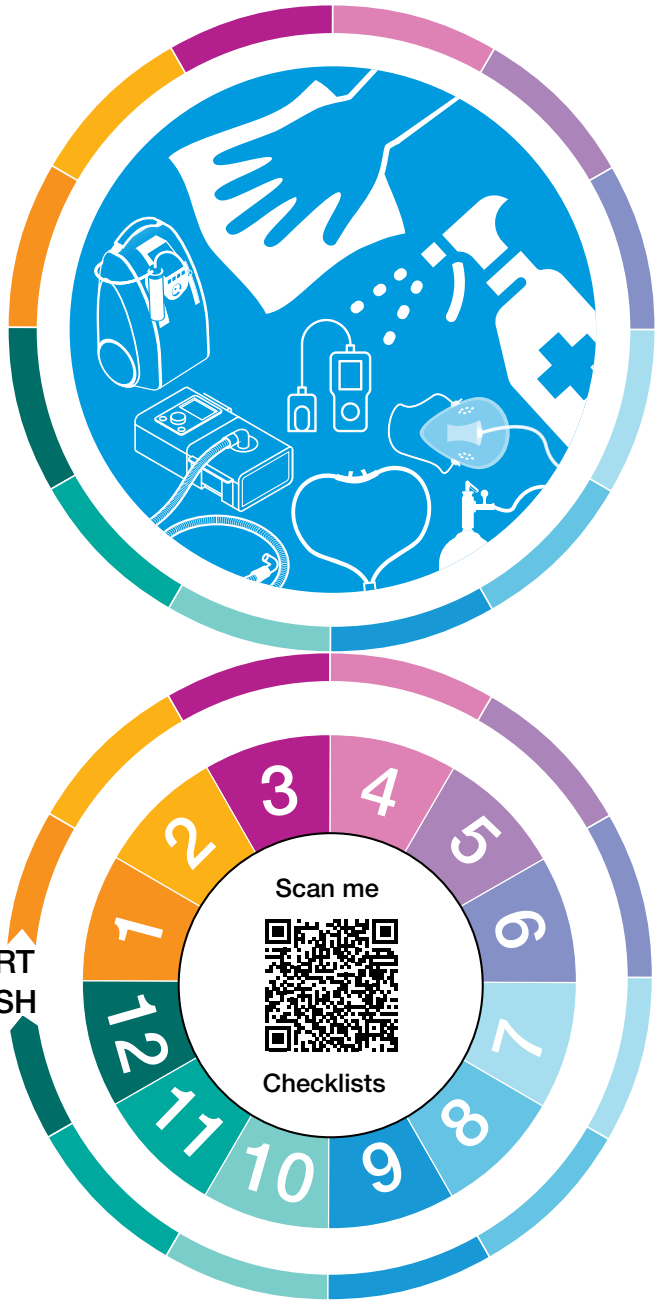
Cleaning – task sequence

Mechanical ventilators/CPAP and **BiPAP/high flow nasal cannula/ oxygen concentrators/pulse oximeters** and **patient monitors**

START

1. Perform hand hygiene
2. Don appropriate personal protective equipment
3. Prepare disinfectant solutions
4. Disconnect the device from the patient and power
5. Properly dispose of single use items*
6. Prepare closed container with components requiring high-level disinfection*
7. Move device away to non-patient well ventilated area for cleaning
8. Change gloves
9. Wipe exterior surfaces with detergent and rinse with clean water. Ensure to dry afterwards
10. Wipe with disinfectant
11. Remove PPE- wash hands
12. Store clean device and disinfect before new use

CYCLE FINISH



* Consumables associated with oxygen delivery are generally intended as single use devices, they should be treated as infectious material and disposed of accordingly. Dispose of patient interface and filters as per facility standard operating procedures for infectious/biohazardous waste management.

For details on each device see Checklists

Perform risk assessment prior to entering the room

Always read and follow the instructions and recommendations of the manufacturer's manual

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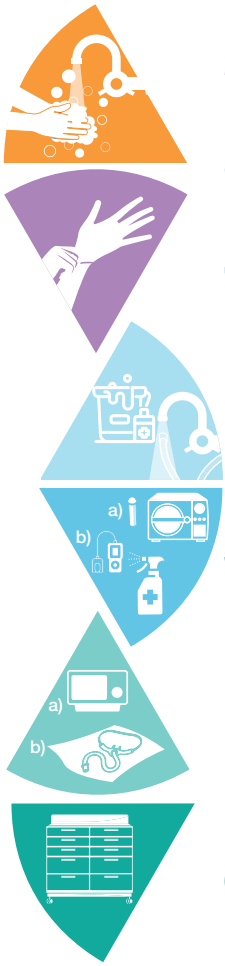
HEALTH EMERGENCIES programme

Care, cleaning and disinfection of **respiratory equipment**

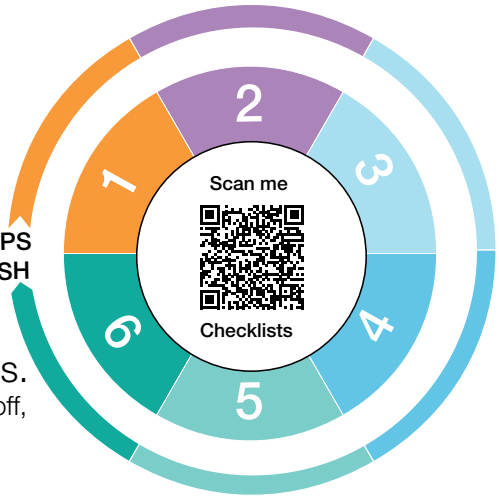
in sterile services department[1]

Equipment used for respiratory therapy (e.g. items that come into contact with mucous membranes of the patient) is considered semi critical; such items should be cleaned and then be disinfected before connecting to other patient.[2] High-level disinfection of respiratory equipment takes place after cleaning and is typically accomplished by physical methods or chemical germicides.[3]

STEPS



1. **Perform hand hygiene.**
2. **Don personal protective equipment (PPE)** to protect against splashing, spraying or aerosols.
3. **Wash** the equipment with detergent and rinse with clean water.
4. **Disinfect**
   a. **Physical heat** (for heat resistant equipment): e.g. steam, hot water (more than 121°C).
   b. **Chemicals** (for plastic and other parts that can be damaged by heat): e.g. hydrogen peroxide > 0.5%, ethanol 70-90% or 0.1% sodium hypochlorite.*
5. **Dry**
   a. **Physical equipment** (e.g. a washer, pasteurizer or autoclave) often has a drying feature within the machine.
   b. For **chemical methods**, let equipment parts air dry on a clean towel or cloth.
6. **Store** equipment dry in closed packages. (Before storing equipment remove PPE- wash hands Doff, discard PPE and perform hand hygiene.)



CYCLE FINISH

* Disinfectant solutions require preparation and should be used in well-ventilated areas away from patients.
- Prepare a fresh cloth or disposable wipe soaked in a compatible disinfectant and wipe the device from top to bottom, avoiding contact with electrical connectors.
- 0.1% sodium hypochlorite (1000 ppm) should only be used if device is known to withstand use of chlorine-based agents and no ammonia cleaning agents or acidic body fluids (e.g. urine) are present on the device.
- Do not use different disinfectant formulations during the same disinfection step, this may produce toxic fumes.

If chemical disinfection is used, rinse with sterile or clean water (i.e. water boiled for 5 minutes and cooled), or filtered water (i.e. water passed through a 0.2 µ filter), followed by an alcohol rinse and forced-air drying.

1 N.B. It is recommended for all involved in sterile services to review OpenWHO course on Decontamination and sterilization of medical devices: https://openwho.org/courses/IPC-DECON-EN As well as refer to WHO's Decontamination and reprocessing of medical devices for health-care facilities: https://apps.who.int/iris/handle/10665/250232)

2 Reference: https://www.who.int/publications/i/item/infection-prevention-and-control-of-epidemic-and-pandemic-prone-acute-respiratory-infections-in-health-care

3 Please refer to quality assurance and monitoring sections in WHO Guideline for Decontamination and reprocessing of medical devices for health-care facilities: https://apps.who.int/iris/handle/10665/250232

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Care, cleaning, disinfection and sterilization of respiratory devices

CHECKLIST 1 Bedside oxygen concentrators

CHECKLIST 2 High flow nasal cannula

CHECKLIST 3 BiPAP/CPAP

CHECKLIST 4 Pulse oximeters and vital sign monitors

CHECKLIST 5 Invasive mechanical ventilators

CHECKLIST 6 Sterile services department

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Care, cleaning and disinfection of **definitions**

Cleaning, **disinfection** and **sterilization** are the backbone of infection prevention and control in **hospitals and or other health care facilities**. The type and level of decontamination depends on the nature of the device and the use to be given to it. All persons who are responsible for handling and reprocessing contaminated elements must:

- Receive adequate training and periodic retraining.
- Use appropriate personal protective equipment.

Cleaning is an activity that removes organic and inorganic materials or dirt that is on the device surfaces with the main purpose of removing conditions that would enable the growth of microorganisms. Cleaning also allow the disinfectant to come into contact with items to kill microorganisms.

This is a mechanical activity mainly done with soaps or detergents with different pH levels that help to remove the dirt material. After washing, objects should be carefully rinsed in order to eliminate any residual chemicals and then dried.

Disinfection is an activity that consists of eliminating many of the pathogenic microorganisms that live on the device's surfaces. It should be performed just after a cleaning activity to guarantee that all other organic material has been removed.

This can be done with chemical and/or heating activities depending on the nature of the type of equipment, disinfectant used and processes selected. The disinfection approach should be selected based on its documented effectiveness with different microorganisms, including viruses, bacteria and fungi that might be contaminating the device. Chemicals used should have a sanitary registration for use in medical environments and must be recommended by the manufacturer.

Sterilization is the process that eliminates all living microorganisms including spores from surfaces. It should be performed just after cleaning and disinfection activities to guarantee that organic material and most pathogenic microorganism have been removed.

This can done with mechanical, e.g. steam sterilization, or chemical activity, e.g. ethylene oxide.

CHECKLIST 1

Care, cleaning and disinfection of **oxygen concentrators**

Between patients

Always read and follow the instructions and recommendations of the manufacturer's manual

Consumables associated with oxygen delivery are generally intended as **single use devices**. They should be treated as infectious[1] material and disposed of accordingly. Disposal of patient interface, tubing, water bag and water chamber, for example, should be done as per facility standard operating procedures for infectious/biohazardous waste management.

DURING OXYGEN THERAPY (same patient)

Before starting any hygiene tasks, please take preventative measures to ensure that: All electrical medical equipment are disconnected from power supply while tasks are being done; and, activities are performed away from the medical wards, preferably in biomedical workshops.

	Task	Description
1.	**Humidifier must be washed, rinsed, and disinfected daily[2]**	Oxygen bubble humidifier (non-heated with bottle) must be washed, rinsed, and disinfected daily when used for the same patient and disposed after use. 1. Empty the water from the humidifier. 2. Rinse the humidifier flask under running water. 3. Fill in with proper distilled water or cold boiled water within the scale between the top scale line and the lowest one. 4. Do not use tap water, even if it is safe drinkable water. 5. Do not use bottled water, even distilled, which has been stored in warm conditions. (These conditions allow bacterial growth in the water and increase the risk of patient infection).
2.	**Inspect and clean air intake filter (1-2 times per week)**	1. Pull the filter gently out and replace with spare one. 2. Put the filter in cool, soapy water and swirl gently to remove debris. 3. Remove from soapy water and place it in shady area until completely dry. 4. Store the spare filter until next cleaning is needed.
3.	**Inspect the bacterial filter weekly**	Do not wash the bacterial filter in water. This filter should be cleaned or changed by the maintenance department as per manufacturer's instructions.

BETWEEN PATIENTS

After each patient use, the concentrator must be disconnected, cleaned, disinfected, and stored appropriately in a clean environment before use on another patient

	Task	Description
1.	**Perform risk assessment prior to entry of room**	Consider the patient care tasks that will need to be performed or additional risks that may be encountered during disconnection of the device.
2.	**Perform hand hygiene**	
3.	**Don appropriate personal protective equipment (PPE)**	PPE worn during disinfectant preparation should include surgical mask/ respirator, goggles or face shield, long-sleeved fluid resistant gown or gown + apron, rubber gloves, and boots or closed work shoes.
4.	**Disconnect the device**	Turn off the device and disconnect from the patient and the power.

	Task	Description
5.	**Dispose of single use patient interface (e.g. nasal cannula , masks) tubing**	Ideally, dispose of single use patient interface, nasal cannula tubing in designated infectious material/biohazardous waste container.
6.	**Move the oxygen concentrator to a well-ventilated area for cleaning**	Move the oxygen concentrator away from patients and other equipment to a designated well-ventilated space where cleaning and disinfection of the device can be performed.
7.	**Change gloves**	**Discard gloves** in appropriate waste container, perform hand hygiene, and don new gloves.
8.	**Wash humidifier**	Wash the humidifier in warm water using a mild detergent. Rinse the humidifier throughly and allow to air dry completely.
9.	**Wipe the external device surfaces from top-to-bottom with detergent (Cleaning)**	Wipe the external device surfaces (all parts including flowmeter, controls and LEDs, from top-to-bottom including controls) with a damp cloth or disposable wipe soaked in detergent and clean water and then wipe off any remaining detergent residue with a dry lint-free cloth. To avoid permanent damage, do not use excessive amounts of liquids to clean the device. Use mechanical action (scrubbing) and brushing, if necessary, along the edges and joints to remove visible dirt deposits and calcifications.
10.	**Prepare disinfectant solutions**	Should always be performed before use, in well-ventilated areas away from patients.
11.	**Wipe with disinfectant**	Prepare a fresh cloth or disposable wipe soaked in a compatible disinfectant. Wipe the device from top to bottom, ensuring surfaces of sensors/cables are wiped while avoiding contact with electrical connectors. 0.1% sodium hypochlorite (1000 ppm) should only be used according to the manufacturer's instructions if device is known to withstand use of chlorine-based agents and no ammonia-based cleaning agents or acidic body fluids (e.g. urine) are present on the device. Do not use different disinfectant formulations during the same disinfection step, this may produce toxic fumes.
12.	**Remove PPE- wash hands**	Doff, discard PPE and perform hand hygiene.
13.	**Store cleaned oxygen concentrator and disinfect before new use**	Ensure cleaned oxygen concentrator is stored in an area where there is low risk of contamination between uses, and that at least 1 minute of contact time has elapsed after the application of the disinfectant before it is used on next patient.
14.	**Stored devices should be cleaned twice a month**	If device is not in use, it should be cleaned as above twice per month.

1 https://www.who.int/news-room/fact-sheets/detail/health-care-waste
2 https://www.primedeq.com/blog/cleaning-disinfection-and-proper-maintenance-of-oxygen-concentrators/

CHECKLIST 2

Care, cleaning and disinfection of **high flow nasal cannula**

During non-invasive ventilation and between patients

Always read and follow the instructions and recommendations of the manufacturer`s manual

Consumables associated with oxygen delivery are generally intended as **single use devices**, should be treated as infectious material and disposed of accordingly. Dispose of patient interface, tubing, water bag and water chamber, for example, as per facility standard operating procedures for infectious/biohazardous waste management.

DURING NON-INVASIVE VENTILATION (SAME PATIENT)

Before starting any hygiene tasks, please take preventative measures to ensure that: All electrical medical equipment are disconnected from power supply while tasks are being done; and, activities are performed away from the medical wards, preferably in biomedical workshops.

	Task	Description
1	**Humidifier (water chamber) must be washed, rinsed, and disinfected daily**	Oxygen bubble humidifier (non-heated bottle) must be washed, rinsed, and disinfected regularly when used for the same patient and disposed after use between patients (if possible). 1. Empty the water from the humidifier. 2. Rinse the humidifier flask under running water. 3. Fill in proper distilled water or cold boiled water within the scale between the top scale line and the lowest one. 4. Do not use tap water (not-boiled), even if it is safe drinkable water. Do not use bottled water, even distilled, which has been stored in warm conditions. (These conditions allow bacterial growth in the water and increase the risk of patient infection).
2	**Check and change air and dust filters every 3 months and clean regularly as recommended**	The filter can be weekly rinse under running water only if the procedure is established in the manufacturer's manual.

BETWEEN PATIENTS

After each patient use, the equipment must be must be cleaned, disinfected, and stored appropriately in a clean environment before use on another patient

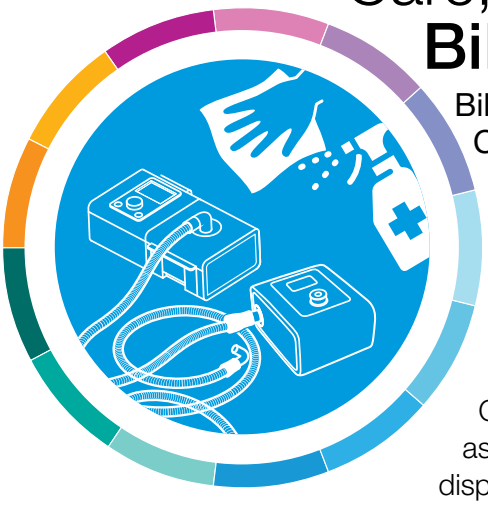
	Task	Description
1.	**Perform risk assessment prior to entering the room**	Consider the patient care tasks that will need to be performed or additional risks that may be encountered during disconnection of the device.
2.	**Perform hand hygiene**	
3.	**Don appropriate personal protective equipment (PPE)**	PPE worn during disinfectant preparation should include surgical mask/ respirator, goggles or face shield, long-sleeved fluid resistant gown or gown + apron, rubber gloves, and boots or closed work shoes.
4.	**Disconnect the device**	Turn off the device and disconnect from the patient, oxygen source and the power.

	Task	Description
5.	**Properly dispose of single use patient interface, nasal cannula tubing, water bag, and water chamber (after draining)**	Ideally, dispose of single use patient interface, nasal cannula tubing, water bag, and water chamber (after draining) in designated infectious material/ biohazardous waste containe.
6.	**Move the device to a well-ventilated area for cleaning**	Move the high flow nasal cannula device away from patients and other equipment to a designated well-ventilated space where cleaning and disinfection of the device can be performed.
7.	**Change gloves**	Discard gloves in appropriate waste container, perform hand hygiene, and don new gloves.
8.	**Wipe exterior surfaces with detergent (Cleaning)**	• Wipe the external device surfaces (all parts, from top-to-bottom including controls) with a damp cloth or disposable wipe soaked in detergent and clean water and then wipe off any remaining detergent residue with a dry lint-free cloth, to avoid permanent damage, do not use excessive amounts of liquid to clean the device. • Use mechanical action (scrubbing) and brushing, if necessary, along the edges and joints to remove visible dirt deposits and calcifications.
9.	**Prepare disinfectant solutions**	Should always be performed before use, in well-ventilated areas away from patients.
10.	**Wipe with disinfectant**	Prepare a fresh cloth or disposable wipe soaked in a compatible disinfectant, such as hydrogen peroxide >0.5% OR ethanol 70-90%; OR as specified by the device manufacturer, and wipe the device from top to bottom, avoiding contact with electrical connectors. 0.1% sodium hypochlorite (1000 ppm) should only be used according to the manufacturer's instructions if device is known to withstand use of chlorine-based agents and no ammonia-based cleaning agents or acidic body fluids (e.g. urine) are present on the device. Different disinfectant formulations should never be used on the same device during the same disinfection step, as this may produce toxic fumes.
11.	**Use high level disinfection when indicated**	Some devices require high level disinfection, see instructions on the manufacturer's manual. Ensure the cycle of disinfection is complete before drying and storing the device.
12.	**Remove PPE- wash hands**	Doff, discard PPE and perform hand hygiene.
13.	**Store clean ventilator and disinfect before use**	Ensure cleaned high flow nasal cannula device is stored in an area where there is low risk of contamination between uses, and that at least 1 minute of contact time haselapsed after the application of the disinfectant before it is used on next patient.

CHECKLIST 3

Care, cleaning and disinfection of **BiPAP/CPAP** devices

Bilevel or two-level Positive Airway Pressure (BiPAP).
Continuous Positive Airway Pressure (CPAP)



During non-invasive ventilation and between patients

Always read and follow the instructions and recommendations of the manufacturer`s manual

Consumables associated with oxygen delivery are generally intended as **single use devices**, should be treated as infectious material and disposed of accordingly. Dispose of patient interface and filters, for example, as per facility standard operating procedures for infectious/biohazardous waste management.

DURING NON-INVASIVE VENTILATION (SAME PATIENT)

**Before starting any hygiene tasks, please take preventative measures to ensure that:
All electrical medical equipment are disconnected from power supply while tasks are being done; and, activities are performed away from the medical wards, preferably in biomedical workshops.**

	Task	Description
1.	**Humidifier must be washed, rinsed, and disinfected daily**	Oxygen bubble humidifier (non-heated bottle) must be washed, rinsed, and disinfected regularly when used for the same patient and after use between patients. Empty the water from the humidifier. Rinse the humidifier flask under running water. Fill in proper distilled water or cold boiled water within the scale between the top scale line and the lowest one. Do not use tap water (not-boiled), even if it is safe drinkable water. Do not use bottled water, even distilled, which has been stored in warm conditions. (These conditions allow bacterial growth in the water and increase the risk of patient infection).
2.	**Check the air filter weekly and replace every 4 weeks**	Replace more often if there are any holes or blockages by dirt, dust, or other organic matter.

BETWEEN PATIENTS

After each patient use, the BiPAP/CPAP must be cleaned, disinfected, and stored appropriately in a clean environment before use on another patient

	Task	Description
1.	**Perform risk assessment prior to entering the room**	Consider the patient care tasks that will need to be performed or additional risks during disconnection of the device.
2.	**Perform hand hygiene**	
3.	**Don appropriate personal protective equipment (PPE)**	PPE worn during disinfectant preparation should include surgical mask/ respirator, goggles or face shield, long-sleeved fluid resistant gown or gown + apron, rubber gloves, and boots or closed work shoes.
4.	**Disconnect the device.**	Turn off the device and disconnect from the patient, oxygen source and the power.

	Task	Description
5.	**Dispose of single use tubing, interface and filters in designated waste containers**	If patient is being permanently disconnected from BiPAP/CPAP device, dispose of single use tubing, interface, and exhalation valve filters in designated infectious material/biohazardous waste container.
6.	**Move the device to a well-ventilated area for cleaning**	Move the BiPAP/CPAP device away from patients and other equipment to a designated well-ventilated space where cleaning and disinfection of the device can be performed.
7.	**Change gloves**	**Discard gloves** in appropriate waste container, perform hand hygiene, and don new gloves.
8.	**Wash humidifier**	Wash the humidifier in warm water using a mild detergent. Rinse the humidifier thoroughly and allow to air dry completely.
9.	**Wipe with detergent and clean water from top-to-bottom with detergent (Cleaning)**	Wipe the exterior of the device from top to bottom weekly and between patients with a damp cloth or disposable wipe soaked in detergent and clean water and then wipe off any remaining detergent residue with a dry lint-free cloth. Use mechanical action (scrubbing) and brushing, if necessary, along the edges and joints to remove visible dirt deposits and calcifications.
10.	**Prepare disinfectant solutions**	Should always be performed before use, in well-ventilated areas away from patients.
11.	**Wipe with disinfectant**	Prepare a fresh cloth or disposable wipe soaked in a compatible disinfectant. Wipe the device from top to bottom, ensuring surfaces of sensors/cables are wiped while avoiding contact with electrical connectors. **0.1% sodium hypochlorite (1000 ppm)** should only be used according to the manufacturer's instructions if device is known to withstand use of chlorine-based agents and no ammonia-based cleaning agents or acidic body fluids (e.g. urine) are present on the device. Do not use different disinfectant formulations during the same disinfection step, this may produce toxic fumes.
12.	**Remove PPE- wash hands**	Doff and discard PPE and perform hand hygiene.
13.	**Store clean BiPAP /CPAP and disinfect before new use**	Ensure cleaned BiPAP/CPAP device is stored in an area where there is low risk of contamination between uses, or that at least 1 minute of contact time has elapsed after the application of the chosen disinfectant (or as specified by the manufacturer) before ventilator device is used on a patient.

CHECKLIST 4

Care, cleaning and disinfection of **pulse oximeters** and patient **monitors devices**

During monitoring and between patients

Always read and follow the instructions and recommendations of the manufacturer`s manual

The device must be cleaned and disinfected after each individual use and, at minimum weekly, prior to use on another patient.

	Task	Description
1.	**Perform risk assessment prior to entry of room**	Consider the patient care tasks that will need to be performed or additional risks that may be encountered during disconnection of the device.
2.	**Perform hand hygiene**	
3.	**Don appropriate personal protective equipment (PPE)**	PPE worn during disinfectant preparation should include surgical mask/ respirator, goggles or face shield, long-sleeved fluid resistant gown or gown + apron, rubber gloves, and boots or closed work shoes.
4.	**Turn-off and disconnect the device from the patient and power**	Turn off the device and disconnect from the patient and the power and/ or make sure the batteries are taken out and all patient connections are removed when clinically safe to do so before cleaning.
5.	**Move device to a well-ventilated area for cleaning**	If monitoring device is not fixed to patient room/environment, move device away from patients and other equipment to a designated well-ventilated space where cleaning and disinfection of the device can be performed.
6.	**Wipe and clean with detergent (Cleaning)**	Wipe the outer surfaces, sensors, and cables of the device from top to bottom with cloth or disposable wipe soaked in detergent and clean water and then wipe off any remaining detergent residue with a dry lint-free cloth. To avoid permanent damage, do not use excessive amounts of liquids to clean the device. Use mechanical action (scrubbing) and brushing, if necessary, along the edges and joints to remove visible dirt deposits and calcifications.
7.	**Prepare disinfectant solutions**	Should always be performed before use, in well-ventilated areas away from patients.
8.	**Wipe with disinfectant**	Prepare a fresh cloth or disposable wipe soaked in a compatible disinfectant, (e.g. hydrogen peroxide ≥0.5%, OR ethanol 70-90%; or as specified by the monitor manufacturer). Wipe the device from top to bottom, ensuring surfaces of sensors/cables are wiped while avoiding contact with electrical connectors. 0.1% sodium hypochlorite (1000 ppm) should only be used according to the manufacturer's instructions if device is known to withstand use of chlorine-based agents and no ammonia-based cleaning agents or acidic body fluids (e.g. urine) are present on the device. Do not use different disinfectant formulations during the same disinfection step, this may produce toxic fumes.
9.	**Remove PPE - wash hands**	Doff, discard PPE and perform hand hygiene.

	Task	Description
10.	**Store clean device and disinfect before new use**	If device is not fixed to patient room/environment, ensure it is stored in an area where there is low risk of contamination between uses, and that at least 1 minute of contact time has elapsed after the application of the chosen disinfectant (or as specified by the manufacturer) before it is used on a new patient.

CHECKLIST 5

Care, cleaning and disinfection of invasive **mechanical ventilators**

During ventilation and between patients

Always read and follow the instructions and recommendations of the manufacturer`s manual

Consumables associated with oxygen delivery are generally intended as **single use devices**, and should be treated as infectious material and disposed of accordingly. Dispose of **patient interface and filters**, for example, as per facility standard operating procedures for infectious/ biohazardous waste management.

During ventilation (same patient)

Before starting any hygiene tasks, please take preventative measures to ensure that: All electrical medical equipment are disconnected from power supply while tasks are being done; and, activities are performed away from the medical wards, preferably in biomedical workshops.

	Task	Description
1.	**Single-use breathing circuits are recommended and should not be routinely changed for the same patient**	Changing circuits leads to the dispersion of contaminated droplets and aerosols as well as increased use of medical resources.
2.	**Place filter in both inspiratory and expiratory end of the ventilator**	When using a disposable filter, the exhalation filter is required to be replaced when the resistance is increased. The disposable filters can be used up to 48 hours before being exchanged. Replace the filter if the expiratory resistance increases or according to the instructions for the filter, whichever comes first.
3.	**Drain water in lines daily**	On a daily basis, drain water in gas supply inlet filter, and check the amount of liquid in the expiratory module water trap (the liquid volume cannot be more than half of the bottle).

BETWEEN PATIENTS

After each patient use, the ventilator must be cleaned, disinfected, and stored appropriately in a clean environment before use on another patient

	Task	Description
1.	**Perform risk assessment prior to entering the room**	Consider the patient care tasks that will need to be performed or additional risks that may be encountered during disconnection of the device.
2.	**Perform hand hygiene**	
3.	**Don appropriate personal protective equipment (PPE)**	PPE worn during disinfectant preparation should include surgical mask/ respirator, goggles or face shield, long-sleeved fluid resistant gown or gown + apron, rubber gloves, and boots or closed work shoes.
4.	**Disconnect the device**	Turn off the device and disconnect from the patient, the oxygen and the power.
5.	**Properly dispose of single use breathing circuit and exhalation valve filters**	Dispose of single use breathing circuit and exhalation valve filters in designated infectious material/biohazardous waste container.

	Task	Description
6.	**Prepare closed container with components requiring high-level disinfection**	Place any components that will be sent for high-level disinfection (respiratory valve, active humidifier, flow sensor and expiratory tubing if used/indicated, and other connectors/components) in a designated closed container for transport to sterile services department. If it is indicated in the manufacturer's manual, follow the instructions for autoclaving parts of the ventilator that are specified for this process.
7.	**Move the mechanical ventilator to a well-ventilated area for cleaning**	**Move the ventilator** away from patient area and other equipment to a designated well-ventilated space where cleaning and disinfection of the device can be performed.
8.	**Change gloves**	**Discard gloves** in appropriate waste container, perform hand hygiene, and don new gloves.
9.	**Wipe the external device surface from top-to-bottom with detergent (Cleaning)**	**Wipe the external ventilator surface** (including controls, housing, trolley and support arm, touch screen, power cord and gas supply hose) with a damp cloth or disposable wipe soaked in detergent and clean water and then wipe off any remaining detergent residue with a dry lint-free cloth. Use mechanical action (scrubbing) and brushing, if necessary, along the edges and joints to remove visible dirt deposits and calcifications. It is not necessary to routinely clean pressure lines within a ventilator between patients (these lines are not exposed to the patient or the patient's respiratory secretions).
10.	**Prepare disinfectant solutions**	Should always be performed before use, in well-ventilated areas away from patients.
11.	**Wipe with disinfectant**	Prepare a fresh cloth or disposable wipe soaked in a compatible disinfectant. Wipe the device from top to bottom, ensuring surfaces of sensors/cables are wiped while avoiding contact with electrical connectors. 0.1% sodium hypochlorite (1000 ppm) should only be used according to the manufacturer's instructions if device is known to withstand use of chlorine-based agents and no ammonia-based cleaning agents or acidic body fluids (e.g. urine) are present on the device. Do not use different disinfectant formulations during the same disinfection step, this may produce toxic fumes.
12.	**Remove PPE- wash hands**	Doff, discard PPE and perform hand hygiene.
13.	**Store clean ventilator and disinfect before new use**	Ensure cleaned ventilator is stored in an area where there is low risk of contamination between uses, and that at least 1 minute of contact time has elapsed after the application of the disinfectant before it is used on next patient.

CHECKLIST 6

Care, cleaning and disinfection of **respiratory equipment** in **sterile services department**[1]

Equipment used for respiratory therapy (e.g. items that come into contact with mucous membranes of the patient) is considered semi critical; such items should be cleaned and then receive at least high-level disinfection between patients.[2]

High-level disinfection of respiratory equipment takes place after cleaning and is typically accomplished by physical methods or chemical germicides.

	Task	Description
1.	**Perform hand hygiene**	
2.	**Don appropriate personal protective equipment**	Don appropriate personal protective equipment as per facility protocol: PPE worn during disinfectant preparation should include surgical mask/ respirator, goggles or face shield, long-sleeved fluid resistant gown or gown + apron, rubber gloves, and boots or closed work shoes.
3.	**Wash with detergent and Rinse clean water (Cleaning)**	Wipe the external device surface with a damp cloth or disposable wipe soaked in detergent and clean water and then wipe off any remaining detergent residue with a dry lint-free cloth. • Use mechanical action (scrubbing) and brushing, if necessary, along the edges and joints to remove visible dirt deposits and calcifications.
4a.	**Disinfect a. Physical -Heat for heat resistant equipment; e.g., steam[3], hot-water**	Physical methods for high-level disinfection include steam (e.g. autoclaving at lower temperature) or hot-water disinfection at least 121°C (pasteurization). Steam sterilization is an inexpensive and effective method for sterilization or high-level disinfection.[4]
4b.	**Disinfect-chemicals for plastic and other parts that can be damaged**	If disinfectant solutions require preparation before use, this should always be performed in well-ventilated areas away from patients. Prepare a fresh cloth or disposable wipe soaked in a compatible disinfectant, such as hydrogen peroxide ≥0.5% OR ethanol 70-90%; OR as specified by the device manufacturer, and wipe the device from top to bottom, avoiding contact with electrical connectors. • 0.1% sodium hypochlorite (1000 ppm) should only be used according to the manufacturer's instructions if device is known to withstand use of chlorine-based agents and no ammonia-based cleaning agents or acidic body fluids (e.g. urine) are present on the device (important to remember to rinse well the rests of chlorine). • Different disinfectant formulations should never be used on the same device during the same disinfection step, as this may produce toxic fumes.

	Task	Description
5a.	**Dry**	Dry equipment. • Physical equipment (e.g. a washer, pasteurizer or autoclave) often has a drying feature within the machine. • After pasteurization, wet equipment is typically dried in a hot-air drying cabinet ,or air drying, before storage. The equipment must be inspected carefully to ensure there is no water left in the equipment.
5b.	**Chemical Methods**	• If using chemical disinfection, rinse with sterile or clean water (i.e. water boiled for 5 minutes and cooled). Sterile water is preferred for rinsing off residual liquid chemical disinfectant from a respiratory device that has been chemically disinfected for reuse, because tap or distilled water may harbour microorganisms that can cause pneumonia. However, when rinsing with sterile water is not feasible, instead, rinse with tap water or filtered water (i.e. water passed through a 0.2 µ filter), followed by an alcohol rinse and forced-air drying.
6.	**Store equipment dry in closed packages**	Store equipment dry in closed packages.

1 N.B. It is recommended for all involved in sterile services to review OpenWHO course on Decontamination and sterilization of medical devices: https://openwho.org/courses/IPC-DECON-EN As well as refer to WHO's Decontamination and reprocessing of medical devices for health-care facilities: https://apps.who.int/iris/handle/10665/250232)

2 Reference: https://www.who.int/publications/i/item/infection-prevention-and-control-of-epidemic-and-pandemic-prone-acute-respiratory-infections-in-health-care

3 However, steam sterilization is unsuitable for processing plastics with low melting points, powders or anhydrous oils.

4 Pasteurization is a non-toxic, cost-effective alternative to high-level disinfection with chemical germicides.

Equipment should be submerged for at least 30 minutes in water at a temperature of about 70 °C (less than the temperature that typically damages plastic).

Pasteurization can be accomplished using a commercial washer or pasteurizer.

Heat for heat-resistant equipment that can withstand high temperature (e.g. 80 °C); such equipment can be disinfected using a washer–disinfector; if a washer or pasteurizer is not available, use a high-end or commercial dishwasher with a "sanitize" feature that can reach 70 °C.

Please refer to quality assurance and monitoring sections in WHO Guideline for Decontamination and reprocessing of medical devices for health-care facilities: https://apps.who.int/iris/handle/10665/250232

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