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MSF SWEDEN INNOVATION UNIT

PROJECT FACTSHEET

HOSPITAL BUILT ENVIRONMENT REQUIREMENTS FOR INFECTION PREVENTION AND CONTROL

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This report presents the findings from the SIU project, proposing recommendations for the hospital built environment, aiming to support the implementation of infection prevention and control measures in MSF hospitals. The below findings have not been validated for field but by identifying and looking into the core focus areas for HCAI (Health Care Associated Infections) prevention, the SIU intends to provide a common baseline for dialogue and practical action that can render better application of existing practices as well as development of new tools and solutions.



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Introduction

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

This is the fact sheet version of the full report. To view the full report, please go to <https://bit.ly/2LRPjP8>

Healthcare facilities are complex buildings with rigorous functional and technical requirements, regardless of the use of technology or the execution of complex clinical procedures therein. Inadequately designed facilities can increase the risk of acquiring infections; create unsatisfactory and dangerous conditions for patients and staff.

A growing number of studies are providing evidence that associates the design of healthcare facilities with clinical outcomes. Research indicates that well-designed healthcare facilities are safer for patients and contribute to the healing process by providing an efficient working environment and, most importantly, have a significant impact on the prevention and control of the transmission of pathogens, mitigating the risk of infection to patients and staff (24).

Figures of Health Care Associated Infections (HCAI) are more available for developed countries, but are practically no-existent for resource-limited settings, where results are often unknown and underestimated. Nevertheless, even without accurate figures, studies have shown that HCAI is of great epidemiological relevance in resource-limited settings and its impact is much higher when compared with high-income countries (25).

The recommendations proposed in this document intend to improve the design of healthcare facilities, creating a working environment that enhances and facilitates the behaviour of healthcare workers in the execution of IPC measures. **They aim 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.



01 _____
**HAND
HYGIENE**



02 _____
**CLEANING AND
DISINFECTION**



03 _____
**TRANSMISSION-BASED
PRECAUTIONS**

Key Report Recommendations

The recommendations listed ahead aim to provide proper built environment conditions for the implementation of Infection Prevention and Control (IPC) measures and are considered relevant in supporting MSF's IPC policy. They are intended to support architects and other professionals working on the planning and designing of healthcare facilities in resource-limited settings, as well as for use as assessment parameters of the built environment of healthcare facilities.



01. 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 by hand washing with either plain or antimicrobial soap and water. Hand hygiene is considered a major component of standard precautions and the most important measure that can be taken to prevent healthcare-associated infections. Moreover, considerable evidence exists which demonstrates that hand hygiene can reduce the transmission of pathogens, thus decreasing HCAI rates and cross-transmission of antimicrobial resistant pathogens (2).

According to WHO, successful and sustained hand hygiene improvement can be achieved through implementing a multimodal strategy, addressing different obstacles and behavioural barriers. The multimodal strategy consists of the implementation of several components⁴ of the **WHO Multimodal Hand Hygiene Improvement Strategy**, where all components are considered crucial for the establishment and effective function of IPC programmes (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 to the infrastructure (equipment and facilities) that enables proper compliance to hand hygiene guidelines (1). The infrastructure required to perform hand hygiene is directly linked to the built environment and is reflected in the healthcare facility design requirements.

General recommendations

- Ensure ready availability and optimal placement of hand hygiene materials and equipment at the point of care¹ (1).
- Provide bottles of alcohol-based handrub, positioned at the point of care in each ward (or make sure such bottles are distributed among staff members) (2).
- Ensure access to at least one sink for every ten beds, with soap and fresh towels available at every sink (2).

Specific recommendations for the patient zone

- Provide one 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, the possibility of removing sinks in the patient zone² should be considered – especially in areas of critical patients’ care, such as NICU and ICU wards/rooms.
- In any case, it is necessary to ensure the availability of hand washing opportunities, such as through the use of mobile handwashing basins³ or the provision of handwashing facilities accessible to staff working in treatment areas, allowing staff to perform hand hygiene when hands are visibly soiled.

Specific recommendations for hand washing facilities

- Hands-free taps: In general, it is preferable to be able to wash hands without having to touch the tap with soiled hands. Ideally, taps should be opened using an elbow- or foot-operating system (2).
- Scrub sinks: A handwashing facility, with a hands-free device, should be provided to allow staff to wash both hands and forearms. These should be located in a dedicated area near: operating rooms (Surgical Dept.); resuscitation rooms (Emergency Dept.); and delivery rooms (Obstetrics Dept.).
- Standard or clinical sinks/basins: At least one handwashing facility should be provided at: consultation rooms; laboratory and sterilization units; kitchens and laundry rooms; soiled utility rooms; housekeeping store rooms; and waste zones.
- Handwashing facilities should be provided in all staff changing rooms and toilet facilities.

Specific recommendations for alcohol-based handrub (ABHR) dispensers

- For optimal compliance with hand hygiene, ABHRs should be readily available, either through dispensers close to the point of care or in small bottles for on-person carriage (4).
- The following characteristics should be considered a prerequisite for all dispensers and their placement:
 - Easy and unobstructed access
 - Logical placement
 - Standardised (regarding fillings/containers and “No-touch” system (operable hands-free) (2)
- Provide ABHR dispensers 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).

■ EFFECTIVES OF ALCOHOL-BASED SOLUTIONS

At present, alcohol-based handrubs are the only known means of rapidly and effectively inactivating a wide range of potentially harmful microorganisms on hands (5) (6) (7) (8). 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, etc.).
- 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 compared with products.

Hand hygiene products, such as alcohol-based handrub, should be easily accessible and placed 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 a way that allows them to perform hand hygiene without leaving the patient zone (2).

■ HANDRUB DISPENSER REQUIREMENTS

The following characteristics should be considered prerequisites 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. to where patient contact is taking place, to avoid having to leave the care/treatment zone.
- Wide availability: Available in all patient rooms (possibly at the bedside), all examination rooms and other points of care.
- Standardised (regarding fillings/containers): Standardisation should ensure that dispensers can be used with products from multiple brands, rather than being limited to a single manufacturer⁵.
- "No-touch" system (operable hands-free): To allow use by contact with a clean body part (e.g. elbow dispenser, or pump on a bottle operated by a clean wrist). This does not include 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: Dispenser design should eliminate the need for contaminated hands to come into direct contact with parts of the dispenser delivery system and/or any parts that will not be possible to clean.

Alcohol-based handrubs:

Additional recommendations for the location of Alcohol-Based Hand Rub (ABHR) dispenser include (3):

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

■ HAND WASHING FIXTURE REQUIREMENTS

Sinks/basins have different models and sizes that will vary in accordance with local markets. Nevertheless, all sinks should follow the recommendations below:

- Basins should be provided with clean water, soap, single-use or clean reusable towels, and wherever possible, they should be hands-free operable (2).
- The water stream from a faucet should not fall directly into the waste outlet to prevent the possible aerosolisation of pathogens residing in the waste outlet (9) (10).
- Taps should be fitted with an aerator screen⁶. 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 (10) (2).
- Hand washing basins should be large enough to control splashing and be designed so that any water retention is avoided. Also, walls adjacent to hand wash basins should be made of non-porous material (11).
- Sinks/basins should have no overflow; have curved sides; be 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 hard, non-scratch material (usually porcelain) and be easy to clean and disinfect (3).

Additional recommendations for scrub sinks:

- 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 elbows, either ask someone else to turn off the tap or use the towel to turn off the tap to avoid re-contaminating hands (12).
- Should be designed to reduce the risk of splashes (2).

■ BASIN/SINK TAPWARE

According to WHO, it is preferable to enable handwashing without requiring touching the tap with soiled hands. Ideally, taps should be opened by using an elbow or a foot; in settings without budget restrictions sensor-activated taps may be used (2).



02. Cleaning and disinfection

In 1991, to establish a correlation between surfaces and potential risk of transmission of infection, the Centers for Disease Control (CDC) proposed an addition to Spaulding's original classification⁷ for medical and surgical instruments (13), by introducing 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 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. Environmental surfaces can be safely decontaminated using less rigorous methods than those used on medical instruments and devices, and can be divided into two sub-categories (14):

- Housekeeping surfaces (e.g. floors, walls, and table tops).
- Medical equipment surfaces⁸ (e.g. knobs or handles on haemodialysis machines, x-ray machines, instrument carts, etc.).

Housekeeping surfaces can be separated into 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 a patient's room, and the edges of privacy curtains) (15). Due to its scope, the report's recommendations are limited to housekeeping surface only, defined here as floors, walls, ceilings and working surfaces/table tops.

Floor finish

- In general, flooring in clinical areas should be seamless, smooth, slip-resistant and easily cleaned (16).
- Vinyl flooring should be the first option for the majority of the hospital's areas. Nevertheless, if the proper quality of materials and installation of vinyl or resin cannot be guaranteed, the use of ceramic tiles is recommended as an alternative.
- For wet areas, such as in the laundry, mortuary, kitchen, and toilet facilities, ceramic tiles are recommended.

Wall finish

- In general, 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 applied around plumbing fixtures should be smooth and water resistant (17).
- Using oil-based paint is recommended in all areas of the hospital, with the exception of wet areas.
- For wet areas, such as toilets, kitchen, soiled utility room and sterilization unit, ceramic tiles should be used.

Ceiling finish

In general, an oil-based paint should be used in all areas of the hospital.

Working top materials

- In general, stainless steel should be used for most working surfaces in clinical and support areas.
- For laboratory worktops, a laminated surface is the most straightforward option. Whenever there is sufficient budget, hard resin should be used.

Support areas for cleaning and disinfection

- Housekeeping storeroom:⁹ Designate an area for storing materials and equipment used to clean and disinfect environmental surfaces (floors, walls, ceiling, and working surfaces). The number and location of housekeeping storerooms should be defined on a case-by-case basis.
- Equipment room: Designate an area for the cleaning and disinfection of equipment (e.g. trolleys, incubators, etc.). This area should be placed close to where the equipment is used.
- Sterilization Unit: Designate a centralized decontamination and/or sterile supply department for the decontamination and sterilization of medical devices and other items/equipment (1) (see OCB guidelines).

The selection of housekeeping surfaces for healthcare facilities can be based on the properties of finish materials, such as permeability and seamlessness of surfaces, in addition to the expected performance outcomes, which will depend on the different requirements demanded by the activities within each healthcare facility functional area¹⁰ (18).

Environmental surfaces should then be allocated to specific functional spaces in accordance with patient and staff risk factor of acquiring an infection. In principle, environmental surfaces in areas for patients with an increased propensity for infection (e.g. immunosuppressed patients) and for patients at a higher infection risk (e.g. intensive care and burn units) must meet higher surface material property standards compared to, for example, administrative offices (32).

The correlation between finish materials, functional spaces, and risk factors can inform decision making wherever financial or other operational constraints necessitate a prioritisation of investments. By providing a clear categorisation of risk factors associated with the use of a particular finish material in a particular setting, decision makers can ensure that priority will be given to the improvement of areas that present a higher risk for patients and staff, thus complying more closely with the prevention and control of HAI.

Zones	Infection Risk	Functional Areas
Zones 1	Low or negligible risk	Example: offices, administrative services, lobby, technical services, stairways, technical sector (workshop), logistics sector (storehouse), pharmacy, etc.
Zones 2	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.
Zones 3	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.
Zones 4	Very high risk	Example: operating rooms, burn unit, etc.

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

■ WORKING SURFACES (TABLE TOPS)

For this report, three finish materials were selected for working surfaces: **stainless steel, laminated, and hard resin**. All three have the necessary properties for medical use and can be applied as working surfaces, depending on the intended 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).

In resource-limited settings it is usual for working benches and counters to be covered with ceramic tiles. However, the joints of ceramic tile surfaces are porous and can retain moisture which encourages the growth of mould (33), and their use should therefore be avoided. Furthermore, the use of plastic (sheets), oil-based paint, or wood as working surfaces are advised against.



Stainless Steel



Laminated



Hard Resin



03. Transmission-based precautions

Transmission-Based Precautions refer to additional measures to 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).

Contact precaution (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 that effectively balance 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 a gown and gloves. Wear a gown and gloves for all interactions that may involve contact with the patient or the patient's environment. Donning PPE prior to entering a patient room and then adequately discarding them before exiting will aid the effort 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 who have been assigned 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 (41)

- Ensure appropriate patient placement in a single room if possible, in acute care hospitals. If single rooms are not available, follow 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 a mask upon entry into the patient room or patient space.
- Limit transport and movement of patients outside 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 (41)

- Ensure appropriate patient placement in an airborne infection isolation room (AIIR⁴¹) 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 has 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 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.

According to WHO, to achieve effective isolation, designated single rooms should be available for the placement of suspected or confirmed infectious patients (1). Wherever possible transmission of an infectious agent is cause for concern, single-patient rooms are the preferred alternative, especially for patients requiring airborne precautions. However, in reality healthcare facilities in resource-limited settings are mostly occupied by multi-bed rooms, and can accommodate only a limited number of single-patient rooms (41).

General recommendations:

- Designated single rooms, preferably with private toilet and shower facilities, should be available for isolation of patients (1).
- Provide at least one room dedicated to the isolation of patients at hospital facilities.
- Preferably, the isolation room should come equipped with an anteroom for staff to change clothes (PPE) wherever needed, creating a transition space between common areas and patient areas.

Functional areas to support IPC measures

In addition, this report provides recommendations for functional areas in the hospital that are important to support IPC measures and the three pillar. According to WHO, several areas, such as appropriated sanitation facilities and areas dedicated to waste management, are essential for the provision of appropriate IPC measures (1).

Soiled utility room

WHO consider functional areas dedicated to waste management, such as sluice and bedpan cleaning areas, to be essential features for the provision of appropriate IPC measures (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). 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 where the soiled material is generated, thus reducing the movement of soiled material through the hospital.

Housekeeping storeroom

An area should be designated for the storage of material and equipment used to clean and disinfect environmental surfaces (floors, walls, ceilings, and working surfaces) accessible to all clinical and non-clinical activities in the hospital. Some departments/units might require a dedicated housekeeping storeroom, such as surgical dept. and Intensive Care Units (6), to facilitate their cleaning procedures and to avoid using the same cleaning equipment in different areas of the hospital, thus decreasing the risk of spreading pathogens between departments/units.

Clean supply storage

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, is recommended (1). Such an area is used for storage of clean materials and sterile medical supplies as part of the healthcare facility system for distribution of goods.

Personal hygiene and sanitation facilities

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

- **Staff changing room** - This area should provide facilities for staff to change clothes and shower whenever needed, before and after entering clinical/work stations. The staff changing room should provide separate changing areas for male and female staff members, and should have natural ventilation. It is recommended to provide a dedicated staff changing room for staff working at the Surgical Dept.; Obstetrical Dept.; Emergency Dept.; Inpatient Dept.; and Intensive Care Units (6).
- **Toilet and shower facilities** - Provide at least one toilet designated for women/girls to manage menstrual hygiene needs; one separate toilet for staff; and at least one toilet meeting the needs of people with limited physical abilities. A minimum of one toilet for every 20 users should be provided in inpatient settings (1). However, the number and location of toilet and shower facilities in any given hospital environment should be discussed on a case-by-case basis.

MSF & Our Approach

The SIU takes a human-centered design approach. This means taking the wishes and requirements from the potential users by involving them directly in the design process. In doing this, the product is more likely to fit the needs and wishes of the end-users and the processes in which it has to work.

■ MÉDECINS SANS FRONTIÈRES (MSF)

Médecins Sans Frontières (MSF) is an international medical humanitarian organisation, and was established in 1971 in France with the aim to establish an independent organisation that focuses on delivering emergency medicine aid quickly, effectively and impartially. Nowadays MSF operates all over the world and continues to be independent of both governments and institutions.

This autonomy is used to provide help to people irrespective of gender, race, religion, creed or political convictions. MSF advocates for improved medical treatments and constantly looks for ways to improve its own practices.

■ INNOVATION PROCESS

The MSF SIU uses a three-phase innovation process of initiation, development and implementation. Although these phases principally follow each other, they also often overlap. It is important to highlight that an innovation process is not a linear one,

■ MSF SWEDEN INNOVATION UNIT

In the humanitarian sector, where responding quickly to rapidly emerging crisis situations is absolutely crucial, humanitarian organisations struggle to maintain a balance between addressing short-term needs and building the capability to meet long-term challenges.

The MSF Sweden Innovation Unit (SIU) explores a human-centered approach for promoting a culture of innovation within MSF, to more effectively co-create innovations that save lives and alleviate suffering.

For more information, visit msf-siu.org

but one that requires iterations in which steps are repeated to improve the product. Iterations improve the design solution to ensure it fits the scenario in which it has to be used.

INITIATION

Framing the challenge, performing research, analyzing insights, designing objectives

DEVELOPMENT

Generating and screening ideas, creating and testing concepts and prototypes

IMPLEMENTATION

Detailed implementation and design of solutions in the field, scaling up and diffusion

References

1. World Health Organization. Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva : WHO, 2016.
2. —. WHO Guidelines on Hand Hygiene in Health Care. Geneva : WHO, 2009.
3. Australasian Health Facility Guidelines. Part D – Infection Prevention and Control. Sidney : Australasian Health Facility Guidelines, 2016.
4. World Health Organization. A Guide to the Implementation of the WHO multimodal hand hygiene improvement strategy. Geneva : WHO, 2009.
5. Pittet D, et al. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. s.l. : Lancet, 2000. pp. 356:1307–1312.
6. Widmer, AF. Replace hand washing with use of a waterless alcohol hand rub? s.l. : Clinical Infectious Diseases, 2000. pp. 31:136–143.
7. Availability of an alcohol solution can improve hand disinfection compliance in an intensive care unit. Maury E, et al. s.l. : American Journal of Respiratory and Critical Care Medicine, 2000, pp. 162:324–327.
8. Bischoff WE, et al. Handwashing compliance by health care workers: the impact of introducing an accessible, alcoholbased hand antiseptic. s.l. : Archives of Internal Medicine, 2000. pp. 162:324–327.
9. Infrastructure Unit Support Systems (IUSS) . Health facility guides: Infection Prevention and Control. National Department of Health, Provincial Departments of Health and Public Works,. s.l. : IUSS, 2014.
10. Voss A, Verweij PE. Faucet aerators: a source of patient colonization with *Stenotrophomonas maltophilia*. s.l. : American Journal of Infection Control, 1999. pp. 27:459–460.
11. RD, White. Recommended standards for newborn ICU design. . s.l. : Journal of Perinatology, 2006.
12. World Health Organization. Surgical care at the district hospital. . Geneva : WHO, 2003.
13. EH., Spaulding. Chemical disinfection and antisepsis in the hospital. Chigago : J Hosp Res, 1972.
14. Sehulster LM, Chinn RYW, Arduino MJ, Carpenter J, Donlan R, Ashford D, Besser R, Fields B, McNeil MM, Whitney C, Wong S, Juraneck D, Cleveland J. Guidelines for environmental infection control in health-care facilities. Recommendations from CDC and the Health-care Infection Control Practices Advisory Committee (HICPAC). Chicago IL : American Society for Healthcare Engineering/American Hospital Association, 2004.
15. Chemical disinfection of medical and surgical materials. In: Block SS, ed. Disinfection, sterilization, and preservation, 5th ed. Favero MS, Bond WW. Philadelphia, PA : Lippincott Williams & Wilkins,, 2001, Vols. 881–917.
16. UK Department of health. Health Building Note 00–09: Infection control in the built environment. London : UK Department of health, 2013.
17. American Institute of Architects. Guidelines for design and construction of hospital and health care facilities. Washington : American Institute of Architects Press, 1996.
18. UK Department of health. Health Building Note 00–10: Part A – Flooring. London : UK Department of health, 2013.
19. NSW Health. Infection Prevention and Control Policy. Sidney : NSW Ministry of Health, 2017.
20. health, London: Department of. UK Health Building Note 00–09: Infection control in the built environment. London : UK Department of health, 2013.
21. Infrastructure Unit Support Systems (IUSS). Health facility guides: Internal Wall Finishes in Healthcare Facilities. s.l. : IUSS, 2014.
22. Siegel JD, Rhinehart E, Jackson M, Chiarello L. Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings . s.l. : Healthcare Infection Control Practices Advisory Committee, 2007.
23. CDC. Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. s.l. : CDC, 2007.
24. ULRICH, Roger and ZIMRING, Craig. A Review of the Research Literature on Evidence-Based Healthcare Design. s.l. : Health Environments Research & Design, 2008. pp. 1(3), 61–125.
25. ALLEGRANZI, B.; BAGHERI NEJAD, S.; COMBESURE, C.; GRAAFMANS, W.; ATTAR, H.; DONALDSON, L.; PITTET, D. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. Geneva: WHO, 2010.

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