

Hospital built environment requirements
for Infection Prevention and Control:
**recommendations for
hand hygiene, cleaning and disinfection
and transmission-based precautions**

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Head of Unit	Innovation Lead	Medical Innovation Advisor
David Veldeman	Marpe Tanaka	Lindsay Bryson

Report title:

Hospital built environment requirements for Infection Prevention and Control: recommendations for hand hygiene, cleaning and disinfection and transmission-based precautions.

Core project team:

An Caluwaerts, Celine Van Lamsweerde, Guilherme Coelho and Joost Hopman.

Project coordination and report:

Guilherme Coelho

General project supervision:

Marpe Tanaka

Collaboration:

Alberto Zerboni, Annick Antierens, Elvina Motard, Fabrizio Andriolo, Francesc López, Joos Van Den Noortgate, Nathalie Tremblay and Wolfgang Sunder.

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Fredsborgsgatan 24
Box 47021
SE-100 74 Stockholm
SWEDEN

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siu@stockholm.msf.org

Introduction

The hospital-built environment is recognised as one of the eight core components of WHO infection prevention and control programme for national and acute healthcare facilities. To promote an effective and standardised clinical practice, WHO addresses that emphasis should be made to optimise the healthcare environment, which should ensure a working system that supports the effective implementation of IPC practices (1).

The objective of this report is to provide information to support the definition of infection prevention and control requirements for the built environment of healthcare facilities in resource-limited settings. The recommendations proposed in the report intent to support the implementation of the Intersectional MSF Policy and Strategic Framework for health structures, which focus on three pillars: hand hygiene, cleaning and disinfection, and transmission-based precautions. They aim to improve the design of healthcare facilities, creating a working environment that enhances and facilitate the behaviour of health care workers in the execution of IPC measures.

For the elaboration of the report, it was used as major references codes and norms that regulate the design of healthcare facilities and WHO and CDC guidelines. Nevertheless, considering the low level of evidence in the subject, the recommendations are in the majority derived from theoretical rationale and expert's opinion. The recommendations presented in this report are not conclusive and require further investigation before been disseminated or implemented in the field.

This report is produced by the SIU and compiles the information collected during the EReq project (Essential requirements for the hospital-built environment), a collaboration between SIU and OCB, as well as beyond this project.

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Summary of recommendations

The recommendations listed below aim to provide the proper built environment conditions for the execution of Infection Prevention and Control measures and are considered relevant to support the implementation of the MSF IPC policy. They intend to support architects and other professionals working on the planning and designing of health care facilities in resource-limited settings, as well as to be used as a parameter for the assessment of the built environment of healthcare facilities.^{1 2}

Hand hygiene

General recommendations:

- It is recommended providing ready availability and optimal placement of hand hygiene materials and equipment at the point of care³ (1).
 - It is recommended providing bottles of alcohol-based handrub positioned at the point of care in each ward (or given to staff) (2).
 - It is recommended providing one sink to at least every ten beds, with soap and fresh towels available at every sink (2).

Specific recommendations for the patient zone:

- It is recommended providing 1 alcohol-based handrub dispenser per patient bed (3). (especially at intensive care wards/rooms)
- In settings where alcohol-based handrub supply and quality can be ensured, it is recommended to study the possibility to remove sinks in the patient zone⁴, especially at areas with critical patients, such as NICU and ICU wards/rooms.
- In any case, it is necessary to make available opportunity for hand washing, such as the use of a mobile hand washing basins⁵ or the provision of handwashing facilities accessible to staff working at treatment areas, to allow staff to perform hand hygiene when hands are visibly soiled.

Specific recommendations for hand washing facilities:

- In general, the possibility of handwashing without the need to touch the tap with soiled hands is preferable. Ideally, taps should be opened by using an elbow or foot operating system (2)
- Scrub sink - It should be provided a handwashing facility, with hands free device, that allow staff to wash hand and forearms, located in a dedicated area in the vicinities of: operating rooms (Surgical Dept.); resuscitation rooms (Emergency Dept.) and delivery rooms (Obstetrics Dept.)

¹ **Wastewater disposal and waste management** specifications should be discussed with WatSan technical referent. For further information see Public Health Engineering in Precarious Situations, MSF 2010.

² Recommendations for the prevention of airborne pathogens are not included in this document. The subject requires a separated study.

³ The point of care refer to the place where the three following elements come together: the patient, the health care worker and care or treatment involving contact with the patient or his/her surroundings within the patient zone (1).

⁴ Patient zone. Concept related to the “geographical” visualization of key moments for hand hygiene. It contains the patient and his/her immediate surroundings. This typically includes the intact skin of the patient and all inanimate surfaces that are touched by or in direct physical contact with the patient such as the bed rails, bedside table, bed linen, infusion tubing and other medical equipment. It further contains surfaces frequently touched by HCWs while caring for the patient such as monitors, knobs and buttons, and other “high frequency” touch surfaces (2).

⁵ Mobile handwashing basins was used in the study conducted by Hopman et al. (17)

- Standard or clinical sink/basin - It should be provided at least one hand-washing facilities at: consultations rooms; laboratory and sterilization unit; kitchen and laundry; soiled utility room, housekeeping storeroom and waste zone.
- It should be provided hand-washing facilities at all staff changing rooms and toilets facilities.

Specific recommendations for alcohol-based hand rub dispensers:

- For optimal compliance with hand hygiene, hand rubs should be readily available, either through dispensers close to the point of care or in small bottles for on-person carriage (4).
- Characteristics to be considered as a prerequisite for all dispensers and their placement: easy and unobstructed access; logical placement; standardized (with regard to fillings/containers and “No-touch” system (free hands operable) (2)
- To provide ABHRs at the foot of every patient bed or adjacent wall, at other multi-use patient care areas such as consultation rooms and at the entrance of each inpatient unit, outpatient clinic and other departments (3).

Cleaning and disinfection

Floors finish:

- In general, flooring in clinical areas should be seamless, smooth, slip-resistant and easily cleaned (5).
- Vinyl flooring should be the first option for the majority of the hospital's areas (see table 3). Nevertheless, if the proper quality of materials and installations of vinyl or resin cannot be guaranteed, it is recommended to use ceramic tiles as an alternative.
- For wet areas, such as such as laundry, mortuary, kitchen and toilets facilities ceramic tiles are recommended.

Walls finish:

- As a general recommendation, wall finish should be fluid resistant and easily cleaned, especially in areas where contact with blood or body fluids may occur (e.g., laboratories, operating rooms) and finish around plumbing fixtures should be smooth and water resistant (6).
- It is recommended to use oil-based paint in all areas of the hospital, with exception to wet areas (see table 4).
- For wet areas, such as toilet, kitchen, soiled utility room and sterilization unit it is recommended to use ceramic tiles.

Ceiling finish:

- In general, it is recommended to use oil-based paint in all areas of the hospital.

Working tops material:

- In general, it is recommended to use stainless steel for most working surfaces in clinical areas and support areas.
- For laboratory worktops laminated is the simple option, wherever budget is not a constraints, hard resign should be used.

Support areas for cleaning and disinfection:

- **Housekeeping storeroom**⁶ - It is recommended to provide a dedicated area for the storage of material and equipment used to clean and disinfect environmental surfaces (floor, walls, ceiling and working surfaces). The number and location of housekeeping storeroom should be defined case by case. Nevertheless, it is recommended to provide a dedicated housekeeping store room at:
 - Surgical Dept., easily accessible from the operating room
 - Obstetrics Dept., easily accessible from the delivery room
 - Emergency Dept., easily accessible from the resuscitation and procedure room
 - Intensive care units and Inpatient dept.
 - Kitchen, laundry and waste zone
 - Toilets and showers facilities (the cleaning material used to clean toilets facilities should not be used to clean other areas of the healthcare facility)
- **Equipment room** – It should be provided a dedicated area for cleaning and disinfection of equipment (ex: trolleys, incubators, etc.). This area should be placed in proximity to the location where the equipment is used.
- **Sterilization Unit** – It should be provided a dedicated centralized decontamination area and/or sterile supply department for the decontamination and sterilization of medical devices and other items/equipment (1) (see OCB guidelines).

Transmission-based precaution

- To achieve effective isolation, designated single rooms (preferably with private toilet and shower facilities) should be available to place suspected or confirmed infectious patients (1).
- It is recommended to provide at least one dedicate room for the isolation of patients at hospital facilities.
- Preferable the isolation room should be provided with an anteroom for staff change clothes (PPE) wherever it is needed, creating a transition space between common areas and patient areas.

General support areas

- **Soiled utility room** - It is recommended to provide a dedicated are for the disposal of body fluids and liquids as well as for the temporary storage of waste, soiled linen and soiled reusable medical devices (RMD). A dedicated Soiled utility room should be provided at: Surgical Dept.; Obstetrical Dept.; Emergency Dept.; Intensive care units and Inpatient Dept.
- **Staff changing room** - It is recommended to provide facilities for staff to change clothes, and/or showering whenever needed, before and after entering clinical/work stations. A dedicated staff changing room should be provided at: Surgical Dept.; Obstetrical Dept.; Emergency Dept.; Intensive care units and Inpatient Dept.
- **Toilet and shower facilities** – It is recommends providing at least one toilet designated for women/girls to manage menstrual hygiene needs; one toilet separated for staff and at least one toilet meeting the needs of people with limited physical disabilities. It should be provide at least one toilet for every 20 users in the inpatient setting (1) as a minimum. Nevertheless, the number and location of toilet and shower facilities in the hospitals should be discussed case by case.

⁶ This functional area should not be merged with soiled utility room.

- **Clean supply storage** - It is recommends providing a dedicated clean storage area for patient care items and equipment, including sterile material, and a separate area for the storage of clean linen (1).

Hand Hygiene

Hand hygiene is defined as any action of hygienic hand antisepsis to reduce transient microbial flora. It is generally performed either by hand rubbing with an alcohol-based formulation or handwashing with plain or antimicrobial soap and water. Hand hygiene is considered a major component of standard precautions and the most important measure to prevent healthcare-associated infections. Moreover, considerable evidence exists, showing that hand hygiene can reduce the transmission of pathogens, thus decreasing HAI rates and cross-transmission of antimicrobial resistant pathogens (2).

According to WHO, successful and sustained hand hygiene improvement is achieved by implementing multiple actions, or multimodal strategy, which addresses different obstacles and behavioural barriers. The multimodal strategy consists of the implementation of several components⁷ of the WHO Multimodal Hand Hygiene Improvement Strategy, where all components are considered crucial for the establishment and effective functioning of IPC programs (4).

One of the five essential components of the multimodal strategy is the “system change”, which refers to the work system where hand hygiene takes place and the **infrastructure** (equipment and facilities) that makes possible the proper compliance to hand hygiene guidelines (1). The infrastructure required to perform hand hygiene is directly linked to the built environment and has an impact in the healthcare facility design requirements.

Hand hygiene infrastructure

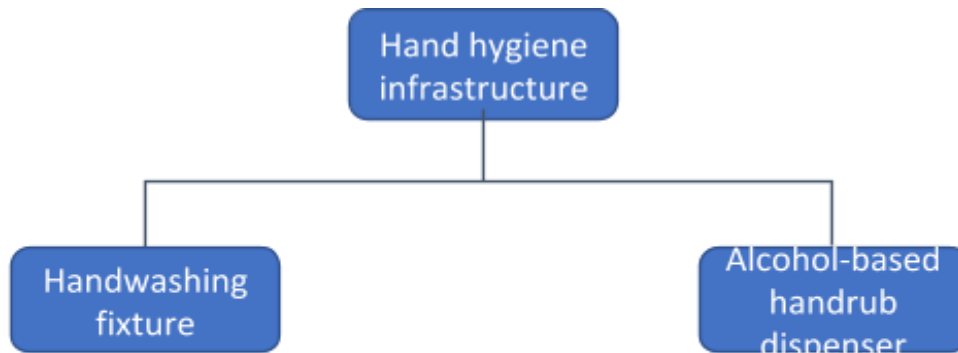
All components of the multimodal strategy are considered equally important; nevertheless, WHO states that hand hygiene compliance is only possible if it is ensured adequate infrastructure and supply of hand hygiene products at the right time and the right location. In general, WHO recommends providing ready availability and optimal placement of hand hygiene materials and equipment at the point of care⁸ (1).

Although WHO Guidelines provide a comprehensive review of scientific data and include technical information to plan implementation strategies, it is necessary to identify recommendations that are specific for each healthcare facility functional area and that are suitable to resource-limited settings. The recommendations for hand hygiene infrastructure should address the different types of equipment and its appropriated location and quantity.

The first aspect to be considered for the selection of the hand hygiene infrastructure is the choice between handwashing fixture and alcohol-based hand rub dispenser, as well as the different types of equipment within those two options as represented in the graphic below:

⁷ The five essential elements of the WHO multimodal hand hygiene improvement strategy: (1) **system change**, including availability of alcohol-based handrub at the point of patient care and/or access to a safe, continuous water supply and soap and towels; (2) **training and education** of health-care professionals; (3) **monitoring** of hand hygiene practices and performance feedback; (4) **reminders** in the workplace; and (5) **cultural change**, the creation of a hand hygiene safety culture with the participation of both individual HCWs and senior hospital managers (2).

⁸ The point of care refer to the place where the three following elements come together: the patient, the health care worker and care or treatment involving contact with the patient or his/her surroundings within the patient zone (1).



Types:

- Clinical/Standard sink/basin for hand washing/disinfection
- Scrub sink for hands and forearms washing/disinfection

Types:

- Wall- and bed-mounted dispensers
- Table-top dispensers (pumps)
- Pocket- and clip-on dispensers
- Automated-wall mounted

Tapware:

- hands free (touchless) taps/faucet
 - Elbow-operated taps
 - Foot or knee-operated taps
 - Sensor-activated (Infrared)
- Hands operated taps/faucet
 - Wall or basin taps

Handwashing fixture and Alcohol-based handrub dispensers

The consensus recommendations of the international panel of experts mandated by the WHO, present indications for hand hygiene in healthcare activities and propose guidelines that could be used worldwide. They are based on evidence- and consensus-based recommendations aiming for optimal hand hygiene practices and successful hand hygiene promotion. The recommendations below refer to the indication for hand hygiene and the use of Handwashing fixture or Alcohol-based handrub dispensers as described below (2):

Handwashing fixture:

- Wash hands with soap and water when visibly dirty or visibly soiled with blood or other body fluids or after using the toilet.
- If exposure to potential spore-forming pathogens is strongly suspected or proven, including outbreaks of *Clostridium difficile*, hand washing with soap and water is the preferred means.

Alcohol-based handrub:

- Use an alcohol-based handrub as the preferred means for routine hand antisepsis in all other clinical situations described in the items listed below⁹:
 - Before and after touching the patient;

⁹ If alcohol-based handrub is not obtainable, wash hands with soap and water (2).

- Before handling an invasive device for patient care, regardless of whether or not gloves are used;
- After contact with body fluids or excretions, mucous membranes, non-intact skin, or wound dressings;
- If moving from a contaminated body site to another body site during the care of the same patient;
- After contact with inanimate surfaces and objects (including medical equipment) in the immediate vicinity of the patient;
- After removing sterile or non-sterile gloves;
- Before handling medication or preparing food, perform hand hygiene using an alcohol-based handrub or wash hands with either plain or antimicrobial soap and water;

Remark: In any case, soap and alcohol-based handrub should not be used concomitantly (2).

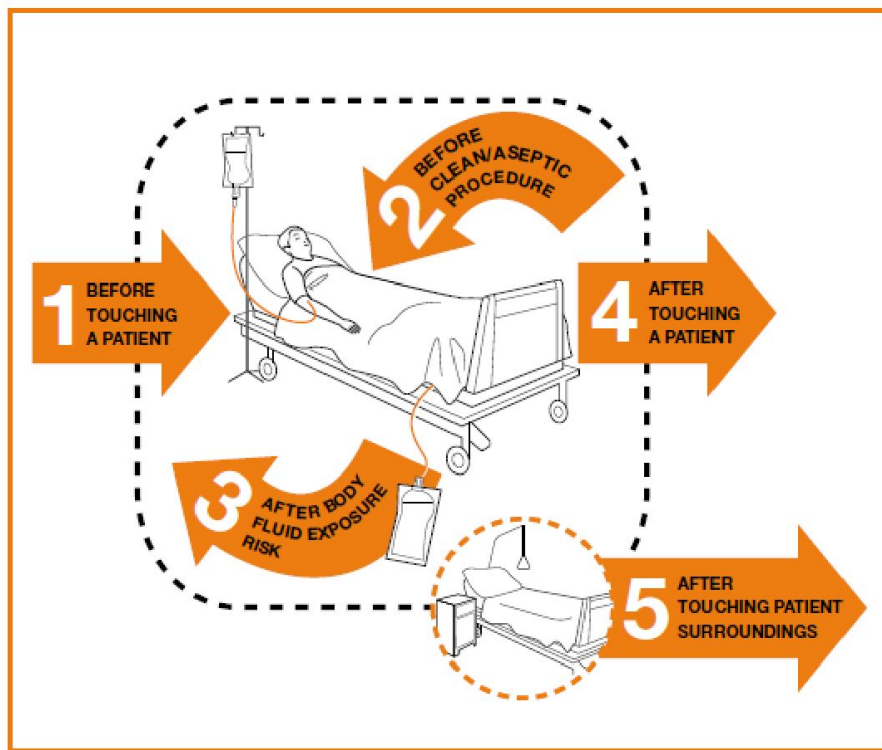


Figure 1: Unified visuals for “My five moments for hand hygiene” (2)

A systematic review of publications between 1992 and 2002 regarding the effectiveness of alcohol-based solutions for hand hygiene showed that alcohol-based handrubs remove organisms more effectively, require less time, and irritate skin less often than handwashing with soap or other antiseptic agents and water (7) (2). At present, alcohol-based handrubs are the only known means for rapidly and effectively inactivating a wide range of potentially harmful microorganisms on hands (8) (9) (10) (11). The WHO recommends alcohol-based handrubs based on the following factors (2):

- Evidence-based, intrinsic advantages of fast-acting and broad-spectrum microbicidal activity with minimal risk of generating resistance to antimicrobial agents.
- Suitability for use in resource-limited or remote areas with lack of accessibility to sinks or other facilities for hand hygiene (including clean water, towels, and so forth).

- Capacity to promote improved compliance with hand hygiene by making the process faster and more convenient.
- Economic benefit by reducing annual costs for hand hygiene, representing approximately 1% of extra-costs generated by HCAI.
- Minimization of risks from adverse events because of increased safety associated with better acceptability and tolerance than other products.

While handwashing fixtures are needed to clean soiled hands and are a crucial component to support the prevention and control infections in healthcare facilities, there is evidence suggesting a transmission route of pathogens from sinks to hands (12) (13). Sink's drains can accumulate strains with resistance genes and become a potential source of pathogens (13) and drains can function as an open bacterial reservoir (14). Handwashing fixture's drains can contain stagnant water, which supports the growth of microorganisms that can be a source of pathogens and can be transferred to hands during hand hygiene procedure (15) (16).

Removing sinks from patient rooms and the introduction of 'water-free'¹⁰ patient care has been associated with a significant reduction of HAI cases in Intensive Care Units (17). Additionally, the introduction of a waterless system for hand hygiene is considered a cost-effective measure (2). For that reason, at settings where alcohol-based handrub supply and quality can be ensured, it is recommended to study the possibility to remove sinks in the patient zone¹¹, especially at functional areas with critical patients, such as NICU and ICU wards. Nevertheless, it might be needed to make available an alternative way for hand washing, such as the use of a mobile hand washing basins¹² to allow staff to perform hand hygiene when hands are visibly soiled.

According to WHO, successful behavioural hand hygiene promotion programmes can induce increased compliance. However, hand hygiene behaviour might persist and will continue to require handwashing with water and soap. Thus, the provision and accessibility of sinks must be carefully considered when design healthcare facilities (2).

Specifications for hand hygiene equipment

WHO recommends providing bottles of alcohol-based handrub positioned at the point of care in each ward (or given to staff) and one sink to at least every ten beds, with soap and fresh towels available at every sink (2).

Hand hygiene product, such as alcohol-based handrub, should be easily accessible and as close as possible, within arm's reach of where patient care or treatment is taking place. Ideally, the infrastructure for hand hygiene should be accessible to staff in the way that they can perform hand hygiene without having to leave the patient zone (2).

An additional recommendation for the location of Alcohol-Based Hand Rub (ABHR) dispenser includes (3):

¹⁰ 'water-free': all patient care related activities that take place in the patient room and that would normally involve the use of tap water were adapted to a 'water-free' alternative (17).

¹¹ Patient zone. Concept related to the "geographical" visualization of key moments for hand hygiene. It contains the patient and his/her immediate surroundings. This typically includes the intact skin of the patient and all inanimate surfaces that are touched by or in direct physical contact with the patient such as the bed rails, bedside table, bed linen, infusion tubing and other medical equipment. It further contains surfaces frequently touched by HCWs while caring for the patient such as monitors, knobs and buttons, and other "high frequency" touch surfaces (2).

¹² Mobile handwashing basins was used in the study conducted by Hopman et al. (17)

- To provide ABHR at the foot of every patient bed or adjacent wall;
- ABHR affixed to mobile work trolleys (e.g. intravenous, drug and dressing trolleys);
- In high staff traffic areas (e.g. staff station, utility rooms and at the entrance to patient rooms);
- Other multi-use patient care areas such as consultation rooms;
- ABHR at the entrance of each inpatient unit, outpatient clinic and other departments; and
- In public areas such as waiting rooms, receptions areas, hospital foyers, and near elevator doors in high traffic areas.

In primary care and outpatient settings, where clinical procedures or examination of patients/clients is undertaken, a clinical wash-hand basin should be close to where the procedure is carried out (5).

Handwashing fixture equipment

According to their function, hand washing fixture can be divided into two types: **standard or clinical sink/basin** for hands washing/disinfection and **scrub sink** for hands and forearms washing/disinfection. Wherever hand hygiene guidelines require to wash/disinfect hands and forearms¹³, such as in the surgical department, a scrub sink should be provided. For all other cases, such as consultation rooms and toilet facilities, a standard/clinical sink/basin should be adopted.

Sink/basins have different models and sizes and will vary according to the local market. Nevertheless all sinks should follow the recommendations below:

- Basins should be provided with clean water, soap, single used or clean reusable towels, and wherever possible, they should be hands-free operable. (2).
- Water stream from faucets should not fall directly into the waste outlet to prevent the possible aerosolisation of pathogens residing in the waste outlet (18) (19).
- Taps should be fitted with an aerator screen¹⁴. The mesh of the aerator screen should be sufficiently wide to ensure that no water remains on top of the aerator screen, as this may lead to bacterial contamination and consequent spread of microbes (19) (2).
- Hand washing basins should be large enough to control splashing and designed to avoid or retained water. Also, walls adjacent to hand wash basins should be made of no porous material (20).
- Sinks/basins should have no overflow; have curved sides; are either sealed to the wall or far enough away from the wall to allow effective cleaning (3).
- Tap water should be delivered at a suitable temperature to allow hand washing under running water (3).
- Hand basins should be made of a hard, non-scratch material (usually, porcelain) and be easy to clean and disinfect (3).

Additional recommendations for scrub sinks:

¹³ It should be investigated if it is necessary to provide a sink for wash/disinfect hands and forearms in the delivery room, at the Obstetrics Department, as well as in the resuscitation room in the Emergency Department.

¹⁴ Aerators screen are mesh screen made of metal or plastic that is attached to the end of a faucet, simply screwed onto the faucet head, creating a non-splashing stream and often delivering a mixture of water and air.

- They should have sufficient space between the waterspout and the sink to enable adequate washing up to the elbow. The basin should be a large wall-mounted type, with hands-free taps, with warm and cold water delivered by a common spout. (3).
- If the sink does not have foot controls or long handles to operate with your elbow, have someone else to turn off the tap or use the towel to turn off the tap, to avoid re-contaminating your hands (21)
- Sinks should be designed to reduce the risk of splashes (2).

Basin/sinks tapware

According to WHO, the possibility of handwashing without the need to touch the tap with soiled hands is preferable. Ideally, taps should be opened by using an elbow or foot, and in settings without budget restrictions, sensor-activated taps may be used (2).

The WHO guideline for hand hygiene state that manual or elbow or foot-activated taps could be considered the optimal standard within health-care settings, nevertheless, recommendations for their use are not based on evidence. Furthermore, it should be considered that the provision of hands-free operable tapware is not among the highest priorities for IPC, particularly in settings with a limited budget and local resources (2).

Regarding the use of sensor-activated taps, it must be noted that the electrical system reliability and local availability of spare parts for maintenance need to be ensured. Electronic activated taps present's maintenance and reliability issues, if the unit fails for technical reasons, it could result in the failure of the hand hygiene programme (2).

Handwashing basins tapware advantages and disadvantages:

Elbow-operated taps	
Advantages: <ul style="list-style-type: none"> ● It is not required to touch the tap with hands at any point during the hand-washing operation, avoiding cross-contamination between users. ● Low maintenance and easy to install. ● Simpler design reliable It is easy to install and maintain. (22)	Disadvantages: <ul style="list-style-type: none"> ● Usually, it is not available in resource-limited settings. ● It is not ensured the local availability of spare parts for maintenances. (22)
Foot or knee-operated taps	
Advantages: <ul style="list-style-type: none"> ● Designed for water control where users must not touch taps. ● Reduce hands contamination with pathogens by avoiding the contact between hands and taps surfaces. ● Can be combined with any spout or separate outlet for hygienic 'hands-free' water supply ● Water saving - switches the water off after the operation (22) 	Disadvantages: <ul style="list-style-type: none"> ● Usually, it is not available in resource-limited settings. ● It is not ensured the local availability of spare parts for maintenance and local labour skills for installations.
Sensor-activated (Infrared)	
Advantages:	Disadvantages:

<ul style="list-style-type: none"> It is not required to touch the tap with hands at any point during the hand-washing operation, avoiding cross-contamination between users. (22) It can be programmed to control water flow (time and volume). 	<ul style="list-style-type: none"> Usually, it is not available in resource-limited settings. It is not ensured the local availability of spare parts for maintenance and local labour skills for installations. Electronic activated taps present's maintenance and reliability issues and unit failure could result in the failure of the hand hygiene programme (2). Requires reliable electrical supply Sensor taps imply higher initial investment than traditional taps. (22)
Wall/Basin taps (hands operable)	
<p>Advantages:</p> <ul style="list-style-type: none"> It is locally available, usually has spare parts in the local market. It is easy to install and maintain. 	<p>Disadvantages:</p> <ul style="list-style-type: none"> The use requires physical contact between hands and taps, creating a risk of cross-contamination between users.

Table 1: Handwashing basins tapware advantages and disadvantages.

Alcohol-based handrub dispenser equipment

For optimal compliance with hand hygiene, handrubs should be readily available, either through dispensers close to the point of care or in small bottles for on-person carriage. Availability of alcohol-based hand-rubs could be made through staff-carried hand rubs (pocket bottles), containers affixed to the patient's bed or bedside table, in trolleys or wall-mounted dispensers (4).

WHO guidelines recommend the use of multiple forms of dispensers in combination, such as wall-mounted and those for use at the point of care, to achieve optimal compliance. The choice of the dispensing system will also be influenced by financial constraints as well as local logistics availability of supplies and equipment. The advantages and disadvantages of the different dispenser methods are presented below (2):

Wall- and bed-mounted dispensers	
<p>Advantages:</p> <ul style="list-style-type: none"> HCWs know where they are – can allow attainment of hand hygiene in alignment with the “Five Moments” concept Can be operated by a no-touch system (if elbow-operated) Standardized about refill (freedom to choose other suppliers) Visible for staff, patients and visitors 	<p>Disadvantages:</p> <ul style="list-style-type: none"> Not always placed in convenient locations; in some units, they will not align with the requirements of the “Five Moments” concept Dependent on good service (refilling and maintenance) Patients and visitors can access and ingest (e.g. areas where patients are confused and paediatric wards) Splashes on the floor that stain certain floor surfaces
Table-top dispensers (pumps)	
Advantages:	Disadvantages:

<ul style="list-style-type: none"> ● Use at the point of care allowing attainment of hand hygiene in alignment with the “Five Moments” concept ● Low costs 	<ul style="list-style-type: none"> ● No fixed location ● Patients and visitors can access and ingest (e.g. elderly and paediatric wards) ● No-touch difficult
Pocket- and clip-on dispensers	
<p>Advantages:</p> <ul style="list-style-type: none"> ● Constant access by HCWs – increased the perception of self-efficacy among HCWs ● No access for patients and visitors for safety purposes 	<p>Disadvantages:</p> <ul style="list-style-type: none"> ● Can run-out at the point of care, thus require back-up and facilitated access inwards for a refill ● Costs ● Dependent on the supplier (clip-on) ● Environmental concerns and disposal if containers are not reused
Automated-wall mounted	
<p>Advantages:</p> <ul style="list-style-type: none"> ● Faster and “aesthetically appealing.” ● No touch 	<p>Disadvantages:</p> <ul style="list-style-type: none"> ● Unusable when out of order ● Costs of maintenance ● Dependent on supplier

Table 2: Advantages and disadvantages of the different dispenser (WHO, 2009; page 138) (2)

Handrub dispenser requirements

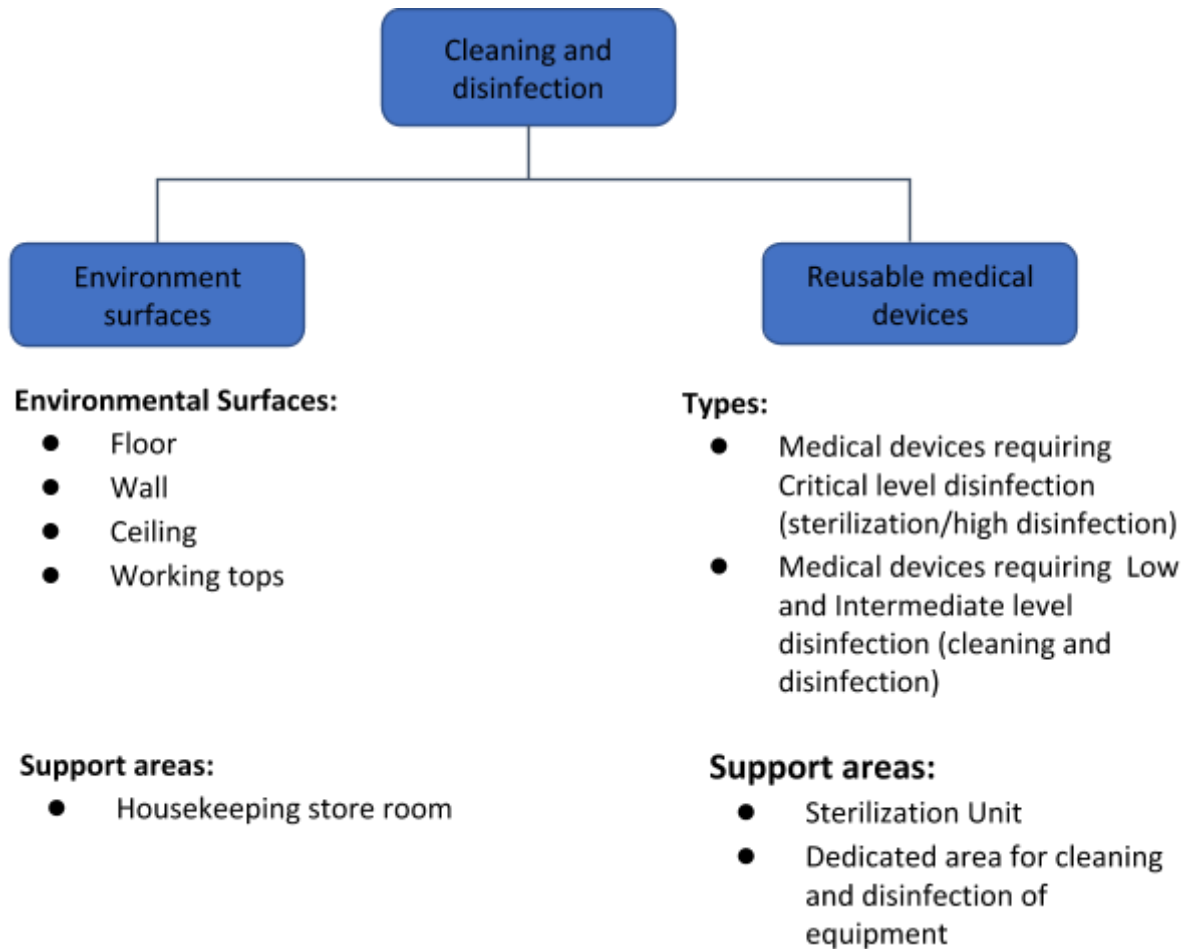
Bellow the characteristics to be considered as a prerequisite for all dispensers and their placement (2):

- Easy and unobstructed access: allow enough space around the dispenser; e.g. do not place under cupboards or next to other objects that hinder/obscure free access.
- Logical placement: Healthcare workers should know intuitively where dispensers are placed. They should be as close as possible, (e.g. within arm’s reach) where patient contact is taking place, to avoid to have to leave the care/treatment zone.
- Wide availability: Available in all patient rooms (possibly at the bedside) and all examination rooms and other points of care.
- Standardized (with regard to fillings/containers): standardisation should ensure that dispensers can be used with products of multiple brands, instead of only fitting the product of a single manufacturer¹⁵.
- “No-touch” system (free hands operable): to allow use by contact with a clean body part (e.g. elbow dispenser, pump on a bottle operated by a clean wrist). This is except pocket bottles or systems worn on HCWs’ uniforms.
- Disposable reservoir: dispensers should generally have a disposable reservoir (container/bottle) that should not be refilled. If reusable reservoirs have to be used, they should be cleaned and disinfected according to WHO guidelines.
- Avoid contamination: dispensers should be constructed in such a way that contaminated hands do not come into contact with parts of the delivery system of the dispenser and/or those parts unable to be cleaned.

¹⁵ A “Euro-dispenser” has been developed that holds European standard 500 ml and 1000 ml containers (2).

Cleaning and disinfection¹⁶

The item Cleaning and Disinfection was divided in two components: environmental surfaces and reusable medical devices as described in the diagram below:



This report considered as environmental surfaces the materials used to cover the floor, walls, ceiling, working tops. It also included recommendation for the housekeeping store room, considered as an important functional area to support the cleaning and disinfection of environmental surfaces. Recommendations for housekeeping store room are presented in the chapter Support Areas and in the report Technical Specifications for Finish Materials and Support Areas.

Medical equipment surfaces is not consider to be related to the built environment and it is not in the scope of this report. For recommendations for the design sterilization units for reprocessing reusable medical devices, please refer to the OCB MSF Guideline for Planning and Design of Health care Facilities.

¹⁶ The tables 3 and 4 was defined together with An Caluwaerts, Celine Van Lamsweerde and Joost Hopman.

Environmental surfaces

To establish a correlation between surfaces and potential risk of transmission of infection, in 1991, CDC proposed in addition to the Spaulding original classification¹⁷ for medical and surgical instruments (23), the introduction of a category designated as “environmental surfaces”. This additional category represents surfaces that do not come into direct contact with patients during care and are considered to carry the minimum risk of disease transmission to patients and staff (23).

According to CDC, the principles of cleaning and disinfecting environmental surfaces should consider the intended use of the surface or item in patient care. Environment surfaces can be safely decontaminated using less rigorous methods than those used on medical instruments and devices, and it can be divided into two sub-categories (24):

- Housekeeping surfaces (e.g., floors, walls, and table tops).
- Medical equipment surfaces¹⁸ (e.g., knobs or handles on haemodialysis machines, x-ray machines, instrument carts, etc.).

Housekeeping surfaces can be separated in surfaces with minimal hand-contact (e.g., floors, and ceilings) and with frequent hand-contact or “high touch surfaces” (e.g., doorknobs, bed rails, light switches, wall areas around the toilet in the patient’s room, and the edges of privacy curtains) (25). This report proposes recommendations only for housekeeping surfaces, here designated as floor, wall, ceiling and working surfaces/table tops. Recommendations for medical equipment surfaces are not within the scope of this report.

Contaminated surfaces can serve as a reservoir of potential pathogens. Nevertheless, environmental surfaces are not directly associated with transmission of infections to patients and staff (24). In this regard, the transfer of microorganisms from environmental surfaces to patients is fundamentally made through hands contact with the surface (26) (27). Limited evidence exists that floor, walls, and ceilings are a significant source of healthcare-associated infection (HAI) (28). According to Centers for Disease Control (CDC) the infection risk to patients from contaminated floors is small (24) (29) and pathogenic microorganisms do not readily adhere to walls or ceilings unless the surface becomes moist, sticky, or damaged (30). Nevertheless, the appropriate selection of environmental surfaces, considering its technical characteristics and cleaning and disinfection properties, is fundamental to reduce the potential risk of cross-contamination and healthcare-associated infection (HAI) (24).

The selection of housekeeping surfaces for healthcare facilities can be based on finish materials properties, such as permeability and seamless surface, additionally to the expected performance outcomes according to the requirements from each healthcare facility activity¹⁹ (31). Nevertheless, as a general criteria for the selection of environmental surfaces considering IPC requirements, finish materials should be chosen with cleaning and disinfection properties as the major parameter, especially in functional areas where contamination with blood or body fluid is likely to happen (5).

¹⁷ The Spaulding classification for medical and surgical instruments, which outlines three categories based on the potential for the instrument to transmit infection if the instrument is microbiologically contaminated before use, defined as “critical,” “semicritical,” and “noncritical.” (24)

¹⁸ Medical equipment surfaces is not related to the built environment and is not included in this document.

¹⁹ Clinical dry; clinical wet; no-clinical dry; clinical specialist; no-clinical wet; heavy traffic; specialist patient areas. (31)

Environmental surfaces should be signed to specific functional spaces according to the patients and staff risk factor of acquiring an infection and cleaning and disinfection properties. The principle is that environmental surfaces where patients have an increased propensity to infection (immunosuppressed patients) and are at higher risk, such as in intensive care and burn units, requires high standards (surface material properties) compared to administrative offices, as an example. This categorisation also considers clinical support areas such as clean supplies and sterilisation units, which has a direct link to patient's safety and possible transmission of infection (32).

The correlation between finish materials and functional spaces and risk factors could support decision making wherever financial or other operational constraints make necessary to prioritise investments. This categorisation makes possible to emphasise investment for improvements in functional areas that present a higher risk for patient and staff, thus more relevant regarding the prevention and control of HAI.

Another critical aspect to be considered is the quality of materials and the execution/installation of housekeeping surfaces. Whenever housekeeping surfaces are not properly executed or present low-quality components, it can compromise the surface required properties, such as permeability and seamlessness. Irregularities in the surface might propitiate the accumulation of pathogens as well as making difficult the proper cleaning and disinfection (33). Also, factors such as the appropriateness of the existing floor or walls to serve as a sub-base for the installation of new finishes, the local availability of finish materials and skilled labour for its installations should be considered (34).

Floor finish

Flooring materials can be classified as hard (ceramic tiles, concrete, etc.), resilient (vinyl sheet, rubber, and linoleum) or soft (carpets, textile, which is not included in this document). Within each category, floor finish presents other properties that define its suitability for use, which includes: permeability, smoothness, slip-resistance, fire hazard properties, dirt retention/control, component size and method of joining, among others (35).

In general, flooring in clinical areas should be seamless and smooth, slip-resistant, easily cleaned and comply with the following requirements (5):

- There should be coving between the floor and the wall to prevent accumulation of dust and dirt in corners and crevices.
- Any joints should be welded or sealed to prevent accumulation of dirt and damage due to water ingress.
- In areas where frequent wet cleaning methods are employed (for example, clinical areas and operating rooms), floors should be of a material that is unaffected by the chemical agents used for cleaning and resistant to corrosion from disinfectants.
- Floors that are particularly subject to traffic when wet (bathrooms, kitchens) should have a slip-resistant surface, but be easily cleaned.

Where floors meet wall surfaces in wet areas, floor finish should be curved at the junction to avoid a square joint (turned up minimum 100mm from the floor), which assists cleaning maintenance and can improve infection control measures. It is recommended that skirting in all clinical areas and functional spaces subject to frequent wetting cleaning methods,

should be integrated with the floor, tightly sealed against the wall and constructed without voids (3).

The selection of floor finishes should also consider operational constraints such as costs, local skilled labour for installation, finish material availability in the market, time of operations (emergency or long-term projects) and the full life-cycle and maintenance/sustainability of the floor wherever possible. Nevertheless, for this document, the characteristics regarding IPC, mainly cleaning and disinfection properties of finish materials were prioritised.

For MSF contexts, it was identified four suitable materials selected according to their use as follow: vinyl sheeting, resin, ceramic tiles and concrete floor. Among those options, vinyl flooring should be the first option for the majority of the hospital's areas (see table 3). Since its introduction in the market, polyvinylchloride (PVC) or 'Vinyl' sheet, has been one of the primary flooring materials used in healthcare facilities. Its inherent characteristics such as durability, resilient and impervious sheet material can provide low maintenance and hygienic solution (34). Although the use of vinyl is prevalent and accepted in the healthcare environment globally (35), vinyl usually is not available in the majority of the resource-limited settings, and frequently there is no skilled labour for its installation, making vinyl not an option in several settings where MSF works.

In MSF contexts, the alternative to vinyl would be resin or ceramic tiles. Resin produces continuous, seamless coatings and high chemical resistance more impervious surface than cementitious coatings and doesn't present joints as tiles (35). However, the resin is more expensive than tiles and concrete flooring, its installations require specialised labour and if it is not correctly applied, might provide inferior performance outcomes compare to tiles. Wherever resin is available and satisfactory installation can be ensured, the resin could replace vinyl, especially in critical areas.

Nevertheless, if the proper quality of materials and installations of vinyl and resin cannot be guaranteed, it is recommended to use ceramic tiles as an alternative. The individual tile unit complies with selection criteria for the majority of the areas in a healthcare facility (being impervious, and easy to clean and disinfect) (35). Ceramic tiles were frequently used in healthcare facilities before Vinyl were diffused (34). Until today, tiles are the most commonly used finish in wet areas, such as laundry, mortuary, kitchen, toilets, utility and cleaning areas due to the impervious quality and efficient performance under wet conditions (35). Also, tiles are less expensive than vinyl and resin and can be found and installed practically worldwide, especially in resource-limited settings.

Regarding costs, the concrete floor has the lowest price of all finish materials select. However, it presents several negative aspects regarding IPC. Large concrete surfaces require joints that can store moisture and encourage microbial growth (35) and hairline cracking and other defects are common (34). Because of its dark colour, concrete floor makes more difficult to identify soiled areas, and mechanical cleaning is less smooth compared with tiles or resin. Furthermore, it was not found in the literature recommendation for the use of concrete floor in any area of healthcare facilities (internal spaces), just in outside areas and warehouses.

Floor finish according to infection risk and functional areas^{20 21}:

Zones	Infection risk	1 st option	2 nd option	3 rd option	4 th option
Zone I	Low or negligible risk Example: offices, administrative services, lobby, technical services, stairways, technical sector (workshop), logistics sector (storehouse), pharmacy, etc.	Vinyl, resin or ceramic tiles	Concrete	-	-
Zone II	Moderate risk Example: maternity, functional rehabilitation care, functional rehabilitation rooms, outpatient consultation, central sterilization (washing area), morgue, bathrooms, waiting rooms, waste storage and treatment area, laundry, kitchen, changing rooms, corridors, etc.	Vinyl	Resin	Ceramic tiles	Concrete
Zone III	High risk Example: intensive care unit, emergency department, post-anaesthesia care unit/recovery room, delivery rooms, paediatrics, surgery, internal medicine, central sterilisation (packaging area), laboratories, isolation, operating room dressing rooms, etc.	Vinyl	Resin	Ceramic tiles	Concrete
Zone IV	Very high risk Example: operating rooms, burn unit, etc.	Vinyl	Resin	Ceramic tiles	Concrete

Table 3: Floor finish according to infection risk and functional areas

Wall finish

As a general recommendation, wall finish should be fluid resistant and easily cleaned, especially in areas where contact with blood or body fluids may occur (e.g., laboratories, operating rooms) and finish around plumbing fixtures should be smooth and water resistant (6). Other requirements from the best practices guidance for IPC in the built environment from the UK Department of Health for walls are (36):

- Smooth, hard, seamless and impervious surfaces are required in clinical areas as they are easier to clean.
- Wall surfaces are to be free from fissures, open joints or crevices.
- Walls penetrated by pipes, ducts, and conduits are to be sealed tightly to stop entry of pests, to maintain acoustic integrity, to maintain fire resistance and for reasons of hygiene.
- Wall finish should not comprise materials that promote or sustain the growth of fungi and microorganisms.

²⁰ Risk categories from MSF-OCP Hygiene Guidelines for Health Care Facilities, 2013.

²¹ This table was defined together with An Caluwaerts, Celine Van Lamsweerde and Joost Hopman.

- Wall finish is to be durable and able to withstand minor impacts without the need for additional wall protection.
- Wall finish is to be impermeable and easily wiped over if necessary and not be physically affected or degraded by detergents and disinfectants.

The quality of the wall finish is directly associated with the quality of the substrate, especially with a liquid finish such as paint. Poor quality of the substrate or plaster will affect the integrity of the smoothness and impervious finish, where cracks in the plaster can become a reservoir of pathogens (12).

Such as floor finishes, the characteristics regarding IPC, mainly cleaning and disinfection properties were prioritized. Nevertheless, the selection of wall finishes should also consider operational constraints such as costs, local skilled labour for installation, the local availability in the market, time of operations (emergency or long-term projects) and the full life-cycle and maintenance/sustainability wherever possible. In this regard, for MSF contexts, it was identified four suitable materials selected according to their use (see table 2) as follow: oil-based painting, porcelain and ceramic tiles and water-based painting.

Washable, water-resistant oil-based painting is recommended for the majority of hospital areas (except for wet areas, see table 4). Oil-based paints are seamless finish produced by painted plaster, ideal for areas where infection prevention is paramount as the surface is impervious to water, oil, and other fluids. Oil paint is relatively inexpensive compared to other wall finish. However, any mechanical damage can lead to small cracks and the potential risk of adhering pathogenic microorganisms in the wall surfaces (33).

Ceramic tiles are recommended for all wet areas, such as toilets facilities, change rooms, soiled utility rooms, housekeeping store rooms, kitchen, and laundry and sterilisation unit. For outside areas, water-based paint is recommended.

Wall finish according to infection risk and functional areas^{22 23}:

Zones	Infection risk	1 st option	2 nd option
Zone I	Low or negligible risk Example: offices, administrative services, lobby, technical services, stairways, technical sector (workshop), the logistics sector (storehouse), pharmacy, etc.	Water-based paint	-
	Moderate risk (dry) Example: maternity, functional rehabilitation care, functional rehabilitation rooms, outpatient consultation, morgue, waiting rooms, changing rooms, corridors, etc.	Oil-based paint	-
Zone II	Moderate risk (wet) Central sterilisation (washing area), bathrooms, waste storage and treatment area, laundry, kitchen.	Ceramic tiles	Oil-based paint
Zone III	High risk (dry)	Oil-based paint	-

²² Risk categories from MSF-OCP Hygiene Guidelines for Health Care Facilities, 2013.

²³ This table was defined together with An Caluwaerts, Celine Van Lamsweerde and Joost Hopman.

	Example: intensive care unit, post-anaesthesia care unit/recovery room, paediatrics, surgery, internal medicine, central sterilisation (packaging area), operating room dressing rooms, etc.		
	High risk (wet) Emergency department, delivery rooms, laboratories, isolation.	Ceramic tiles	Oil-based paint
Zone IV	Very high risk Example: operating rooms, burn unit, etc.	Ceramic tiles	Oil-based paint

Table 4: Wall finish according to infection risk and functional areas

Ceiling finish

Ceilings can be divided into three types of installation: actual structure overhead (concrete slab); membrane fixed directly to the structure overhead (for example a nail-up ceiling board, not included in this report) and a membrane suspended from the structure overhead (suspended grid system) (37). Possible types of installation:

- Concrete slab: surface finish can range from off-shutter smooth concrete to plastered and painted surface treatment. It has limited flexibility for service outlets (could not be hidden under the ceiling) however it provides a stable structure where more massive fittings need to be attached to the ceiling (surgical lamp, i.e.).
- Suspended grid system: it allows flexibility for positioning lights, ventilation, and other services. Replacement of damaged areas is simple and the easy access to technical installations for maintenance.

Ceiling finish in clinical areas should be easily cleaned and not physically affected or degraded by detergents and disinfectants (36). Smooth surfaces on concealed suspension systems should be impervious and able to withstand hard cleaning regimes. This system requires maintenance and might harbour dust and pests. Therefore it should be avoided in high-risk areas unless adequately sealed (29).

Ceiling structures should cover all conduits, piping, ductwork and open construction systems. Ceilings in critical areas and clean storages must be monolithic from wall to wall without fissures, open joints, or crevices that may retain dirt particles (38). For each type of ceiling different finish can be applied, such as paint on seamless plaster, and vinyl-clad ceiling tiles, polyester, among others. In any case, ceiling finish and materials should be smooth, impervious and joint-less/seamless (37).

Working surfaces (Table tops)

For this report, we had selected three finish materials for working surfaces: stainless steel, laminated and hard resin. All three have the properties for medical use and can be applied as working surfaces depended on the type of activity. In general, work surfaces should be impervious, designed for easy cleaning and be free of fissures and unsealed joints. They should be able to withstand the effects of regular cleaning with both detergents and disinfectants and be resistant to chemicals and moisture (39).

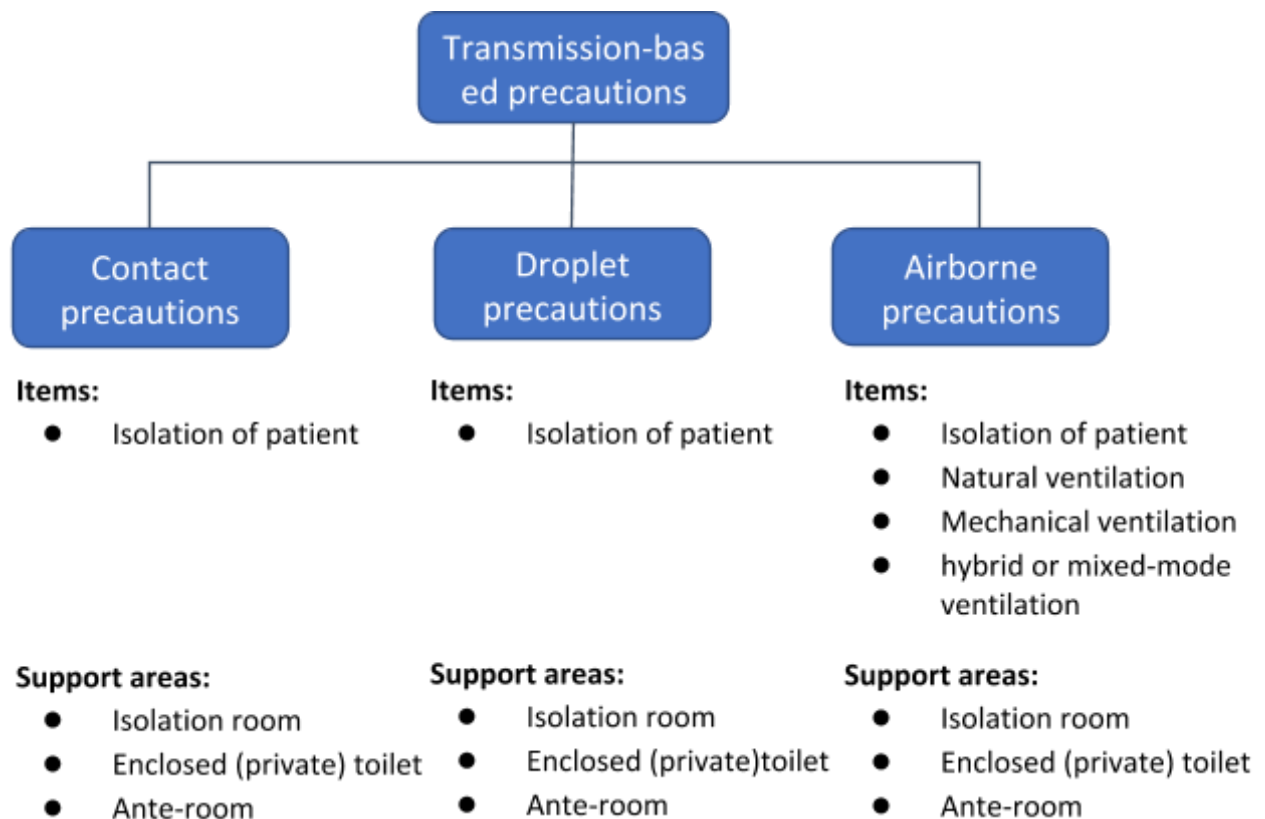
It is usual in resource-limited settings that working benches and counters are covered with ceramic tiles. However, the joints of ceramic tiles surfaces are porous and can retain

moisture which encourages the growth of mould (33). For that reason, it should be avoided. It is also advised to not use plastic (sheets), oil-based paint or wood as working surfaces.

Transmission-based precaution

Transmission-Based Precautions refer to additional measures from the standard precautions and are designated for patients who are known or suspected to be infected or colonised with infectious agents that require additional control measures to effectively prevent transmission of pathogens (40).

The modes of transmission of pathogens can vary by type of organism, and some pathogens may be transmitted through more than one route. In general, the routes of transmission are direct or indirect contact, (e.g., Herpes simplex virus [HSV], respiratory syncytial virus, Staphylococcus aureus), droplets, (e.g., influenza virus, B. pertussis) or airborne routes (e.g., M. tuberculosis). (40)



According to the WHO, to achieve effective isolation, designated single rooms (preferably with private toilet and shower facilities) should be available to place suspected or confirmed infectious patients (1). Wherever there is a concern about possible transmission of an infectious agent, single patient rooms are the preferred alternative, especially for patients requiring airborne precautions. Nevertheless, most of the healthcare facilities have multi-bed rooms and limited number of single-patient rooms (41).

It is common to group together (cohorting) patients who are colonized or infected with the same organism. This practices intents to restrict their care to one area and prevent contact

with other patients. Nevertheless, considering that clinical patient status can be caused by more than one infectious agent, when available, single patient rooms are always the preferred option to isolate patients (41). Below the CDC recommendation for isolation of patients according the modes of transmission:

Contact precaution

Use Contact Precautions for patients with known or suspected infections that represent an increased risk for contact transmission. (41)

- **Ensure appropriate patient placement** in a single patient space or room if available in acute care hospitals. In long-term and other residential settings, make room placement decisions balancing risks to other patients. In ambulatory settings, place patients requiring contact precautions in an exam room or cubicle as soon as possible.
- **Use personal protective equipment (PPE) appropriately**, including gloves and a gown. Wear a gown and gloves for all interactions that may involve contact with the patient or the patient's environment. Donning PPE upon room entry and adequately discarding before exiting the patient room is done to contain pathogens.
- **Limit transport and movement of patients** outside of the room for medically-necessary purposes. When transport or movement is necessary, cover or contain the infected or colonised areas of the patient's body. Remove and dispose of contaminated PPE and perform hand hygiene before transporting patients on Contact Precautions. Don clean PPE to handle the patient at the transport location.
- **Use disposable or dedicated patient-care equipment** (e.g., blood pressure cuffs). If common use of equipment for multiple patients is unavoidable, clean and disinfect such equipment before use on another patient.

Droplet precaution

Use Droplet Precautions for patients known or suspected to be infected with pathogens transmitted by respiratory droplets that are generated by a patient who is coughing, sneezing, or talking. (41)

- **Ensure appropriate patient placement** in a single room if possible. In *acute care hospitals*, if single rooms are not available, utilise the recommendations for alternative patient placement considerations in the Guideline for Isolation Precautions. In *long-term care* and other residential settings, make decisions regarding patient placement on a case-by-case basis considering infection risks to other patients in the room and available alternatives. In *ambulatory settings*, place patients who require Droplet Precautions in an exam room or cubicle as soon as possible and instruct patients to follow Respiratory Hygiene/Cough Etiquette recommendations.
- **Use personal protective equipment (PPE) appropriately**. Don mask upon entry into the patient room or patient space.
- **Limit transport and movement of patients** outside of the room to medically-necessary purposes. If transport or movement outside of the room is necessary, instruct the patient to wear a mask and follow Respiratory Hygiene/Cough Etiquette.

Airborne precaution

Use Airborne Precautions for patients known or suspected to be infected with pathogens transmitted by the airborne route (e.g., tuberculosis, measles, chickenpox, disseminated herpes zoster). (41)

- **Ensure appropriate patient placement in an airborne infection isolation room (AIIR)**²⁴ constructed according to the Guideline for Isolation Precautions. In settings where Airborne Precautions cannot be implemented due to limited engineering resources, masking the patient and placing the patient in a private room with the door closed will reduce the likelihood of airborne transmission until the patient is either transferred to a facility with an AIIR or returned home.
- **Restrict susceptible healthcare personnel from entering the room** of patients known or suspected to have measles, chickenpox, disseminated zoster, or smallpox if other immune healthcare personnel are available.
- **Use personal protective equipment (PPE) appropriately**, including a fit-tested NIOSH-approved N95 or higher level respirator for healthcare personnel.
- **Limit transport and movement of patients** outside of the room to medically-necessary purposes. If transport or movement outside an AIIR is necessary, instruct patients to wear a surgical mask, if possible, and observe Respiratory Hygiene/Cough Etiquette. Healthcare personnel transporting patients who are on Airborne Precautions do not need to wear a mask or respirator during transport if the patient is wearing a mask and infectious skin lesions are covered.

Support areas

Soiled utility room

WHO considered an essential building feature for appropriated IPC measures to provide facilities for waste management, such as sluice area and bedpans (1). The Soiled Utility Room is a functional area used for the disposal of body fluids and liquids as well as for the temporary storage of waste, soiled linen and soiled reusable medical devices (RMD). Usually, at the soiled utility room in inpatient care areas, it should be provide facilities to cleaning bedpans.

The soiled utility room should be equipped with a collection point for soiled goods (soiled area), a hand wash basin, a sluice sink or flusher disinfectant, and a storage area for PPE and cleaning material (for cleaning the soiled utility room premises). The soiled material collected should remain in the soiled utility room until it can be safely transferred to the sterilisation unit, laundry, and waste zone.

Some departments/units might require a dedicated soiled utility room, such as surgical dept. and intensive care units (6), to facilitate the collection of waste, soiled linen and RMD. Wherever possible, the soiled utility room should be placed close to the local where the

²⁴ Airborne infection isolation room (AIIR). Formerly, negative pressure isolation room, an AIIR is a single-occupancy patient-care room used to isolate persons with a suspected or confirmed airborne infectious disease. Environmental factors are controlled in AIIRs to minimize the transmission of infectious agents that are usually transmitted from person to person by droplet nuclei associated with coughing or aerosolization of contaminated fluids. AIIRs should provide negative pressure in the room (so that air flows under the door gap into the room); and an air flow rate of 6-12 ACH (6 ACH for existing structures, 12 ACH for new construction or renovation); and direct exhaust of air from the room to the outside of the building or recirculation of air through a HEPA filter before retraining to circulation (44).

soiled material is generated, thus reducing the movement of soiled material through the hospital.

In any case, the soiled utility room should be placed in a separate location and without crossflow with clean supply and medical equipment storage areas. Wherever possible it should be near the nursing station and patient care areas.

- For technical specification, see annexe report: soiled utility room.

Housekeeping store room

It is recommended to provide an area for the storage of material and equipment used to clean and disinfect environmental surfaces (floor, walls, ceiling and working surfaces) accessible to all clinical and no clinical activities in the hospital. This functional area intends for storage of cleaning equipment and material, storage of PPE for the hygienists, to provide facilities to refill/disposal of water used for cleaning surfaces and to clean mops.

Some department/unit might require a dedicated housekeeping store room, such as surgical dept. and Intensive Care Units (6), to facilitate the cleaning procedures within the department/unit and to avoid using the same cleaning equipment in different areas in the hospital, thus decreasing the risk of spreading pathogens from different department/unit.

In addition, it is recommended to provide a housekeeping store room easily accessible to toilets/latrines facilities, staff change rooms, sterilisation unit, laundry and kitchen. It should be considered to make available a housekeeping store room to be used exclusively to support the cleaning of the staff changing room and the toilets facilities.

Wherever possible, the housekeeping storage room should be placed in a separate location and without crossflow with clean supply and medical equipment storage areas and near the nursing station and patient care areas.

- For technical specification, see annexe report: housekeeping store room.

Clean supply storage

It is recommends providing a dedicated clean storage area for patient care items and equipment, including sterile material, and a separate area for the storage of clean linen (1). This area is used for storage of clean materials and sterile medical supplies as part of the healthcare facility system for distribution of goods. The storage area could be a specific room, or cupboards placed out of the way of traffic. In small facilities, storage for clean supplies is provided by means of cupboards in the treatment areas and nursing station.

Personal hygiene and sanitation facilities

According to the WHO, it is considered an essential requirement for IPC to provide appropriated sanitation facilities following international and national standards. Without the availability of sanitary facilities, as well as safe water supply, IPC cannot be effectively implemented and health care worker, patient and visitor safety are put at high risk (1).

Staff change room

This area should provide facilities for staff to change clothes, and/or showering whenever needed, before and after entering clinical/work stations. This functional area provides a place to store staff personal items/clothes in individual lockers, area for temporary storage of staff soiled uniforms/clothes and provision of toilets facilities and shower facilities. The staff changing room should provide separate changing areas for male and female, and it is necessary to have natural ventilation. Wherever natural ventilation is not possible mechanical ventilation should be provided.

It is recommended to provide a dedicated staff change room for staff working at the Surgical Dept. and Intensive Care Units (6). A dedicated staff changing room might have a positive impact on the prevention and control of infections by:

- Creating a barrier, from hospital corridors (dirt area) to critical areas (clean areas) where staff can perform hands hygiene, change clothes and/or wear PPE before accessing working stations. This is especially important for critical areas.
- Decreasing the movement of staff in and out of the dept. /unit by providing a toilet facility easily accessible from staff working areas.

Whenever a dedicated staff changing room is adopted, the design of the changing room should be set up to promote one-way traffic flow, so that staff coming from outside the department/unit can change (clothes and shoes) before entering their working areas.

Also, it is recommended to provide a separated staff changing room easily accessible to staff working in supportive services, such as kitchen, laundry and sterilisation unit. The number and location of staff changing rooms in the hospitals should be further discussed. Wastewater disposal technical specifications should be discussed with WatSan technical referent.

The general staff changing room should be located close to the main hospital's entrance used by the majority of the staff. Staff should be able to change clothes and/or showering before access working/clinical areas.

- For technical specification, see annexe report: staff change room.

Toilet and shower facilities

The WHO recommends providing at least one toilet designated for women/girls to manage menstrual hygiene needs; one toilet separated for staff and at least one toilet meeting the needs of people with limited physical disabilities (1).

The recommendation from WHO is to provide at least one toilet for every 20 users in the inpatient setting (1) as a minimum. Nevertheless, the number and location of toilet and shower facilities in the hospitals should be discussed case by case.

Wastewater disposal technical specifications should be discussed with WatSan technical referent and for technical specification regarding the design of latrines, see Public Health Engineering in Precarious Situations, MSF 2010.

- For technical specification, see annexe report: Toilet and shower facilities

Accessibility standards for toilet and shower rooms

The WHO recommends providing at least one toilet facility meeting with the needs of people with limited physical disabilities (1). Nevertheless, it should be considered that in hospital settings there is a significant number of patients/users with permanent and/or temporary physical limitations, such as pregnant, surgical patients, elders, patients with fractures, etc. To make the building accessible for those with permanent and/or temporary physical disability, the hospital requires specific design standards.

This document provides only recommendations for the design of toilet and shower facilities adapted for wheelchair users, as well as suitable for the majority of physical disability cases. Additional information for the general building accessibility standards (ramps slopes, the width of corridors, etc.) should be developed.

- For technical specification, see annexe report: Accessibility standards for toilet and shower rooms.

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