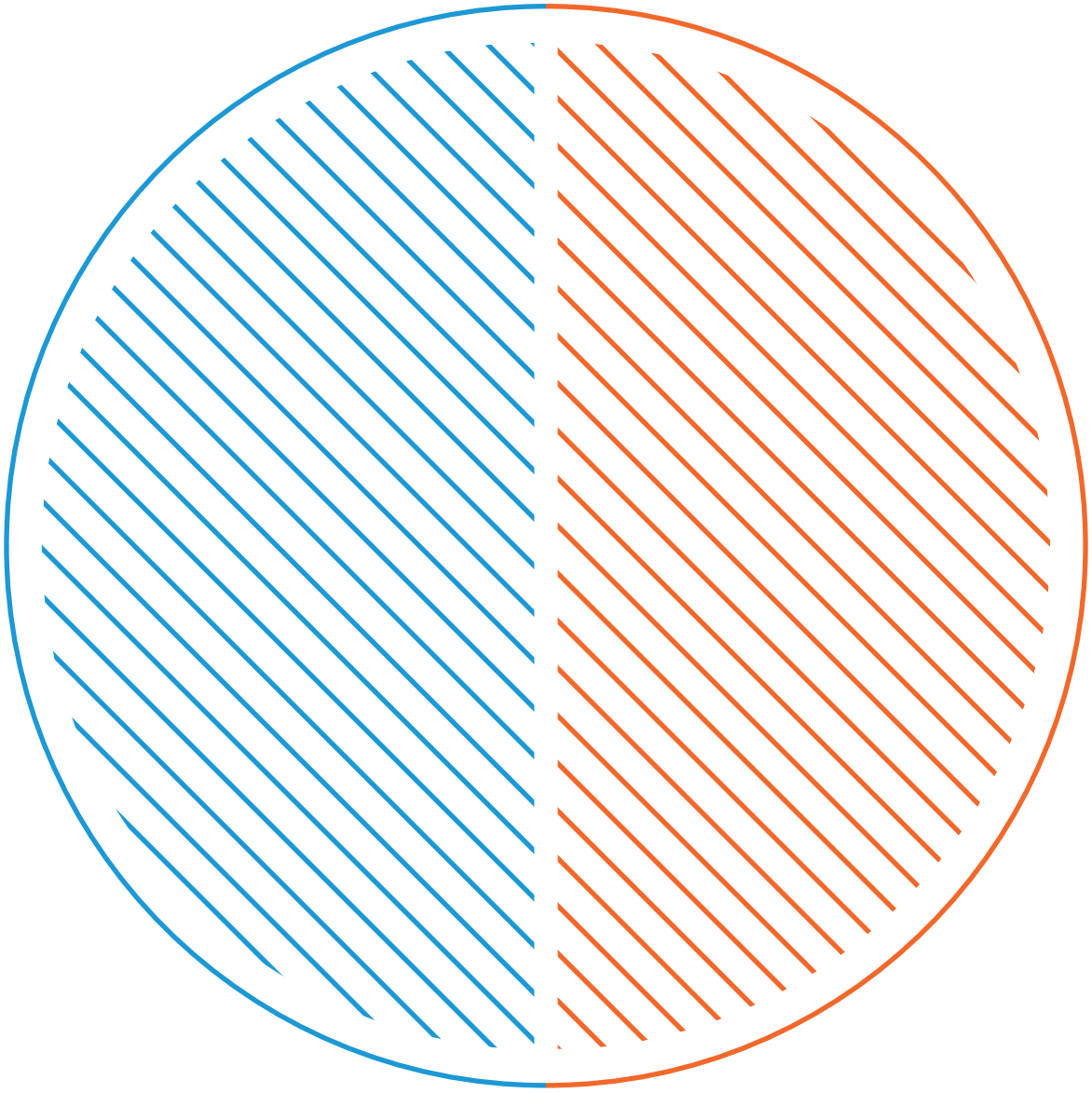
# WHO training package on environmental cleaning

## Evaluation methodology guide



World Health Organization

# WHO training package on environmental cleaning

Evaluation methodology guide

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WHO training package on environmental cleaning: evaluation methodology guide

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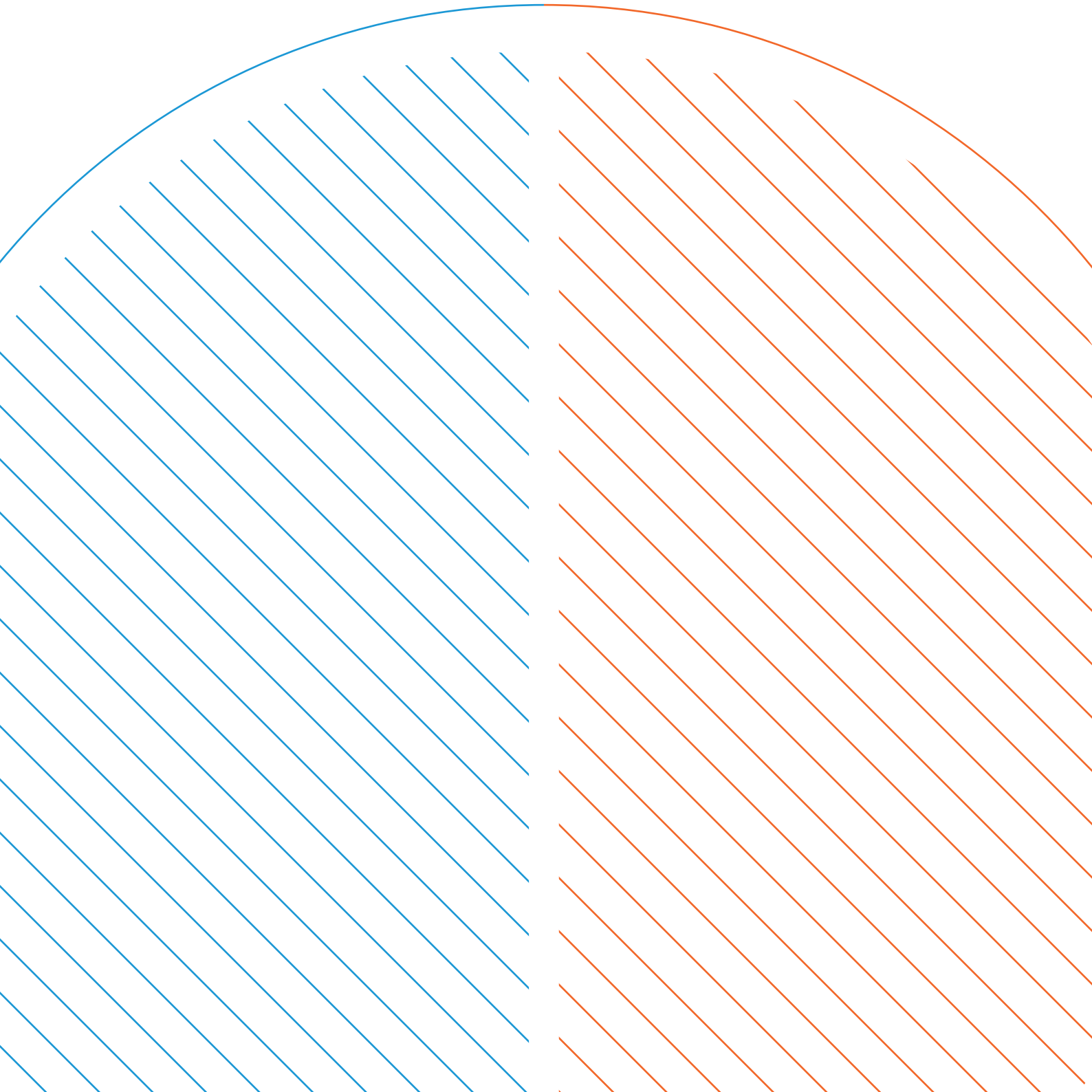
# Definitions

| | |
|---|---|
| **Cleaners** | Personnel or contractors whose primary role in health-care facilities is environmental cleaning |
| **Dipslides** | One widely used method for measuring surface microbial cleanliness in health-care facilities; dipslides are coated with a non-specific agar on one side for measuring total aerobic colony counts (per $cm^2$) and a selective agar on the other to determine the presence of a specific pathogen, such as *Staphylococcus aureus* |
| **Evaluation protocol or plan** | A written document that describes how an evaluation will be managed and sets out the steps needed to assess the outcomes and processes of the target intervention or programme |
| **High-touch surfaces (or frequent-touch surfaces)** | High-touch surfaces in health-care facilities are those frequently touched by health-care workers, patients and visitors and may become contaminated with microbial pathogens, including door handles, bed rails, light switches, sink handles, bedside furniture and edges of privacy curtains |
| **Impact evaluation (or outcome evaluation)** | Assessment of how the intervention (in this guide, the WHO training package) being evaluated affects outcomes, whether these effects are intended or unintended, with outcomes being intermediate outcomes or final endpoints |
| **Microbiological cleanliness** | Defined in this guide as a binomial variable, with "clean" defined as surfaces with <2.5 aerobic colony-forming units per $cm^2$ and "not clean" ≥2.5 aerobic colony-forming units per $cm^2$ |
| **Patient zone** | Contains the patients and their immediate surroundings: the patients and some surfaces and items that are temporarily and exclusively dedicated to them, including all inanimate surfaces 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 and surfaces frequently touched by health-care workers while caring for the patient, such as monitors, knobs and buttons and other touch surfaces |
| **Process evaluation** | Evaluation that considers the delivery of the intervention and how this contributes to desired outcomes, with the usual parameters being intervention fidelity, reach, dose, context and mechanisms |

# 1. Introduction



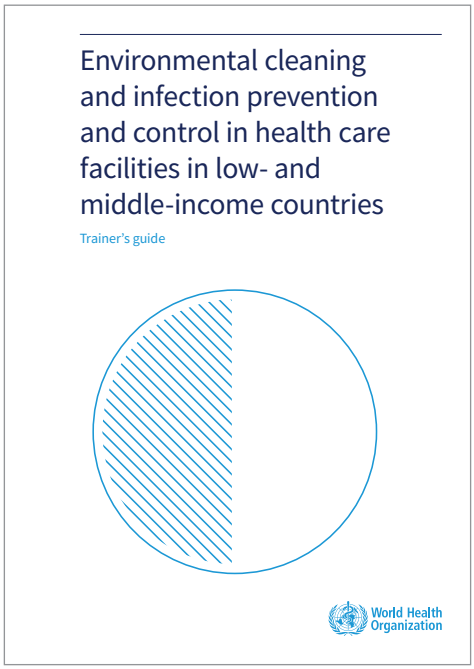
# Introduction

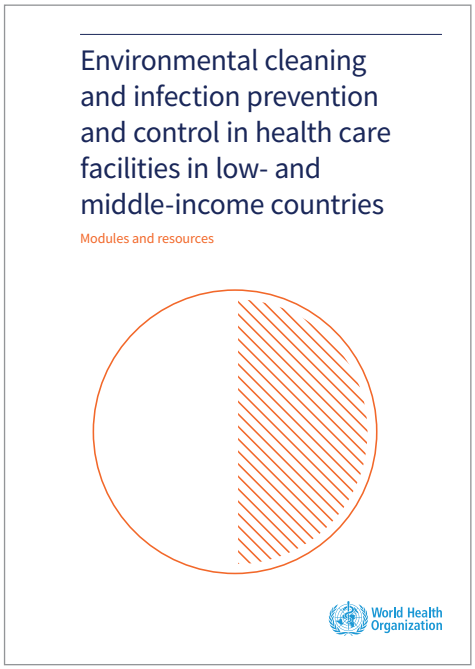
## 1.1 Purpose and audiences

This purpose of this guide is to inform robust evaluations of the WHO training package – a package aimed at personnel whose primary role in health-care facilities is environmental cleaning, hereafter referred to as cleaners.

The WHO training package – *Environmental cleaning and infection prevention and control in health-care facilities in low- and middle-income countries* – was designed to improve the competencies of cleaners through a practical, educational approach for adult learners in low- and middle-income countries and comprises two volumes: trainer's guide and modules and resources *(1,2)*. An associated OpenWHO online course describes the essential preparations for trainers to deliver the WHO training package.

The evidence base on environmental cleaning needs to be strengthened overall in terms of determinants, interventions and consequences and as a core component of infection prevention and control (IPC) in relation to the built environment *(3)*. For example, several recent systematic reviews assessing interventions to improve environmental cleanliness have identified only small-scale pilot studies in resource-limited settings *(4–9)*. Evaluations of interventions to improve environmental cleaning in health-care facilities in low- and middle-income countries, such as the WHO training package, provide an important opportunity not only to learn lessons of local relevance but also to help strengthen the broader evidence base if attention is paid to the important methodological considerations that ultimately determine the reliability of findings.



The purpose of this guide is ultimately to strengthen evaluations of the WHO training package, so that robust and useful lessons can be learned for future implementation, adaptations and assessments of the package. The guide seeks specifically:

- to highlight key methodological considerations for process evaluation that account for the delivery of the intervention and how this contributes to the measured effects and/or impact evaluation (sometimes called outcome evaluation), which assesses the effects of intervention in terms of final endpoints; and
- to promote the use of mixed methods (qualitative, quantitative and microbiological) in evaluation to capture the multiple facets of the WHO training package as a complex intervention.

The intended audience for this guide is primarily those tasked with designing and delivering a process and/or impact evaluation, whether in the context of a research study or a type of programme audit, as discussed further later (see Table 2). It is therefore assumed that most readers will be familiar with the usual stages of evaluation. Other stakeholders, such as those who commission the evaluation, may consult just the introductory Sections 1 and 2 of the guide but are less likely to focus on the technical aspects in Section 3. The diverse needs of stakeholders besides those conducting the evaluation should be recognized in what should be an iterative, co-design activity and thus manage varying expectations about the goals and outputs *(10)*.

» For implementers of the training package, an evaluation is a means of learning whether the desired change in the main outcomes has been achieved, whether this represents a worthwhile improvement, whether the training caused any unintended negative effects and how the delivery of the training worked in practice and can be sustained.

» For funders or budget holders, an evaluation can provide feedback on whether providing the financial and human resources needed for the training was justified and can help in making decisions to fund future work.

» For those responsible for broader IPC and activities to improve the quality of care, the evaluation can be a resource for learning and sharing knowledge about barriers and facilitators of change in a specific context.

## 1.2 Background

Cleaners are part of the health-care workforce, helping both to prevent health care–associated infections (HAI) and to reduce the transmission of antimicrobial-resistant pathogens from the environment to patients. Strengthening the training of this important group can contribute to resolving some of today's public health challenges, providing a crucial link in delivering safe, high-quality health care. Cleaners should be valued, supported and trained to perform their roles effectively and to be an active member of IPC teams. Sustained investment in this cadre is needed urgently since ample evidence supports the lack of appropriate training, which the WHO training package seeks to address *(1)*. The main stated rationale for developing the two-volume package is as follows.

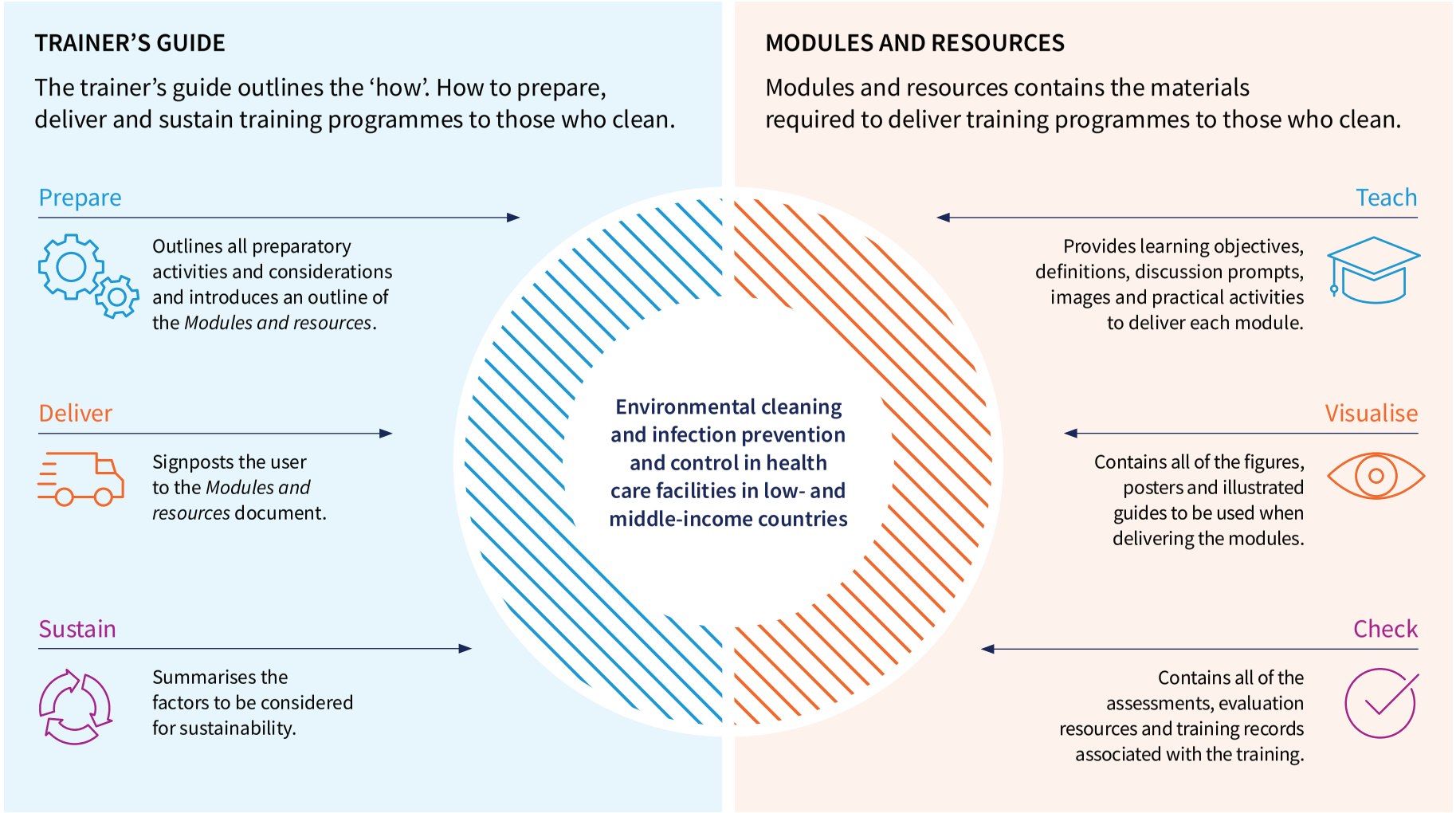
» Cleaners are often neglected members of the health-care workforce, with low pay, limited employment rights and – crucially – untrained or with poor access to training.

» Cleaners may have limited literacy, and participatory adult learning is often the most relevant approach to improving knowledge and practices.

» Cleaners require access to supplies and equipment, supportive supervision and to be acknowledged for their role by other health-care workers and managers.

Fig. 1 summarizes the structure of the WHO training package (trainer's guide and modules and resources).

**Fig. 1. Structure of the WHO training package**




*Source: Environmental cleaning and infection prevention and control in health-care facilities in low- and middle-income countries: trainer's guide (1).*

The package was informed by the TEACH CLEAN training intervention, which was developed and piloted based on research studies the London School of Hygiene and Tropical Medicine and partner organizations conducted across five low- and middle-income countries *(11)*. These projects revealed not only the neglect of routine training of cleaning personnel in health-care facilities but also the wider importance of assessing the state of environmental hygiene to inform targeted improvements as part of a multimodal strategy to improve IPC and broader assurance of the quality of care *(12–14)*.

The series of research projects provides important lessons on the methods for evaluating the process (implementation) and impact of the TEACH CLEAN training intervention for cleaning personnel. This research experience has informed both the WHO training package and this guide. Given the broader gap in robust evaluations of training of cleaning personnel in health-care facilities in high-income countries and in low- and middle-income countries, as noted in a recent systematic review, the guide can help to encourage and inform more rigorous assessments *(4)*.

## 1.3 How to use this guide

As a guide, the content is not intended to be prescriptive or to provide a standard procedure for process and impact evaluation. It seeks to illuminate the range of factors and options to consider in the planning and design stages of an evaluation of the WHO training package based on experience, especially from two specific research studies in Cambodia and the United Republic of Tanzania *(16,17)*.

Table 1 provides a simple roadmap of the structure of the guide to help users to identify the sections most relevant to them. After this introduction, Section 2 discusses the three crucial considerations affecting the scope of an evaluation: the purpose of evaluation, the type of evaluation and pathways to impact. The two research studies are introduced as examples and then used in Section 3 to illustrate the typical components of an evaluation protocol; Annex 1 provides a checklist of factors to consider in developing an evaluation protocol. From study design through to data capture to dissemination and communication, the real-world experiences from Cambodia and the United Republic of Tanzania are shared under 11 themes.

## Table 1. Roadmap of the guide for different audiences

| Guide section | Subsection | Intended audiences | | | |
|---|---|---|---|---|---|
| | | Evaluation implementers (researchers or audit team) | Commissioners and funding agencies | Implementers of the WHO training package | Actors in broader IPC and quality improvement |
| **Introduction** | Purpose and audiences for the guide | ✓ | ✓ | ✓ | ✓ |
| | Background to the guide | ✓ | ✓ | ✓ | ✓ |
| | How to use the guide | ✓ | ✓ | ✓ | ✓ |
| **Scope of evaluation** | Purpose and type of evaluation | ✓ | ✓ | ✓ | ✓ |
| | Pathways to impact | ✓ | ✓ | ✓ | ✓ |
| | Introducing the research exemplars | ✓ | ✓ | ✓ | ✓ |
| **Components of the protocol for evaluation** | Study design | ✓ | | | |
| | Study populations and sites | ✓ | | | |
| | Sample size requirements | ✓ | | | |
| | Delivery of intervention | ✓ | | ✓ | |
| | Process evaluation | ✓ | | ✓ | |
| | Impact evaluation | ✓ | | ✓ | |
| | Data collection, management and analysis | ✓ | | ✓ | |
| | Ethical approval and consent | ✓ | | | |
| | Timeline | ✓ | | ✓ | |
| | Dissemination and communication | ✓ | | | |
| **Priority research questions for environmental cleaning-** | | ✓ | ✓ | ✓ | ✓ |
| **Annexes** | A. Checklist for preparing an evaluation protocol | ✓ | | | |
| | B. Evaluation resources | ✓ | | | ✓ |
| | C. Examples of data capture instruments from two exemplar studies | ✓ | | ✓ | |

The final part of the guide revisits the need to strengthen the evidence base on environmental cleaning and outlines a recent priority-setting exercise that identified 12 key research questions. As noted in the guide, some of these questions may be addressed as substudies alongside evaluations of the WHO training package. Given the contextual specificity of resource and budget considerations for conducting an evaluation, the guide does not cover these considerations in detail, and readers are encouraged to consult the relevant resources in Annex 2.

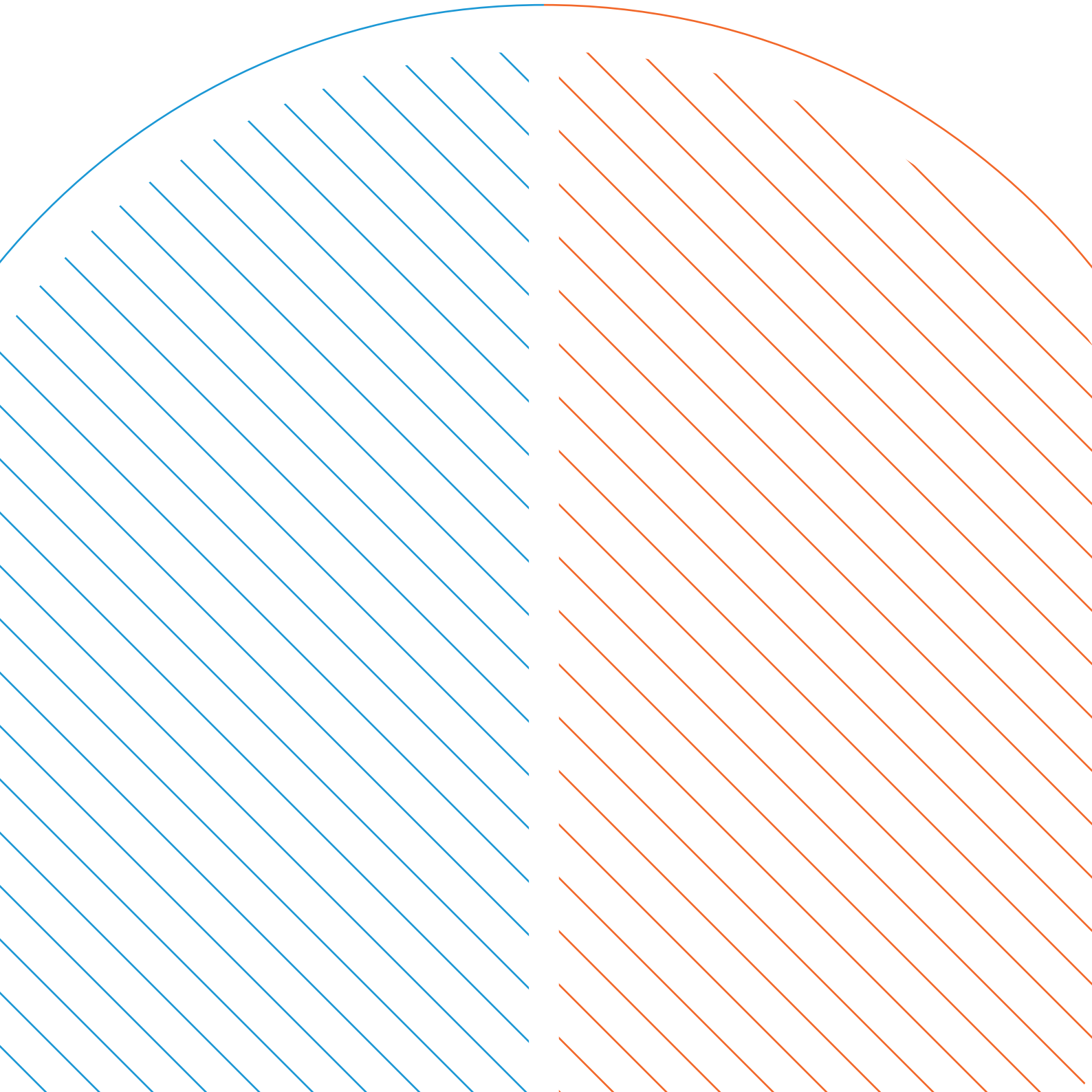
Although the guide draws primarily on the practical lessons from the two exemplar research studies, Annex 2 provides a list of generic resources relevant to evaluation of interventions, including recent guidance from WHO. All users of this guide are encouraged to become familiar with the practical resources in the WHO training package itself (Fig. 1) *(1,2)*. The volume on modules and resources includes several data capture tools and forms relevant to implementing the training package (Fig. 2), providing process evaluation measures on the delivery of the intervention and how this contributes to desired outcomes, as discussed further below.

**Fig. 2. Extract from WHO training package: modules and resources**

**CHECK**

- Training on baseline needs assessment tool.
- IPC and environmental hygiene pre- and post-training questionnaire.
- Competency assessments.
- Training course evaluation.
- Example of a training record.

# 2. Defining the scope of evaluation of the training package



# Defining the scope of evaluation of the training package

## 2.1 Purpose and type of evaluation

The main purpose or need for an evaluation is closely tied to the scope and type of evaluation *(10)*. In the case of the WHO training package, it is helpful to distinguish between an evaluation for the purpose of informing the design and implementation of the package, including contextualization or adaptation, versus for the purpose of assessing the size and direction of effects for specified outcomes. This distinction matches with the two broad types of evaluation: summative and formative, as defined in Box 1. The guide focuses on the summative variant, encompassing both process and impact evaluation, and conducted primarily as research in which the main aim is generating new, robust and generalizable knowledge on the effectiveness of the WHO training package. Much has been written about the distinction between evaluating interventions as research versus as a type of programme audit, and Table 2 summarises the relevant differences for this guide. The WHO training package can indeed be evaluated with either approach. However, given both the need to strengthen the broader evidence base on environmental cleaning in health-care facilities, including on training of cleaners, and the only recent availability of the WHO training package and thus limited experience of its application and effects, there is a strong case for encouraging evaluations that adopt a rigorous research approach whenever possible.

**Box 1. Definitions of summative and formative evaluation**

A summative evaluation sums up the overall effect of the intervention. It is often carried out at the end, when all the data are available to help the evaluation team to determine whether the intervention has been a success or not, often against stated goals. This type of evaluation might show whether the intervention worked and met its objectives, what improvements, if any, it created, and how the benefits compared with the costs.

A formative evaluation is designed to help form or shape an intervention. It is used as the intervention evolves and can provide information about how to optimally revise and modify the work taking place. It can help people to explore not only whether improvement has been achieved but also how it has occurred in their particular environment.

*Source:* adapted from *Evaluation: what to consider (10)*.

### Table 2. Key differences between conducting an evaluation as a research study versus as a type of programme audit

This guide focuses on a specific intervention – the WHO training package. The relevant distinction between evaluation and research is that evaluation is the overall term for assessing the worth or effects of an intervention, and research is one type of approach to evaluation. In other words, if the evaluation is for the purpose of creating generalizable knowledge for a wider evidence base, then this sh ould be regarded as research, but if the aim is to provide information specifically for local decision-making in a specific context, then this evaluation is essentially a type of programme audit. In practice, these two approaches often overlap. For the two exemplar cases in this guide, although the main evaluation approach used was research, many of the findings were also valuable for the specific country contexts. The other key differences are summarized below.

| Area of difference | Approach to evaluation | |
|---|---|---|
| | Research study | Type of audit |
| Study design | Design driven by aim for robust and generalizable knowledge, often focusing on randomized designs | Typically, a more pragmatic approach to the choice of design, often using non-randomized designs |
| Primary audience | Broader, global knowledge community | Specific clients commissioning the evaluation |
| Competencies needed | Evaluation theory, mixed methods to enable qualitative, quantitative and microbiological data to be captured, statistical and data managements skills, research project management | Similar to research but often with less breadth of competencies and addition of financial planning and routine audit expertise |
| Funding | Typically from competitively secured research grants | Usually from commissioning agency (including the health ministry), implementing partner (such as a United Nations organization) or international foundations |
| Value judgements | Researchers aim to be value neutral in terms of the effects found by the research | Often involves a value judgement and provides recommendations |
| Action setting | Seeks to undertake evaluation with an appropriate level of control or influence over the implementation context | Usually takes place without seeking or aiming to control or influence the implementation context |
| Dissemination | Often published in journals, aiming for wide dissemination | Rarely published in journals, and typically only main clients view the reports |

*Source:* adapted from Wanzer *(18)*.

Although this guide focuses on summative evaluation, Volume 2 of the WHO training package (modules and resources) includes materials relevant to aspects of formative evaluation, such as conducting a needs assessment or contextualizing and adapting the content and delivery of the package to fit local circumstances *(2)*.

The requirement to contextualize the training intervention inevitably presents a challenge for generalizing the findings to other settings. However, summative evaluation specifically includes assessing the fidelity of the training intervention in the face of contextual changes and can thus help to overcome some of the usual limitations on extrapolating findings.

## 2.2 Pathways to impact of the training package

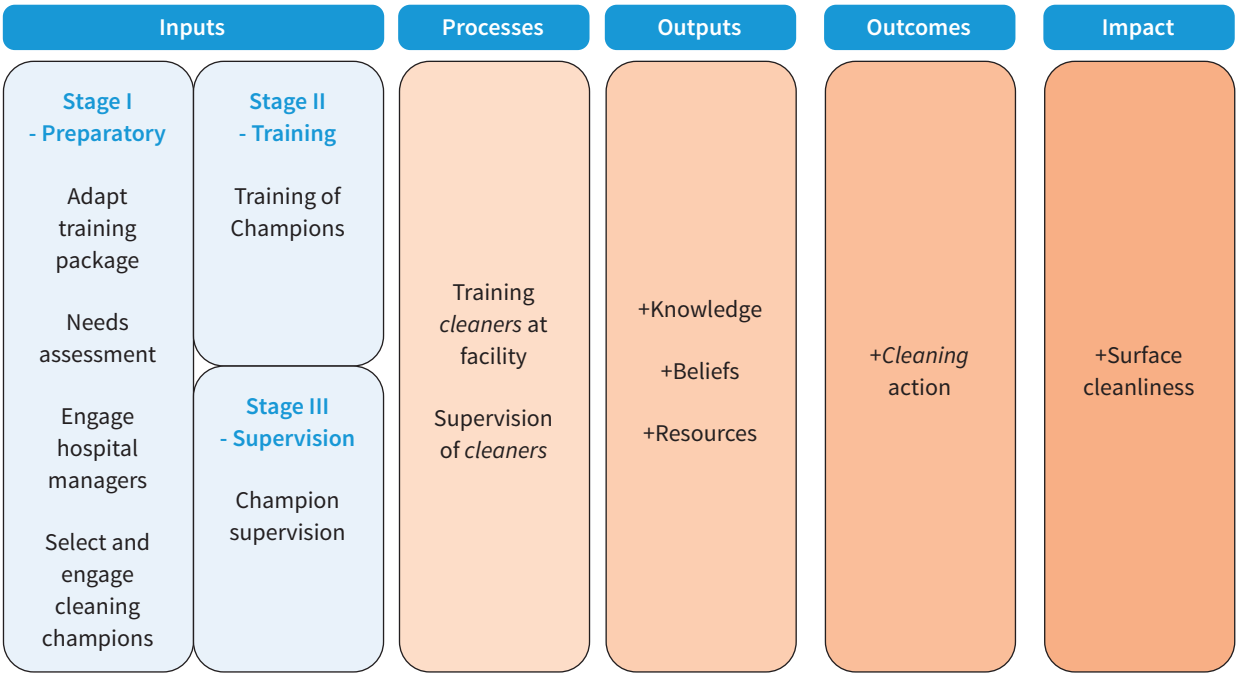
The stated purpose of the WHO training package *(2)* is:

> "… to improve the competence of those who clean through a practical, educational approach for adult learners in low- and middle-income countries. The training package's resources are intended to lead to long-term improvement in competence through supporting the target audience to put cleaning approaches into practice, in the context of supportive supervision and a multimodal improvement strategy for IPC"

As framed here, the desired benefits of the training are improved standards of environmental hygiene in health-care settings, within the context of broader quality improvement – especially in relation to IPC and as part of a programme of work leading ultimately to reduced HAI and antimicrobial resistance (AMR). The WHO training package should be recognized as an intervention that contributes to reducing health-related endpoints and cannot achieve this impact alone. Attributing specific reductions from the WHO training package in the context of such broader strategies raises important considerations for the study design of the evaluation, as discussed further in Section 3.

Specifying the pathway – or theory of change – by which an intervention is expected to affect final and intermediate endpoints is an important stage in conceptualizing and designing any evaluation. These endpoints lie at different points along a hypothesized causal pathway, as shown in Fig. 3, which is taken from one of the research studies used in this guide *(17)*.

**Fig. 3. Theory of change for a training intervention (TEACH CLEAN) for cleaners**




*(Key:* + denotes improvement)
*Source:* Gon et al. *(17).*

Fig. 3 highlights a pathway to impact on a non-health-related endpoint or outcome – surface cleanliness, especially of high-touch surfaces – those fomites that may serve as reservoirs of potential pathogens *(3)*. Systematically removing microorganisms from hospital surfaces impedes direct transmission to patients and direct or indirect transmission via the hands of health-care workers or medical equipment *(19,20)*. The robust evidence for improved cleaning leading to a decline in HAIs from the REACH trial and from earlier non-trial studies provides the main rationale for evaluations of the WHO training package focusing on reducing surface contamination in the patient zone as a key endpoint *(21,22)*.

With any causal pathway or theory of change, the choice of final endpoints influences the choice of intermediate endpoints and outputs (process measures), as discussed further later. For example, if the final endpoint or outcome is reduced levels of omphalitis (infection of the umbilicus and/or surrounding tissues) on neonatal wards, then an intermediate outcome on the pathway might be improved microbial cleanliness in the patient zone for newborns (e.g., incubators or bassinettes), and an output could be improved cleaning practises. In Fig. 3, the hypothesis is that the intervention provides training and supervision of cleaners, which increases their knowledge about environmental hygiene and appropriate cleaning behaviour (including cleaning techniques), and this improves cleaning practices and thereby improves the microbial cleanliness of high-touch surfaces.

Although this guide focuses on lessons from research studies that have used particular endpoints, highlighting other potential measures that might be considered in future evaluations is important (Table 3). The categorization of a measure as being a final or intermediate endpoint depends on the hypothesized theory of change in an evaluation. If the primary variable for judging the effectiveness of the training intervention is, for example, surface microbial contamination, which is categorized as an intermediate outcomes in Table 3, this becomes the final endpoint. Similarly, if the primary variable for judging effectiveness is reduced mortality from HAI, for example, then reduced prevalence of HAIs – categorized as a final endpoint in Table 3, become an intermediate outcome.

For the health-related endpoints, note that training of cleaners is just one component intervention of a multimodal improvement strategy for IPC and cannot be expected to achieve these endpoints alone. Moreover, considering such endpoints requires appreciating the sample size requirements, which will be considerable for comparatively rare outcomes, such as death from an overwhelming HAI, and optimal study design to enable plausible attribution of change within the context of broader initiatives to improve IPC. Both considerations in turn have major implications for costs, technical capacity (human resources and laboratory resources), quality assurance and the time needed for the evaluation. These alternative endpoints are not considered further in this guide, but Annex 2 includes a list of useful and relevant technical resources.

## Table 3. Potential endpoints in evaluating the WHO training package

| Intermediate endpoints | | Final endpoints[a] | | |
|---|---|---|---|---|
| **Outputs** | **Intermediate outcomes** | **Health impact: morbidity** | **Health impact: mortality** | **Non-health impact** |
| Visual surface cleanliness<br>Cleaners' knowledge<br>Cleaners' practices (quality and intensity of cleaning and frequency of cleaning)<br>Cleaners' perceptions, attitudes, beliefs and self-efficacy | Reduced microbial contamination of high-touch surfaces in the patient zone and in the broader health-care environment<br>Reduced contamination of reusable cleaning equipment and materials | Reduced prevalence and/or severity of HAIs<br>Reduced prevalence and/or severity of infections caused by AMR<br>Reduced patient gastrointestinal or skin colonization with marker pathogens (such as extended-spectrum beta-lactamase (ESBL)-producing enterobacteria for the gastrointestinal tract or *Staphylococcus aureus* or methicillin-resistant *Staphylococcus aureus* for skin) | Reduced mortality from HAIs and/or from infections caused by AMR | Patient satisfaction with ward cleanliness<br>Staff satisfaction, motivation and retention<br>Reduced patient length of stay<br>Reduced diagnostic tests (for example, to specify the pathogen)<br>Reduced health-care (treatment) and societal costs from HAIs<br>Reduced use or costs of last-line or critical antibiotics |

[a] *Achieved by strengthening environmental cleaning alongside other IPC and quality improvement interventions.*

## 2.3 Introducing the research exemplars

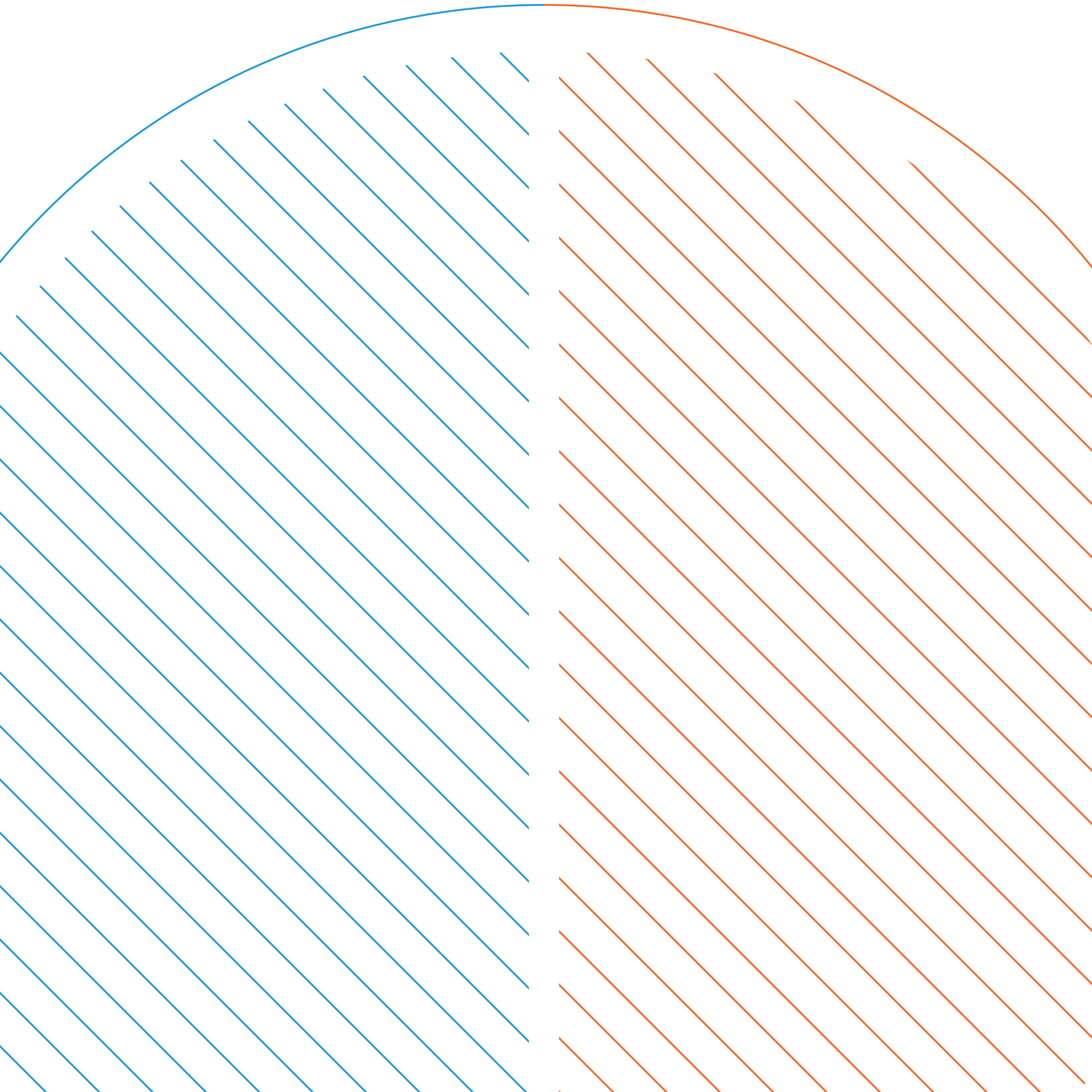
This guide draws primarily on two research studies conducted in Cambodia and the United Republic of Tanzania *(16,17)*. For the Cambodia study, a prototype of the WHO training package was available, and the implementing team undertook the contextual adaptation process using a combination of both the WHO and TEACH CLEAN training packages. The two studies also shared a similar causal pathway or theory of change, as illustrated earlier in Fig. 3, with the final endpoint being specified as "improved microbial cleanliness of high-touch surfaces in the patient zone". With this specification, the intermediate endpoints were then defined as improvements in relation to cleaning practices and knowledge. The final choice of the evaluation objectives and endpoints for these studies (Table 4) was a collaborative process involving all research partners, together with key stakeholders implementing the training (the trainers) and responsible for wider delivery of IPC and quality improvement for government health services (health ministries). Having defined these, a detailed research protocol was prepared for the evaluation. Although there are no universally agreed templates for such protocols, a standard set of issues should be considered, and Annex 1 provides a checklist for these. The rest of this guide provides summaries of the content of the protocols for the two studies; text boxes are used to enable readers to skip detailed descriptions if desired.

**Table 4. Stated objectives of exemplar research studies**

| | Cambodia | United Republic of Tanzania |
|---|---|---|
| 1. | Assess whether the level of surface microbial cleanliness (primary outcome) changes as a result of the intervention | Assess the change in surface microbial cleanliness |
| 2. | Assess whether the absence or presence of *S. aureus* changes as a result of the intervention | Assess the change in cleaning action frequency, knowledge and beliefs |
| 3. | Explore knowledge, self-efficacy alongside social norms among cleaners and investigate whether they vary by the degree of implementation strength and possibly by the level of microbial cleanliness | Describe the intervention implementation – fidelity, adaptations, dose and reach |
| 4. | Explore the association between the degree of implementation strength and microbial cleanliness | Describe the context in relation to resources and barriers to microbial cleanliness |

*Sources:* Gon et al. *(16)* and Gon et al. *(17)*.

# 3. Components of an evaluation protocol



# Components of an evaluation protocol

## 3.1 Study design

The choice of study design is crucial to meeting the stated objectives of the evaluation. Broadly speaking, there are two main categories of study design: an observational study and an experimental or intervention study *(23)*. In an observational study, the investigators stand apart from events taking place in the study. They simply observe and record. In an experimental or intervention study, the investigators introduce an intervention and observe the events that take place. For evaluation of the WHO training package, an intervention (training) is being introduced and experimental designs are therefore most appropriate. However, as noted earlier, there is a crucial preparatory phase before the training intervention is introduced comprising contextualizing and adapting the package, and for this phase, observational work is often conducted; further guidance on this phase is available in the WHO training package: modules and resources *(2)*.

Many resources are available describing the nature and relative benefits of different experimental designs, and Annex 2 lists some of these. A key factor affecting the design is the choice of the comparator for the intervention – comparison with itself over time, comparison with a concurrent comparator group or comparison with a control group allocated randomly using formal methods for a randomized trial design. Table 6 summarizes key issues in relation to the choice of comparators for evaluations of the WHO training package and from the experience of the two research studies.

In addition, practical considerations, such as budget and expertise, also affect the choice of study design and the ultimate use of the evidence generated and the needs of stakeholders, such as funders or policy-makers. The intended uses of the evaluation findings also affect the degree of certainty, confidence and generalizability required. Each design has different strengths and weaknesses, and they are not considered equal in the grade of evidence they provide. In the traditional hierarchy of evidence, randomized controlled studies are generally ranked highest, followed by non-randomized designs, and finally before-and-after designs; Annex 2 provides further reading on this hierarchy. The two exemplar research studies span this hierarchy with a before-and-after design used in the United Republic of Tanzania, as summarized in Box 2, and a randomised trial conducted in Cambodia – specifically a stepped-wedge design, as summarized in Box 3.

## Table 5. Examples of comparators in evaluations of the WHO training package

| Comparator | Type of design | Issues to consider | Challenges | Advantages |
|---|---|---|---|---|
| **Comparing within the same health-care facilities or district or region** | Before-and-after<br>(before and after introduction of training) | Crucial that "before" data are collected before the intervention starts<br>Comparability of target health-care facilities or areas is key<br>Difficult to stop the intervention once the training is done – so no real "after" observation | Deciding how long the "before" period should be is often challenging. Data capture itself may bring about changes in variables of interest before the intervention is started; this bias is referred to as the Hawthorne effect – *when people behave differently because they know they are being watched (24)*. Avoiding this bias often requires the "before" period to be long enough to dilute this effect<br>Findings can only be said to relate to the context and participating facilities or area, so generalizing is more difficult<br>Challenging to interpret findings since change in selected outcomes, such as microbial cleanliness, may be unrelated to the training intervention but is caused by other factors in the health-care facilities or area, such as improved provision of water, sanitation and hygiene (WASH). | The simplest design to implement in practice and often easiest to understand and analyse – both relevant factors when evaluation expertise is limited |
| | Interrupted time series – multiple points of measurement – before, during and after intervention | As above | As above | Provides more data points compared with a simple before-and-after design, and trend analysis is thereby more robust |
| **Comparing with control health-care facilities or areas** | Non-randomized controlled trials (quasi-experimental) | Selection bias *(25)* | Selection bias happens when the intervention group and the group chosen as the comparator differ. The most common way to deal with selection bias is by randomly allocating health-care facilities or areas (see below). Other ways of reducing selection bias include for example, fitting regression models or conducting subgroup analysis of a matched subset of control health-care facilities or areas that are like the intervention group | Enables more sophisticated analysis compared with designs without independent controls and thereby gives stronger confidence that any effects observed in intervention arm are real, if selection bias has been minimized |

| Comparator | Type of design | Issues to consider | Challenges | Advantages |
|---|---|---|---|---|
| | Randomized controlled trials *(26)* | Randomized controlled trials will generally give the most confidence that any change can be attributed to the intervention | They can be costly and complicated to design and depend on specific factors being in place, such as being able to deliberately allocate exposure to an intervention or not<br><br>Conducting a randomized controlled trial can sometimes require specific limitations or changes to the usual care context to ensure that the intervention is delivered as intended and to minimize the risk of contamination between trial arms. Creating such an artificial context can then present a challenge in assessing the generalizability of the findings to normal care settings<br><br>In some circumstances, randomization may not be possible for ethical or practical reasons: for example, withholding training could be considered unethical. A stepped-wedge randomized trial is intended to overcome this, as in Cambodia trial described in Box 3. A stepped-wedge trial is one in which clusters receive the intervention at different time points, the order in which they receive it is randomized, and data are collected from clusters over time *(27)* | A design least prone to major biases. Enables a variety of analytical approaches to be applied. Regarded as providing the highest grade of evidence of intervention effects |

## 3.2 Study populations and sites

The evaluation objectives and specified outcomes define the relevant target population and suitable sites for the study. For the WHO training package as an intervention, there are several types of potential target populations depending on the level of the main final endpoint or outcome, as defined in the causal pathway or theory of change. If, for example, the final outcome chosen is improved knowledge and cleaning practices, then the focus is at the individual level of cleaners. This, in turn, influences the study design, as discussed earlier. For example, randomizing cleaners to receive the training or not would be logistically difficult in the same health-care facility and would raise concerns about diluting effects by control cleaners learning from the randomized individuals and raise ethical concerns about withholding an intrinsically valuable resource (training). If, in contrast, the final endpoint is selected as microbial cleanliness of specified high-touch surfaces, then the "study population" is essentially clinical areas or wards, such as the neonatal unit, and these may be randomly allocated to receive or not the training intervention. However, the hospital layout and pattern of deployment and interactions of cleaners needs to be considered to minimize the risks of diluting intervention effects. As noted from Box 2, in the United Republic of Tanzania the "study population" was selected wards and a before-and-after design was used, which avoids these risks since the intervention is not withheld from a concurrent control group. Nevertheless, the attribution of improvement is weakened by the potential for confounding because of wider service changes, such as staffing shifts.

**Box 2. Summary of design and conduct of research study in the United Republic of Tanzania**

The evaluation ran between April 2018 and July 2019 in three high-volume public hospital facilities in Dar es Salaam, United Republic of Tanzania (average monthly deliveries: 1089–1393). The training intervention involved three phases: *(1)* preparatory stage: engaging with hospital managers, selecting facility cleaning champions in each hospital, assessing environmental hygiene status and resources and adapting TEACH CLEAN to the local context; *(2)* training stage: training facility cleaning champions to educate and supervise existing personnel with environmental hygiene responsibilities; *(3)* supervision stage: ongoing mentorship of cleaning champions while they educate and supervise existing personnel with environmental hygiene responsibilities.

A local training institution, the Muhimbili University of Health and Allied Sciences delivered the training intervention, with technical support from The Soapbox Collaborative. The London School of Hygiene and Tropical Medicine and the Ifakara Health Institute collaborated in evaluating the project.

The evaluation was conducted in four wards in each facility: labour ward, postnatal ward for vaginal deliveries, postnatal ward for caesarean sections, neonatal ward (in two facilities), and kangaroo mother care ward (in one facility). In terms of timing, 10 days of formative observation (August–September 2018) identified key environmental sites at which to measure cleanliness. Pre-training data collection ran for eight weeks from 28 October 2018 (roughly coinciding with stage 1 of implementation). Training of champions (stage 2) and subsequent training of cleaners at facilities took place from 7 to 28 January 2019 (weeks 9–12). Post-training data collection (intended to coincide with stage 3) ran for 15 weeks from 29 January to 24 May 2019 (weeks 13–28).

This study design prospectively evaluated the intervention as a whole and offered a before and after comparison of impact of the main training (stage 2), albeit with a baseline period (stage 1) in which some intervention activities had already started to take place owing to time constraints in the availability of the training institute. This contaminated baseline was a limitation of the evaluation and was considered in interpreting the findings.

Source: Gon et al. *(17).*

In Cambodia, the randomized design focused on hospitals as the units of study, as described earlier in Box 3. When the training intervention is being delivered at such a cluster level, then the broad comparability of the health-care facilities must also be considered in terms of factors likely to affect the delivery of the training and the primary outcome. When data have been gathered in the needs assessment to help contextualize the training package, this may provide useful insight on factors to consider to ensure relevant similarity between intervention and comparator units, such as numbers, mobility or previous training and current knowledge of cleaners as well as broader characteristics of the study setting, such as the state of WASH infrastructure *(3)*. Box 4 provides more details on the selection of study units from the Cambodia study.

### Box 3. Summary of design and conduct of research study in Cambodia

The design selected for evaluating the TEACH CLEAN package in Cambodia was a randomized controlled trial using stepped-wedge random allocation. This was deemed the optimal design to ensure that all 13 participating hospitals ultimately received the training, as was required by the key stakeholders while keeping to the rigour of randomization.

- The environmental hygiene intervention was rolled out to 13 hospitals over 10 months.
- The main intervention – the training of trainers and champions was delivered to selected cleaning champions from three or four hospitals within a certain month (within the same four weeks of a specific month in the schedule), with a total of four steps (four main periods when training happens), as shown in the chart below.
- The timing allocation for the hospitals matched with the four training periods was random.
- The results across unexposed observation periods were compared with those across the exposed observation period.
- The stepped-wedge design, with staggered timing for the start of the intervention and intervention length (two to eight months), was feasible to implement while maintaining the rigour of the study.
- The design enabled implementing partners to work with a group of hospitals at the time to maximize the quality and consistency of the implementation and avoided having to manage the changes across 13 hospitals simultaneously.

| | | | Period/Month | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | March | May | June | July | August | September | October | November | December | January | February |
| Hospital | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | Pilot | 0 | Training group 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | Pilot | 0 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | Pilot | 0 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | Pilot | 0 | 0 | 0 | Training group 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | Pilot | 0 | 0 | 0 | | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | Pilot | 0 | 0 | 0 | | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | Pilot | 0 | 0 | 0 | 0 | 0 | Training group 3 | 1 | 1 | 1 | 1 |
| 8 | Pilot | 0 | 0 | 0 | 0 | 0 | | 1 | 1 | 1 | 1 |
| 9 | Pilot | 0 | 0 | 0 | 0 | 0 | | 1 | 1 | 1 | 1 |
| 10 | Pilot | 0 | 0 | 0 | 0 | 0 | | 1 | 1 | 1 | 1 |
| 11 | Pilot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Training group 4 | 1 | 1 |
| 12 | Pilot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 1 | 1 |
| 13 | Pilot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 1 | 1 |

*Source:* Gon et al. *(16).*

**Box 4. Considerations in the selection of study hospitals in Cambodia**

The 13 hospitals were selected from three provinces with similar sociodemographic characteristics.

| Province | % rural (versus urban) | Population density per km2 | Income (gross domestic product per capita, 2015) |
|---|---|---|---|
| Kampong Chhnang | 85% | 95 | 2726 |
| Battambang | 76% | 84 | 2881 |
| Kratie | 90% | 34 | 2765 |

Across these three provinces, 13 hospitals were then chosen out of a possible total of 25, considering both health-care facility characteristics and practical factors:

- district or provincial referral hospitals;
- public hospitals;
- 46% with an operating theatre;
- range of hospital beds: 30–220;
- ensuring broad representation of the functions and size of health-care facilities **within** the three selected provinces; and
- logistical considerations of travel time for study teams, including the time to reach central laboratory processing microbiological samples.

## 3.3 Sample size requirements

The choice of main final endpoint or outcome for the evaluation directly affects the sample size requirements for robustly demonstrating effects. Again, several resources provide guidance on calculating these requirements, and Annex 2 highlights some of these.

For evaluations of the WHO training package intervention, the sample size needs to be driven by an estimate of the expected size of the effect of the intervention on the final endpoint or outcome. This relates to the evaluation hypothesis or main objective in terms of a meaningful difference in the endpoint or, indeed, no difference if the null hypothesis is being used. This effect size is usually based on evidence from relevant related studies. Given the uniqueness of the WHO training package, there is not currently a large evidence base to inform about the likely size of effects for the possible endpoints shown in Table 3, but as experience builds, this limitation on driving sample sizes should ease.

For the studies on Cambodia and the United Republic of Tanzania, the primary final outcome or endpoint was the microbial cleanliness of high-touch surfaces in the patient zone. There are several approaches to measuring contamination by surface site sampling, as described in the overview by Rawlinson et al. *(28)*. The option selected for the two studies was dipslides, owing primarily to considerations of data capture feasibility, costs, local laboratory capacity and ease of interpretation. Box 5 provides further details on this approach to surface site sampling. A useful summary of alternative monitoring methods for environmental cleaning is available in Annex 5 of a WHO manual on preventing and controlling the spread of AMR *(29)*.

### Box 5. Microbiological sampling of surfaces using dipslides

Dipslides are a widely used method for measuring surface microbial cleanliness in hospitals and elsewhere. Dipslides are coated with a non-specific agar on one side for measuring total aerobic colony counts (per $cm^2$) and a selective agar on the other to determine the presence of a specific pathogen, such as *S. aureus*. Each side of the dipslide is pressed firmly onto the selected surface, using adjacent areas of the sampling site. Dipslides may be incubated locally if laboratory capacity permits or transported to a central laboratory on the day of collection. The dipslides are incubated in aerobic conditions for 14–36 hours at 37°C. Colonies are enumerated by visual inspection, as shown in the photo.

Reading of the slides for aerobic colony counts is based on density per $cm^2$ but also determined visually as shown in the photo as "light, medium or heavy". In the studies in Cambodia and the United Republic of Tanzania, the convention of defining hygiene failures was used and cleanliness categorized as a binomial variable, with "clean" defined as surfaces with <2.5 aerobic colony-forming units per $cm^2$ and "not clean as ≥2.5 aerobic colony-forming units per $cm^2$.


Samples of dipslides demonstrating surface contamination as "light, medium or heavy"

*Source:* Rawlinson et al. *(28)*.

Although at the time, there were no studies before those in Cambodia and the United Republic of Tanzania of the size of effect from training interventions on microbial cleanliness, there were reports from low-resource settings without formal training of cleaners showing low levels of microbial hospital cleanliness, and these findings helped to inform the sample size calculations along with other considerations *(30)*. Boxes 6 and 7 provide more details on the sample sizes determination and the choice of surfaces for the studies in United Republic of Tanzania and Cambodia, respectively.

### Box 6. Sample size determination and surface sampling sites in the study in the United Republic of Tanzania

In the United Republic of Tanzania, for the primary outcome of microbial cleanliness, the sample size of 1200 dipslides was derived, primarily based on what the investigators deemed as a meaningful improvement based on preventing and controlling infection and from the reports on expected baselines. The determination of 1200 dipslides gave more than 90% power to detect a 10% absolute increase in surface microbial cleanliness, as measured by aerobic colony counts, from a 20% cleanliness baseline ascertained during the preparatory phase for contextualizing the TEACH CLEAN package *(17)*.

The sites for taking the samples were determined by observations at one of the participating hospitals in the preparatory phases, which showed patient beds as the surfaces most frequently touched by health-care workers and closest to the patient, thereby providing the greatest risk of pathogen cross-transmission *(19)*. Surface samples were also taken using dipslides from an equipment trolley, a bedside locker, a sink and a water tap because these were also high-touch sites and beds were limited in one ward. Ten sites were selected in each of 11 wards and five sites in the kangaroo mother care ward, giving a total of 115 sites (see Box 2 for details on wards). Twenty samples were taken at each site, half during the pre-training (pre-intervention) and half during the post-training periods. To minimize staff behaviour change in response to the evaluation, the day and site on each visit were randomly selected.

The reading of the samples and categorization into microbially clean or not was based on aerobic colony count, as described in Box 5.

**Box 7. Sample size determination and surface sampling sites in the Cambodia study**

Drawing on the earlier experience from the study in the United Republic of Tanzania, the selected primary outcome in Cambodia was the proportion of microbial cleanliness (<2.5 colony-forming units/$cm^2$ = clean; ≥2.5 colony-forming units/$cm^2$ = not clean), calculated for each of 30 selected surfaces sampled per period or month. These surfaces were key high-touch sites – patient beds and other equipment around the patient area (such as beds, equipment trolley and bedside locker). Since this was a stepped-wedge design (see Box 3), the training intervention was delivered in four steps across the 13 hospitals (three hospitals per step, except for one step with four hospitals), with 30 surface sampling sites each.

Assuming a pre-training cleanliness proportion ranging from 30% to 50%, as found in the United Republic of Tanzania study, the required sample size was 4300 dipslides (13 hospitals* 30 sampling sites*10 months = 3900 + 10% for contingency purposes). This gave more than 85% power to detect a 30% relative increase in microbial cleanliness. This was based on a two-sided 5% significance level, a two-period decay correlation structure, with conservative estimates of within-period intraclass correlation in microbial cleanliness at 0.03, autocorrelation of observation at 0.6 and cluster autocorrelation at 0.6, with these values also derived from the United Republic of Tanzania.

*Source:* Gon et al. *(16).*

## 3.4 Delivery of the intervention (WHO training package)

This guide assumes that users are familiar with the content and proposed delivery of the WHO training package (Fig. 1) *(1,2)*. Here we summarize the key aspects relevant to process and impact evaluation.

The trainer's guide of the WHO training package explains how to prepare, deliver and sustain an effective training for those who clean *(1)*. Seven key considerations are highlighted, as shown in Box 8. The question of whether to conduct a summative evaluation should be considered as part of the first crucial step of identifying capacity, since robust evaluations require dedicated financial and human resources. The intended purpose and value of the evaluation will help to drive both the choice of a realistic study design and the resource requirements. This decision-making process is likely to be an iterative rather than linear process and should involve key stakeholders, such as those funding and/or commissioning the evaluation.

**Box 8. Key considerations when starting out implementing the WHO training package**

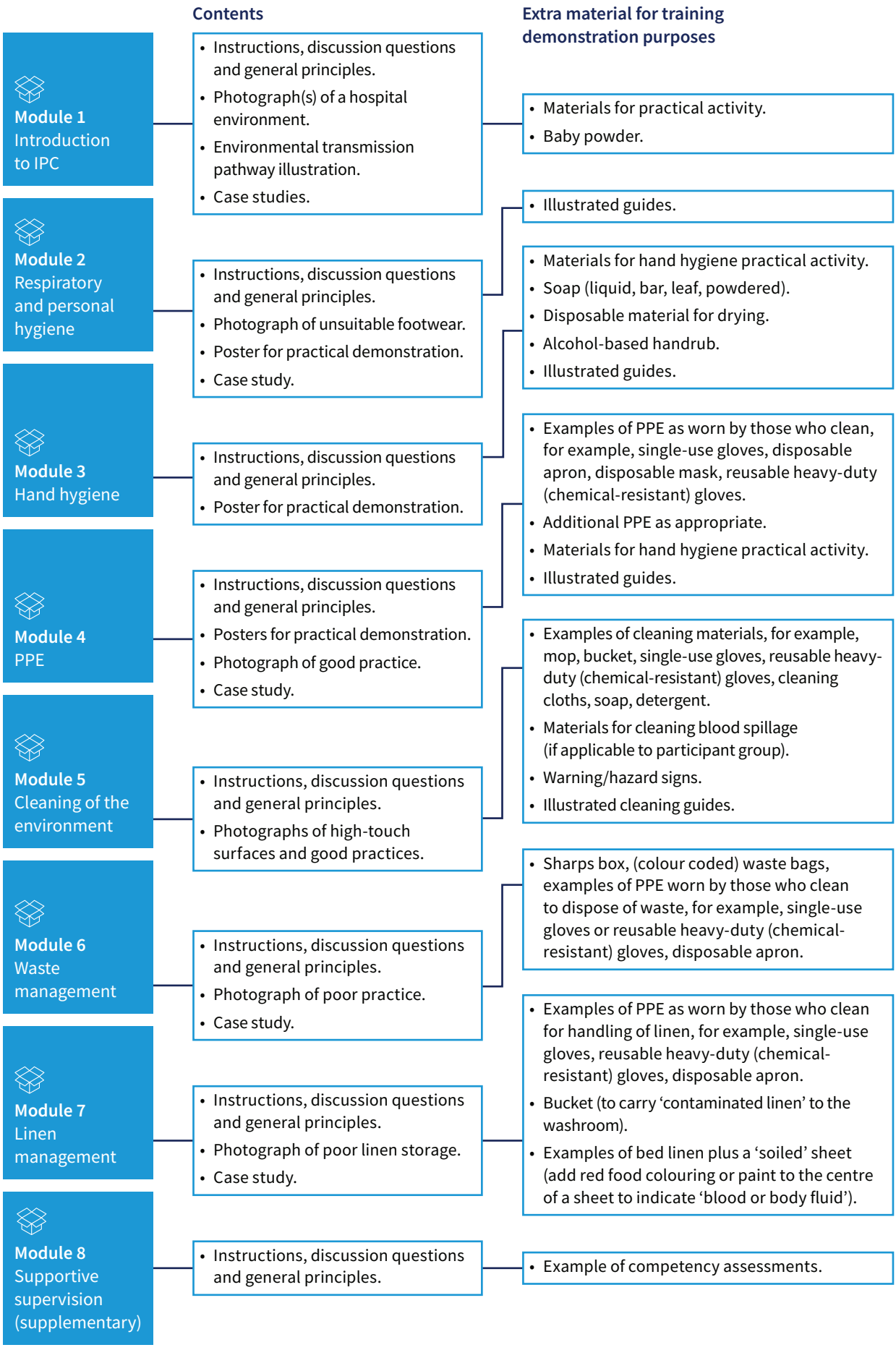
1. Consider people, resources and budgets for training (see section 2.1.1).
2. Review relevant cleaning guidance (see section 2.1.2).
3. Establish baseline information (see section 2.1.3).
4. Understand the training approach (see section 2.1.4).
5. Consider adaptation to the local context (see section 2.1.5).
6. Consider potential barriers and opportunities (see section 2.1.6).
7. Consider a multimodal approach (see section 2.1.7).

*Source: Environmental cleaning and infection prevention and control in health-care facilities in low- and middle-income countries: trainer's guide (1).*

The modules and resources volume of the WHO training package provides training materials: instructions, definitions, photographs, posters and other illustrated cleaning guides, including specific illustrations that support competence statements intended to improve practices *(2)*. The materials can be used to train cleaners on how to perform cleaning activities, to support them to visualize the correct steps to take and to check environmental cleanliness standards. The WHO training package is summarized in Fig. 4. In the practical delivery of these modules, the learning materials are usually gathered into boxes (often referred to as "clean boxes") to aid the trainer and act as a visual reminder to cleaners, as illustrated in the photograph.


First pilot application of TEACH-CLEAN: The Gambia, 2016 - Training of Trainers & 'Clean Box' Approach

## Fig. 4. Summary of the content of WHO training package modules and resources




*Source: Environmental cleaning and infection prevention and control in health-care facilities in low- and middle-income countries: trainer's guide (1).*

A further consideration is the interaction between the actors involved in measurement-related activities, such as those undertaking the routine monitoring of the implementation of the training versus those conducting the summative evaluation. The latter may, for example, be conducted by a group independent of the delivery of the training, and this is important in maintaining the integrity of the evaluation. The studies in Cambodia and the United Republic of Tanzania maintained a distinction between these roles. As noted earlier in Box 2, in the United Republic of Tanzania the implementing agency was a training institute, supported by the international nongovernmental organization that created the package (the Soapbox Collaborative), and the evaluation was conducted by a national research institute (Ifakara Health Institute) with the London School of Hygiene and Tropical Medicine. Similarly in Cambodia, the training package was delivered by the health service delivery arm of the Ministry of Health along with WaterAid; the process evaluation involved contracting an independent consultant to work with the London School of Hygiene and Tropical Medicine; and the National Institute of Public Health and London School of Hygiene and Tropical Medicine led the impact evaluation. This sort of multiple engagement also reflects the range of technical skills and experience typically required for monitoring and evaluating an intervention. For the two country studies, the team skills included both quantitative and qualitative research expertise as well as health service provision and quality improvement, microbiology and laboratory science, data management and statistical analysis.

## 3.5 Process evaluation

It is now widely accepted that evaluating impact in terms of final and intermediate endpoints should be accompanied by evaluating processes for complex interventions, such as the WHO training package *(29)*. Process evaluation attempts to document how an intervention is implemented and what was actually delivered compared with that intended to be delivered. Implementation can be examined in terms of fidelity, reach, dose delivered and any unanticipated additional activities or adaptations that had to be made to an intervention in a given context, such as changes to the content *(31)*.

Process evaluation does not typically include studying the initial preparatory phases to delivering an intervention, primarily because there is no opportunity for comparisons since they carried out across the entire target population. These preparatory phases are highly relevant to designing the evaluation, however, and this is demonstrated further in Box 9 for the Cambodia study.

### Box 9. Description of preparatory activities in the Cambodia study

The preparatory stage included engagement with all the hospital managers, selection of trainers of cleaners in each hospital and a basic needs assessment of environmental hygiene status and resources in each facility, which informed the adaptation of the WHO and TEACH CLEAN training packages to the local context. The assessment involved reviewing relevant policy documents and a rapid facility survey. For the latter, trained surveyors paid a visit to all the 13 hospitals to conduct interviews with hospital and ward leaders responsible for IPC and cleaning, using a semistructured questionnaire. In addition, a hospital walkthrough was done to observe the cleaning and hygiene facilities and practices using an observation checklist. These data helped to guide the implementation in terms of selecting relevant wards (maternity ward, including labour and postnatal rooms, general medicine ward and paediatric ward) and facility trainers and to adapt the training tools to align with existing policies and guidelines and to integrate digital technologies (such as videos) for the training. Crucially, these preparatory data were also shared with the evaluation team and thereby aided the choice of ward-specific sites for capturing the primary outcome assessed using dipslides, as described in Box 5.

The preparatory phase also established important practical details on the delivery of the cascade of training. Although the training of trainers approach with master trainers from the Ministry of Health's Department of Health Services training designated trainers at workshops was common across participating hospitals, each hospital and ward manager organized the timing and duration of the training for cleaners to ensure that personnel were able to attend while maintaining key core personnel on the wards, and the same was true for providing supportive supervision after the training. These aspects of the delivery of training package were crucial to defining the process evaluation, as described in Box 10.

### Box 10. Process evaluation in Cambodia

The process was evaluated through a collaboration of the National Institute of Public Health, WaterAid Cambodia and the London School of Hygiene and Tropical Medicine and implemented by an external consultant. The activities followed international guidelines and included the following parameters *(32)*.

- **Implementation fidelity**. This was measured through semistructured observations of training sessions at the training of trainers level and facility level, observing one or more sessions in each facility, and using interviews and focus group discussions with stakeholders and conducted by an experienced qualitative researcher. A sample of facility trainers and cleaners were interviewed by phone at regular intervals during the study to assess both implementation fidelity in terms of supportive supervision and contextual changes.
- **Context**. For this, the hospital characteristics and context were mapped (such as staffing and size), infection prevention policies and practices (such as antimicrobial stewardship, antibiotic use and screening) and other relevant activities (such as cleaning personnel changes and policy changes) within the hospital in a qualitative way by interviewing stakeholders. Ongoing reviews of contextual information throughout the intervention gathered at each site by the implementers also assisted with trial site comparisons, replication and scalability and knowledge translation.
- **Dose and reach**. These were monitored using training records on, for example, number of modules delivered, number of facility personnel trained and number of supervision sessions.
- **Data on mechanisms**. The hypothesized mechanism by which the training would exert its effect was through increased knowledge. This was assessed through a quantitative survey enquiring about knowledge, social norms, network structure and self-efficacy measures. The survey was administered to all cleaners in the selected facilities at the end of the trial and enabled the knowledge and attitudes scores to be compared between the control and intervention hospitals at the different steps in this stepped-wedge trial.

## 3.6 Impact evaluation

As noted earlier, impact evaluation typically focuses on final and intermediate endpoints or outcomes selected based on a hypothesized causal pathway or theory of change (see Fig. 3). In the two exemplar research studies, the main or primary final outcome was the microbial cleanliness of high-touch surfaces in the patient zone, assessed in terms of aerobic colony count gathered from surface sampling site using dipslides. A further final outcome was the presence or absence of *S. aureus* – an indicator bacterium chosen primarily based on being an important human pathogen and one typically carried and spread on human skin. The study designs in the two studies enabled impact to be assessed for the main final outcome by comparisons before and after the intervention for the United Republic of Tanzania or by a randomized control arm for Cambodia. Intermediate endpoints or outcomes varied between studies, including cleaning intensity and practice, as measured using fluorescent gel dots (a form of fluorescent marking) and observational checklists and knowledge and beliefs as measured by questionnaires, key informant interviews and focus group discussions. In the United Republic of Tanzania, fluorescent gel dots were applied to selected sites in the patient zone, and 8–24 hours later (after the morning cleaning), ultraviolet light was used to determine whether these had been substantially disrupted or totally removed *(29,30)*. The time the gel dots were applied was randomly allocated to either morning, afternoon or night shift. The combination of assessing the extent of removal of gel dots and in relation to cleaning schedules provided a way to consider changes in the intensity and frequency of cleaning before and after the training intervention. Table 3 showed potential alternative outcomes to those used in the Cambodia and the United Republic of Tanzania studies.

## 3.7 Data collection, management and analysis

The data capture instruments used for process and impact evaluation are usually designed for the specific context in terms of capacity, scale and feasibility but are also usually based on or built up from pre-existing tools, depending on the variable of interest. Table 6 shows the range of instruments used in the evaluations in Cambodia and the United Republic of Tanzania, and Annex 3 provides examples.

The frequency and timing of data capture should be set out in the detailed evaluation protocol. For example, in Cambodia, the microbial cleanliness was captured through dipslides at 30 sites in each of the 13 hospitals monthly for the 10 months required by the stepped-wedge design. The different types of data may be captured once during the evaluation, such as the observational walkthrough during the preparatory phase, whereas others may be applied at multiple time points, such as the use of fluorescent gel dots.

**Table 6. Data capture instruments used in the Cambodia and the United Republic of Tanzania studies**

| Type of data | Purpose of data | Instrument |
|---|---|---|
| **Outcome** | Microbial cleanliness | Dipslides or other surface site sampling technologies (aerobic colony count) |
| | | Dipslides – pathogen specific, such as *S.aureus* |
| **Process** | Cleaning intensity and practices | Fluorescent gel dots |
| | | Observational checklist |
| | Knowledge and beliefs | Interview or self-complete questionnaire |
| | | Key informant interviews |
| | | Focus group discussions |
| | Implementation fidelity | Semistructured observational checklist |
| | | Interviews |
| | | Focus group discussions |
| | Context | Key informant interviews |
| | | Diary or log of key contextual changes |
| | Dose and reach | Training records |
| | Mechanisms | Survey questionnaire |
| **Preparation** | Baseline | Policy document review |
| | | Observational walkthrough (planned route through the health-care facility) |
| | | Key informant interviews |
| | | Review of hospital annual reports on staffing and resources |

As shown in Table 6, quantitative, qualitative and microbiological data may be gathered, requiring different approaches to handling and storage and indeed analysis. Such arrangements should be set out in the data management plan. The quantitative data may be gathered by using paper-based forms or electronic devices, such as tablets, as in both country studies. Electronic devices have the advantages of enabling in-built consistency checks and ease of transfer into a database on a secure site. Some qualitative data may be gathered using voice recorders and then transcribed into a database. Microbiological samples need to be cultured and interpreted together with quality assurance steps and the findings securely stored. The security requirements for storage of and access to data, including the use of encryption or the archiving of paper copies, are usually defined at the national and institutional levels and should be stated clearly in the management plan.

Similarly, for analysing the evaluation data, a plan is needed to guide the activity and ensure adequate attention to data cleaning and data quality and to the time needed for interpretation, including stakeholder engagement. Box 11 summarizes the analysis undertaken in the United Republic of Tanzania for the main or primary endpoint; further details on the quantitative and qualitative analysis are available in the main article for this study *(11)*.

**Box 11. Analysis of primary final endpoint (outcome) in the study in the United Republic of Tanzania**

For the final endpoint (microbial cleanliness), data were cleaned, checked for inconsistencies and analysed using Stata/MP v14.2 software. Descriptive statistics were used to summarize and compare impact outcomes (cleanliness standards: aerobic colony count and absence of *S. aureus*) and process outcomes (physical cleaning action performed: gel dots removed) before and after the training. Biweekly proportions of these outcomes were determined and used to show time trends throughout the study.

Multivariable logistic regression (with random effects to account for clustering by sampling location) was used to estimate the weekly change in odds and confidence intervals (95%) for the impact and process outcomes. Potential predictors of the outcome were adjusted for ward type, hospital and bed occupancy.

Two sensitivity analyses were undertaken for the main impact outcome (aerobic colony count pass/fail): *(1)* recalculating bed occupancy at one facility excluding infrequently used delivery beds and *(2)* restricting analysis to the data collected from bedframes in case personnel might engage with cleaning frames and mattresses differently. The polychoric correlation coefficient was calculated between microbial cleanliness (using dipslide aerobic colony count) and frequency of cleaning action (gel dots). Intracluster correlation was determined separately for wards and hospitals to measure the relatedness of data *(33)*. Sensitivity, specificity, positive predictive value and negative predictive value were calculated using conventional methods. The results from gel dots (“test”) were compared with the aerobic colony count results for dipslides (“reference”).

## 3.8 Ethical approval and consent

For the examples of summative evaluation shared in this guide, the study protocol and related tools were submitted to the National Ethics Committee for Health Research as well as the institutional ethical boards of the lead partners, and permission was also sought from relevant committees of the participating health-care facilities. For formative evaluations aimed at informing routine quality improvement, the requirements for ethical approval and consent often differ and are determined locally. Similarly, if an evaluation focuses on data on pathogens from surfaces in clinical settings and involves no human participation, the requirements for permission and ethical approval are likely to differ.

Submitted evaluation protocols need to strictly adhere to best ethical practice, including respect for the voluntary nature of the participation and the confidentiality of the information provided by all participants. Individual informed consent should be sought from participants, such as hospital managers and cleaners, before data collection. A project information sheet should be made available in the participating health-care facilities and wards. Annex 3 provides examples from the two studies.

The experiences in Cambodia and the United Republic of Tanzania also highlight some of the challenges of conducting an evaluation in which a key stakeholder – here cleaners – is comparatively powerless to decline to participate and participation may also bring perverse effects, such as risks to continued employment if poor cleaning practice is demonstrated or if comments on lack of cleaning supplies may produce adverse reactions from managers. Confidentiality and anonymity are important principles to respect in all circumstances, but if health-care facilities have comparatively few cleaners, this can be difficult to assure. The evaluation protocol should explicitly consider the risks of perverse effects for participants as an integral part of the ethical approval process.

## 3.9 Data quality assurance and risk mitigation

The partners are jointly responsible for the quality of the delivery of the WHO training package. For summative evaluation, establishing an independent advisory committee to ensure that high standards of practice and governance are maintained is generally considered good practice. This undertaking may overlap or be distinct from a stakeholder group whose role usually focuses on the scope, value and end uses of the data emerging from the evaluation.

Based on the experiences in the Cambodia and the United Republic of Tanzania studies, the challenges of maintaining data quality emerged specifically for the microbial outcomes. A microbiology laboratory should ideally be quality accredited and be actively involved in developing the project-specific standard operating procedures for performing relevant testing, ensuring suitable storage conditions for laboratory materials and checking the consistency of results. These conditions were met in the two studies, but since the participating hospitals lacked experienced microbiology personnel and adequate facilities, all dipslides were transported to a central laboratory, with consequences for storage in transit and timely transport and cost.

Although sound project planning is an essential part of all evaluation, it is also important to remain vigilant and be prepared to act on unexpected emerging issues, such as the recent experience of the COVID-19 pandemic. The Cambodia study was affected by the pandemic, halting the data capture processes periodically, requiring additional safeguarding arrangements for personnel and delaying the completion. Other potential limitations of all evaluations include reluctance to participate; participation fatigue; adverse events occurring at the personnel, patient or hospital level during the trial; seasonal factors; and organizational or policy changes. These limitations can be mitigated somewhat by frequently monitoring the risks and threats in each participating health-care facility or region, and any advisory committee

should be kept informed. One specific challenge in evaluation in the real-world context of routine health services, as was the case with the exemplar studies reported in this guide, is the inevitable risk of changing circumstances that directly affect an intervention, such as implementing wider quality improvement initiatives that alter roles in IPC or increased problems with WASH infrastructure. The duration of most summative evaluations, typically spanning many months, poses real risks and likely occurrences that can rarely be prevented. The evaluation team should therefore remain vigilant to such challenges and put in place mechanisms for recording the nature and timing of relevant changes in the participating health-care facilities, as was the case in the exemplar studies.

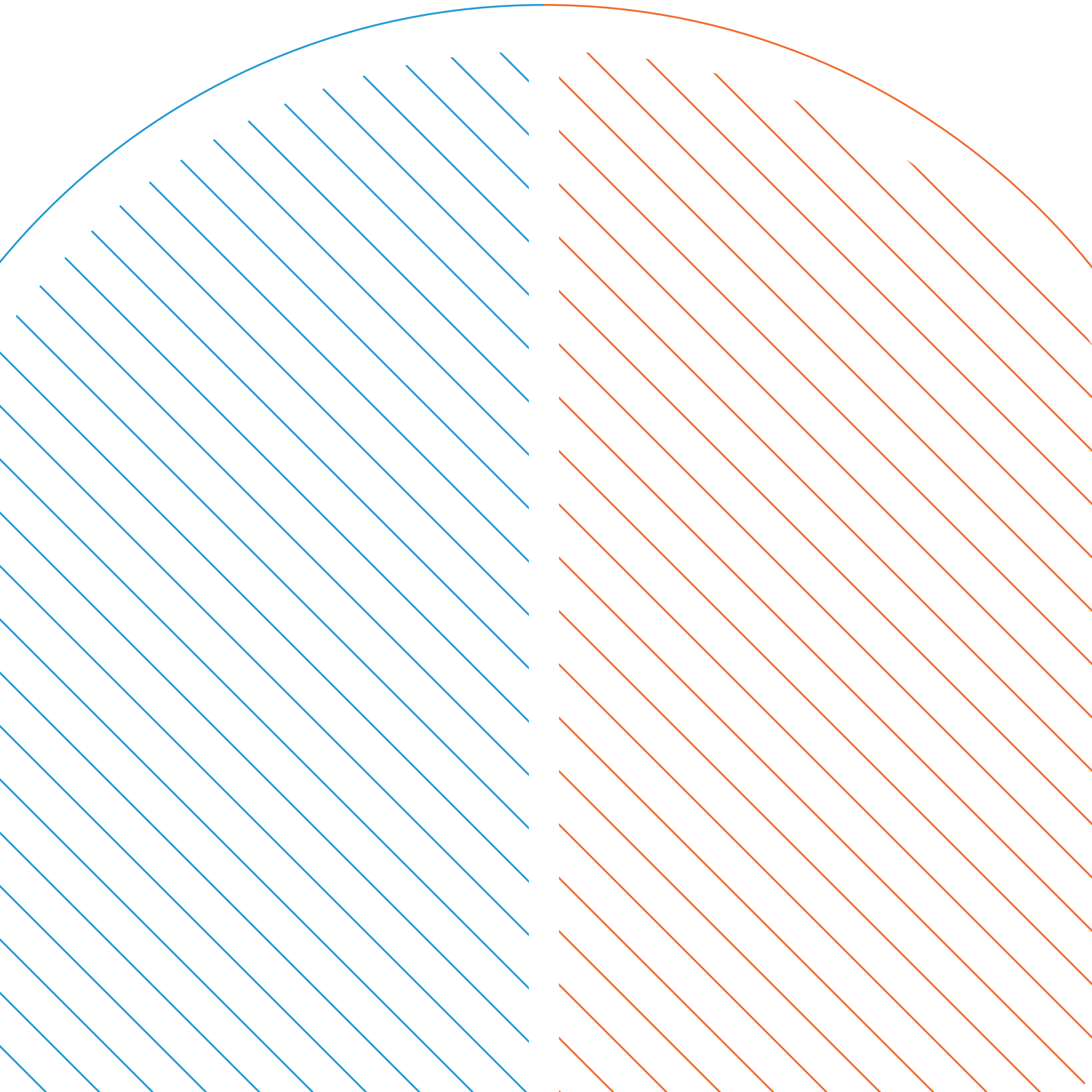
## 3.10 Timeline

The timeline for an evaluation needs to dovetail with the three phases in implementing the WHO training package: preparation, delivery and sustaining, as shown earlier in Fig. 1. The scale, resources and study design for the evaluation will also influence the order and length of each stage. In the United Republic of Tanzania evaluation in three hospitals, for example, the study was completed over 15 months, excluding the dissemination step. In Cambodia, in contrast, where the evaluation was larger (13 hospitals in three provinces) and there were delays because of the COVID-19 pandemic, the study took about 30 months. It is important to develop and maintain a detailed Gantt chart for the evaluation, which can be linked to a chart of the implementation of the entire training package and can be used both to track progress and to identify potential risks of delays. Annex 3 provides an example of an evaluation Gantt chart.

## 3.11 Dissemination and communication

The overall aim of this guide is to help to inform and support process and impact evaluations of the WHO training package. At the global level, sharing the findings from these evaluations among the community of actors interested in the high-level goal of reducing HAI and AMR or in the methods of evaluation is important in strengthening the evidence base in both these interest areas. At the global, regional and national levels, evaluations of the WHO training package can help to promote its scaling up and provide valuable insights on contextual adaptations. Crucially within countries, at the district and health-care facility levels, communicating the methods and findings of the evaluation can inform important refinements as the package is rolled out and raise the profile and capacity for robust evaluations. Local dissemination should seek to appropriately engage with the principal target audience for the training package – the facility cleaners. In both exemplar studies, the dissemination process included a combination of local, national and international exchange of findings, using a variety of mechanisms, such as workshops, seminars or webinars, conference presentations, journal articles, poster presentations and via social media, including blogs and newsletters. The workshops held with key stakeholders in the health ministries in both countries were key opportunities to explore the uptake of the training package as a routine component of broader quality improvement and how this could be sustained without the additional technical inputs and funding provided through the original research projects. In Cambodia, for example, possible plans included integrating the training package modules into the national standard operating procedures for IPC and potentially also into the Hospital Service Accreditation Standards.

# 4. Priority research questions on surface cleaning in health-care facilities in low- and middle-income countries



# Priority research questions on surface cleaning in health-care facilities in low- and middle-income countries

The WHO training package helps to meet an immediate need for improving the knowledge and practices of cleaners in the health-care environment. The exemplar studies reported in this guide show the potential for obtaining additional insight on the drivers and effects of environmental cleaning alongside the conduct of robust evaluations. Evidence on all aspects of environmental cleaning is currently limited, and this necessitates focusing on the most important research gaps. A recent international consultative exercise identified such priorities specifically around surface cleaning and specifically for low- and middle-income countries. Although the evidence base on interventions to improve this aspect of environmental cleaning is weak across all settings, the situation of limited health system resources is a major common factor across low- and middle-income countries, and different types of barriers, such as the outsourcing of health-care facility cleaning to private providers and contractors, applies in high-income settings *(15,19)*.

In early 2022, an advisory group was establishing the CLEAN Group, comprising individuals from Africa, Europe, Asia, Australia and North and South America with expertise in IPC, hospital cleaning and disinfection, WASH, health policy, implementation science and clinical research in resource-limited settings. Under the auspices of this group, an iterative research priority-setting process was undertaken between March and October 2022. This process encompassed three steps: identifying evidence gaps reviewing existing literature and themes, identifying and selecting the criteria for setting priorities and steps and discussions (workshop and online meetings) applying the priority-setting process, as described further in the published briefing note *(34)*. Table 7 shares the conclusion of this exercise: identifying the 12 most pressing questions to inform or enhance the implementation of best practices in surface cleaning in health-care facilities in resource-limited settings. These priority questions are shared in this guide since there may be interest, funds and capacity in some evaluations of the WHO training package to embed substudies to help to fill some of these evidence gaps.

**Table 7. Research priorities in surface cleaning in health-care facilities in low- and middle-income countries**

| | | |
|---|---|---|
| Standards | 1 | How frequently (and at what diurnal time points) should high-touch surfaces in high-risk units be cleaned and disinfected to achieve adequate bioburden reduction? |
| | 2 | What are the human resource requirements to achieve microbial cleanliness in different types of health-care settings? |
| System strengthening | 3 | What are the minimum requirements at the health system level to implement environmental cleaning programmes? |
| | 4 | What are the factors at the health system level that can support the professionalization of cleaning staff? |
| | 5 | What types of communities of practice and practitioners' networks are most useful for supporting environmental cleaning programmes? |
| Behaviour change | 6 | What are effective strategies to engage health facility decision-makers in investing (financial and managerial commitment) in environmental cleaning? |
| | 7 | What are effective training techniques to improve the cleaning practices of cleaning staff? |
| | 8 | What are cost-effective strategies to sustain cleaning behaviour (maintaining frequency and quality)? |
| | 9 | What are effective behaviour change techniques to establish a facility culture (values and social norms) of environmental cleanliness? |
| | 10 | What are effective strategies to involve patients and caregivers in improving environmental cleanliness? |
| Behaviour change | 11 | Is the use of detergents alone non-inferior/sufficient compared to the use of detergents plus disinfectants in reducing bioburden on non-critical/low-touch surfaces? |
| | 12 | Are locally produced disinfectants more cost-effective compared to existing (commercially available) disinfectants for bioburden reduction? |

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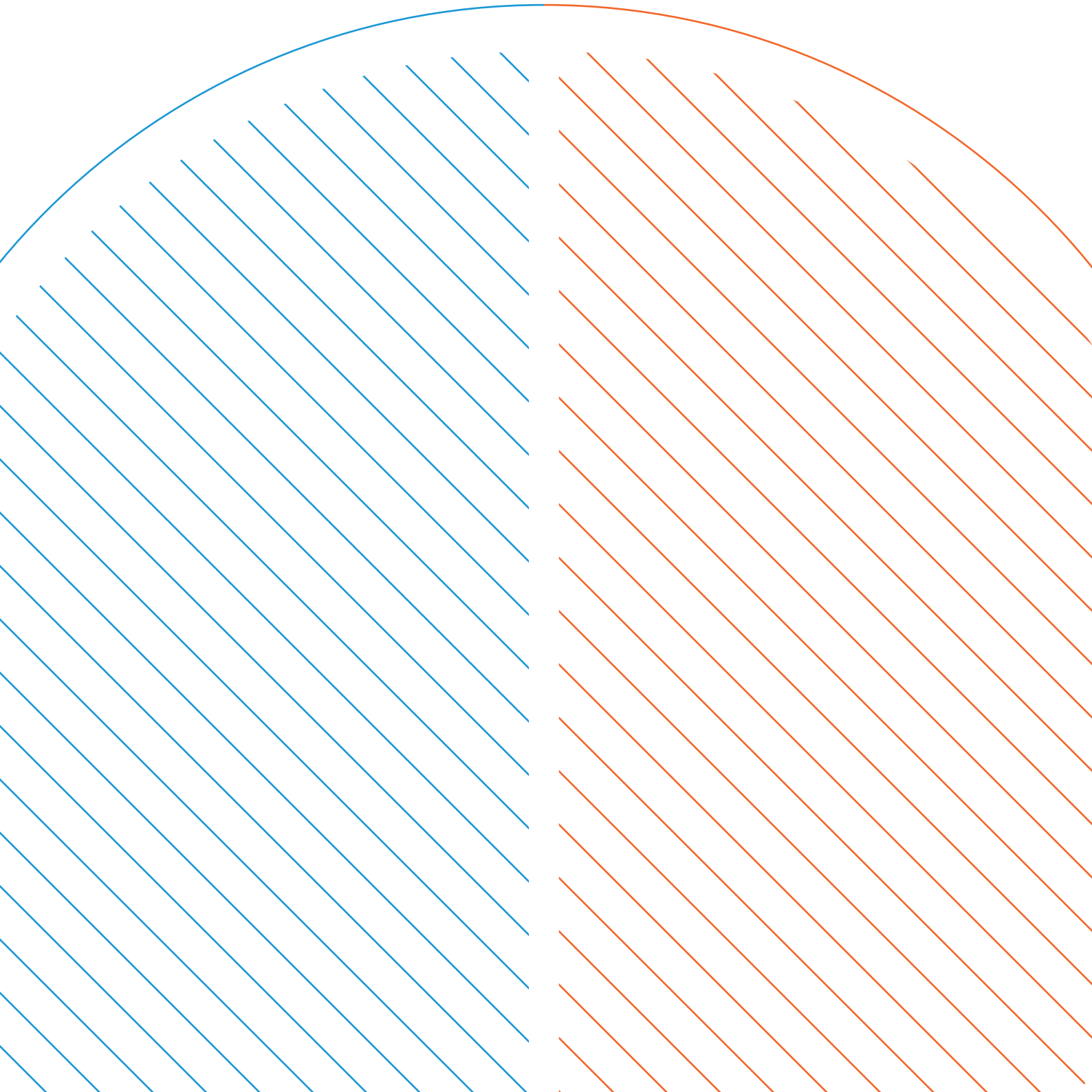
# Annexes



# Annex 1. Checklist for preparing an evaluation protocol for the WHO training package

"An evaluation plan or protocol is a written document that describes how an evaluation will be managed. It clarifies the steps needed to assess the outcomes and processes of an intervention. The evaluation team and stakeholders should agree on the contents of the evaluation plan. An effective evaluation plan is a dynamic tool, or a 'living document', that should be updated on an ongoing basis to reflect changes and priorities over time."

| Protocol component | Relevant section of the evaluation guide | Content | Completed | |
|---|---|---|---|---|
| | | | Yes | No |
| **Title page** | – | Title | | |
| | | Author(s)' names and affiliations | | |
| | | Date of preparation | | |
| | | Name of client or funder(s) | | |
| **Executive summary** | – | Brief description of when, where and how WHO training package is to be implemented | | |
| | | Purpose of the evaluation and main evaluation questions | | |
| | | Brief description of intended methods and analytical strategy | | |
| | | Evaluation partners and stakeholders | | |
| | | Time-line for evaluation in relation to implementation of WHO training package | | |

| Protocol component | Relevant section of the evaluation guide | Content | Completed | |
|---|---|---|---|---|
| | | | Yes | No |
| **Introduction and Background** | 2.1, 2.2 | Purpose and type of evaluation: what types of decisions or actions about the WHO training package may be made based on the findings (such as how to improve or modify it and whether to continue, discontinue, expand or reconfigure it).<br>Given the purpose, what type of evaluation is envisaged – formative or summative? | | |
| | - | Intended users of the evaluation findings: who are the primary stakeholders and at what level (such as national or regional)? | | |
| | 2.3 | Description of other relevant of evaluations of WHO training package | | |
| **Objectives of the evaluation** | 2.2 | Pathways to impact: how are the inputs of the WHO training package expected to lead to outputs (processes), outcomes and final endpoints (impact), and where along this pathway will this evaluation aim (such as processes only)? | | |
| | 2.3, 3.5, 3.6, | Specific evaluation questions: what are the primary and secondary questions this evaluation seeks to address? | | |
| **Methods** | 3.1 | Study design: what types of comparison groups are needed and possible to answer the evaluation questions, and realistic give the resources available (time, finance, capability etc.)? | | |
| | 3.2 | Study populations and sites: what is the unit of interest (study population) for addressing the evaluation questions (at what level was the WHO training package delivered – such as wards, whole health-care facilities, districts etc.), where are the units located geographically and how were they selected originally for the WHO training package (how comparable are the units)? | | |
| | 3.3 | Sample size requirements: given the evaluation questions and proposed study design, what number of units of interest need to be included in the evaluation to achieve the desired confidence in the results for the primary outcome? | | |
| | 3.4 | Delivery of intervention: what content of the WHO training package was delivered (all modules or a subset), how was it implemented and who were the main actors? | | |
| | 3.5 | Process evaluation: what types of outputs from the implementation of the WHO training package will be evaluated and in terms of what parameters – fidelity, reach, dose delivered, unanticipated additional activities, adaptations to the training package, and/or perverse effects? | | |
| | 3.6 | Impact evaluation: what intermediate outcomes and final end-points are identified in the evaluation questions, how are they defined, and how will they be judged in terms of effect size (such as the cut-off level for surface contamination as measured microbiologically)? | | |

| Protocol component | Relevant section of the evaluation guide | Content | Completed | |
|---|---|---|---|---|
| | | | Yes | No |
| | 3.7 | Data collection, management and analysis: what types of data (qualitative, quantitative and microbiological) will be gathered, what data capture tools will be used (pre-existing or developed specifically – if so, who will pilot these), how will the data be secured, stored and managed, what is the analysis plan and who are the main actors for each of these activities? | | |
| | 3.8 | Ethical approval and consent: what ethical approval processes are required, at what level and by whom? What is the requirement for informed consent during the data capture processes, from whom and how will this be obtained and observed? | | |
| | 3.9 | Data quality assurance and risk mitigation: how will mechanisms for assuring the quality of the data capture be built into the evaluation and who will be primarily responsible for overseeing this? What are the potential risks from conducting the evaluation, to whom and how can these be mitigated? | | |
| | 3.10 | Timeline: what is the detailed timeline for the evaluation expressed as a Gantt chart, and how does this dovetail with the delivery of the WHO training package? What are the potential delays in the delivery of the package or the conduct of the evaluation, and how will these be managed? | | |
| | 3.11 | Dissemination and communication: what is the detailed plan for sharing the findings of the evaluation, including audience, format for communication, timeline and resources? | | |

# Annex 2. Evaluation resources

## A). General resources on evaluating health intervention


Introduction to program evaluation for public health programs: a self-study guide. Atlanta: United States Center for Disease Control and Prevention; 2011 (https://stacks.cdc.gov/view/cdc/26245).

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## B). WHO resources on evaluation


WHO, FAO, UNEP, WOAH. Guidance to facilitate monitoring and evaluation for antimicrobial resistance national action plans. Geneva: World Health Organization; 2023 (https://iris.who.int/handle/10665/372142).

WHO evaluation practice handbook. Geneva: World Health Organization; 2013 (https://iris.who.int/handle/10665/96311).

Massive open online course (MOOC) on implementation research: infectious diseases of poverty [website]. Geneva: UNICEF/UNDP/World Bank/WHO Special Programme in for Research and Training in Tropical Diseases; 2023.

TDR implementation research toolkit. 2nd ed. Geneva: UNICEF/UNDP/World Bank/WHO Special Programme in for Research and Training in Tropical Diseases; (http://adphealth.org/irtoolkit).

TAP manual: an in-depth guide for planning and implementing tailoring antimicrobial resistance programmes. Copenhagen: WHO Regional Office for Europe; 2022 (https://iris.who.int/handle/10665/363136).

A practical guide for health researchers. Cairo: WHO Regional Office for the Eastern Mediterranean; 2004 (https://iris.who.int/handle/10665/119703).

## C). Resources relevant to research in environmental cleaning (additional to those in the guide reference list)

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# Annex 3. Examples of data capture instruments from two exemplar studies

## CLEAN FRONTLINE CAMBODIA

### Questionnaire for interviews with hospital leaders

This questionnaire will be administered to hospital leader(s) responsible for IPC during the facility survey

Hospital name: _____ Date: _____/_____/_____

Respondent name: _____ Respondent designation/title: _____

Respondent gender: M F Surveyor's name: _____

| Questions | Answers | | | Comments |
|---|---|---|---|---|
| 1. Is there a hospital map?<br>a. If yes, take a photo of the map<br>b. If no, draw a schematic map with indicated location of wards or departments in a separate sheet | Yes | No | Do not know | |
| 2. How many wards or departments are there in this hospital (in accordance with the map)? | | | | |
| 3. Among these wards, what are the three wards for which environmental hygiene and cleaning are the most critical or essential? | | | | |
| 4. In total, how many inpatient beds are there in this hospital? | | | | |
| 5. Please provide the number of staff by category as follows: | Government staff | Government contracted | Hospital contracted | |
| a. Specialist doctor | | | | |
| b. General MD/MA | | | | |

| Questions | Answers | | | Comments |
|---|---|---|---|---|
| c. Midwife (secondary/bachelor) | | | | |
| d. Midwife (primary) | | | | |
| e. Nurse (secondary/bachelor) | | | | |
| f. Nurse (primary) | | | | |
| g. Cleaner | | | | |
| h. Workers | | | | |
| i. Other, specify: | | | | |
| j. Other, specify: | | | | |
| k. Other, specify: | | | | |
| 6. Besides cleaners, do other staff perform cleaning duties or tasks? | Yes | No | Do not know | |
| 7. Has there been any training on environmental hygiene or cleaning provided to cleaners in this hospital? | Yes | No | Do not know | |
| 8. If yes, how often? Provide the frequency or number of training sessions | | | | |
| 9. When was the last training session provided? | | | | |
| 10. Is there a qualified or trained person responsible for or looking after IPC in the hospital? | Yes | No | Do not know | |
| 11. If yes, what is his or her job title? | | | | |
| 12. Is there a person managing or leading cleaners in this hospital? | Yes | No | Do not know | |
| 13. If yes, what is his or her job title? | | | | |
| 14. Is there a formal or informal IPC committee in this hospital? | Yes | No | Do not know | |
| 15. If yes, it is: | Formal | Informal | Do not know | |
| 16. If yes, are there cleaners or cleaner representatives in the IPC committee? | Yes | No | Do not know | |
| 17. If yes, how often does the IPC committee meet? Provide the frequency or number of training sessions | | | | |
| 18. When did the last meeting take place? | | | | |
| 19. Are the minutes of the last IPC committee meeting available? Ask to see the minutes | Yes | No | Do not know | |
| 20. Please describe a recent activity of the IPC committee | | | | |
| 21. Is there a quality improvement committee in this hospital? | Yes | No | Do not know | |

| Questions | Answers | | | Comments |
|---|---|---|---|---|
| 22. If yes, please describe the role of the quality improvement committee in relation to the IPC committee (if any) | | | | |
| 23. Is there an orientation programme with information on IPC or environmental hygiene for new medically trained staff? | Yes | No | Do not know | |
| 24. Is there regular training on IPC or environmental hygiene delivered to medical staff? | Yes | No | Do not know | |
| 25. If yes, how often? | | | | |
| 26. If yes, when was the last training session? | • Within the last six months<br>• Within the last year<br>• More than one year ago | | | |
| 27. Which group(s) of medical staff attended the last training? Provide job titles and % of them | | | | |
| 28. Is there an orientation programme with information on IPC or environmental hygiene for non-medically trained staff not involved in direct patient care (such as cleaning and maintenance staff)? | Yes | No | Do not know | |
| 29. Is there regular training on IPC or environmental hygiene delivered to non-medical staff? | Yes | No | Do not know | |
| 30. If yes, when was the last training session? | • Within the last six months<br>• Within the last year<br>• More than one year ago | | | |
| 31. Which group(s) of non-medical staff attended the last training? Provide job titles and % of them | | | | |
| 32. Where are training sessions delivered? | Medical staff | Non-medical staff | | Comments |
| a. On-site (hospital grounds) | | | | |
| b. Off-site (outside the hospital) | | | | |
| c. Both | | | | |
| 33. How are training sessions delivered? Mark all that apply | Medical staff | Non-medical staff | | Comments |
| a. Lecture format | | | | |
| b. Practical demonstration | | | | |
| c. Hands-on participant involvement | | | | |
| d. Brainstorming | | | | |
| e. Individual exercise | | | | |
| f. Group exercise | | | | |
| g. Discussion | | | | |
| h. Other (specify): | | | | |

| Questions | Answers | | | Comments |
|---|---|---|---|---|
| 34. What topics were covered during training sessions in the last year? Mark all that apply | Medical staff | Non-medical staff | | Comments |
| a. The chain of infection | | | | |
| b. Health care–associated infection | | | | |
| c. Hand hygiene | | | | |
| d. Glove use | | | | |
| e. Dress code | | | | |
| f. Respiratory hygiene and cough etiquette | | | | |
| g. Personal protective equipment | | | | |
| h. General cleaning of the hospital or ward environment | | | | |
| i. Floor cleaning | | | | |
| j. Cleaning of toilets or latrines | | | | |
| k. Preparation of chlorine-based disinfectant solution | | | | |
| l. Handling of contaminated waste | | | | |
| m. Cleaning of blood spillages | | | | |
| n. Other, specify: | | | | |
| 35. Are there policies, protocols or guidelines available in the hospital in the following areas? Mark all that apply and note the date of the current policy version | Available (copy seen) | Available (copy not seen) | Not available | Date of current version (if available) |
| a. Hand hygiene | | | | |
| b. Waste management (including handling and disposal) | | | | |
| c. Linen management (including handling and disposal) | | | | |
| d. Personal protective equipment (PPE) | | | | |
| e. General housekeeping and cleaning of the environment | | | | |
| f. Colour coding of cleaning equipment | | | | |
| g. Other, specify: | | | | |
| 36. Any specific comments by data collectors: | | | | |

## CLEAN Frontline Cambodia: questionnaire for interviews with ward leaders

This questionnaire will be administered to ward leaders during the facility survey

Hospital name: _____ Date: _____/_____/_____

Respondent name: _____ Respondent designation/title: _____

Respondent gender: M F Surveyor's name: _____

| Questions | Answers | | | | Comments |
|---|---|---|---|---|---|
| 37. In each ward or unit, provide the number of staff and mark "x" in the relevant column if they perform and/or supervise cleaning[a] activities | Number (total) | Number (female) | Perform cleaning duties | Supervise cleaning activities | |
| 1. Specialist doctor | | | | | |
| m. General MD/MA | | | | | |
| n. Midwife (secondary/bachelor) | | | | | |
| o. Midwife (primary) | | | | | |
| p. Nurse (secondary/bachelor) | | | | | |
| q. Nurse (primary) | | | | | |
| r. Cleaner | | | | | |
| s. Maintenance | | | | | |
| t. Other, specify: | | | | | |

[a] Refers to general cleaning of the environment and infection control in relation to environmental hygiene.

38. Are there main overall supervisors for all the cleaners on this ward? Yes No
39. If yes, how many are there? Number: _____
40. Are they specific to this ward or for the whole hospital? Ward Hospital
41. This project is about providing training for cleaners. On your ward, who are the two individuals whom you feel are best placed to train the cleaners?

    Do not record specific names but their job title and initials: _____

    For cleaners in your ward, what is their average level of literacy? Circle the correct answer

    a. Very poor – unable to read instructions on a packet
    b. Poor – can deal with only very simple, clearly laid out materials, some difficulty facing novel demands, such as learning new job skills
    c. Moderate – minimum literacy required for coping with demands of everyday life and work (denotes level required for secondary school completion)
    d. High – command of higher-order information-processing skills

42. For cleaners in your ward, what is their average level of digital literacy? Circle the correct answer
    a. Cannot or can hardly use a smartphone or tablet (for phone calls and listening to music)
    b. Can fluently use a smartphone or tablet for many functions, including Facebook or YouTube
43. Do the majority of cleaners in your ward have a smartphone? Yes No

| Questions | Answers | | | Comments |
|---|---|---|---|---|
| 44. Do job descriptions exist for **cleaners** in this ward/unit? Circle the correct answer | Yes, exist for all | Yes, exist for some only | No for all staff | |
| 45. Do job descriptions exist for other **staff** in this ward or unit? Circle the correct answer | Yes, exist for all | Yes, exist for some only | No for all staff | |
| 46. Who is primarily responsible for undertaking each task and the supervision of each task? Circle the correct answers | NA | Personnel responsible for task | | Personnel responsible for supervision of task |
| a. Cleaning of the general environment of the ward or unit | NA | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: | | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: |
| b. Cleaning of the floor of the ward or unit | NA | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: | | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: |
| c. Cleaning of patient beds/mattresses | NA | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: | | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: |
| d. Cleaning of delivery bed or mattress | NA | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: | | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: |
| e. Cleaning of handwashing facilities in or nearest the ward or unit | NA | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: | | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: |
| f. Cleaning of toilets or latrines in or nearest the ward or unit | NA | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: | | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: |
| g. Removal of sharps waste from the ward or unit | NA | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: | | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: |
| h. Removal of infectious (non-sharps) waste from the ward or unit | NA | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: | | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: |
| i. Removal of non-infectious waste from the ward or unit | NA | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: | | • Nurse<br>• Midwife<br>• Cleaners<br>• Other, specify: |

| Questions | Answers | | | Comments |
|---|---|---|---|---|
| 47. Are cleaning activities routinely supervised? Circle the correct answer | Yes | No | Do not know | |
| 48. If yes, how? Mark "x" and provide the frequency in the relevant column | Yes | Frequency | No | |
| a. On the job | | | | |
| b. One-to-one supervisory meetings | | | | |
| c. Group supervisory meetings | | | | |
| d. Other (specify): | | | | |
| 49. Are cleaning activities routinely monitored? Circle the correct answer | Yes | No | Do not know | |
| 50. If yes, how? Mark "x" and provide the frequency in the relevant column | Yes | Frequency | No | |
| a. Spot checks | | | | |
| b. Audit | | | | |
| c. Competency assessments | | | | |
| d. Other (specify): | | | | |
| 51. Is feedback given to staff involved in cleaning activities on their performance? Circle the correct answer | Yes | No | Do not know | |
| 52. If yes, how? Mark "x" in the relevant column | Yes | No | | |
| a. One-to-one | | | | |
| b. Team meetings | | | | |
| c. Performance charts | | | | |
| d. On-the-job | | | | |
| e. Other (specify): | | | | |
| 53. Are reports made with regard to cleaning standards and performance? Circle the correct answer | Yes | No | Do not know | |
| 54. If, yes, please provide details of the reports (such as who writes them and who sees them) and how often they are produced | | | | |
| 55. Is there an orientation programme with information on IPC or environmental hygiene for new medically trained staff in this ward or unit? | Yes | No | Do not know | |
| 56. Is there regular training on IPC or environmental hygiene delivered to medical staff in this ward or unit? | Yes | No | Do not know | |
| 57. If yes, when was the last training session? | • Within the last six months<br>• Within the last year<br>• More than one year ago | | | |

| Questions | Answers | | | Comments |
|---|---|---|---|---|
| 58. Which group(s) of medical staff in this ward or unit attended the last training? Provide job titles and % of them | | | | |
| 59. Is there an orientation program with information on IPC or environmental hygiene for NON medically trained staff not involved in direct patient care (e.g. cleaning and maintenance staff) in this ward or unit? | Yes | No | Do not know | |
| 60. Is there regular training on IPC or environmental hygiene delivered to NON-medical staff in this ward or unit? | Yes | No | Do not know | |
| 61. If yes, when was the last training session? | • Within the last six months<br>• Within the last year<br>• More than one year ago | | | |
| 62. Which group(s) of non-medical staff in this ward or unit attended the last training? Provide job titles and % of them | | | | |
| 63. Where are training sessions delivered? Mark all that apply | Medical staff | Non-medical staff | | Comments |
| a. Within this ward or unit | | | | |
| b. Outside this ward or unit but in the hospital | | | | |
| c. Outside the hospital | | | | |
| 64. How are training sessions delivered? Mark all that apply | Medical staff | Non-medical staff | | Comments |
| a. Lecture format | | | | |
| b. Practical demonstration | | | | |
| c. Hands-on participant involvement | | | | |
| d. Brainstorming | | | | |
| e. Individual exercise | | | | |
| f. Group exercise | | | | |
| g. Discussion | | | | |
| h. Other (specify): | | | | |
| 65. What topics were covered during training sessions in the last year? Mark all that apply | Medical staff | Non-medical staff | | Comments |
| a. The chain of infection | | | | |
| b. Health care–associated infection | | | | |
| c. Hand hygiene | | | | |
| d. Glove use | | | | |
| e. Dress code | | | | |
| f. Respiratory hygiene and cough etiquette | | | | |

| Questions | Answers | | | Comments |
|---|---|---|---|---|
| g. Personal protective equipment | | | | |
| h. General cleaning of the hospital or ward environment | | | | |
| i. Floor cleaning | | | | |
| j. Cleaning of toilets or latrines | | | | |
| k. Preparation of chlorine-based disinfectant solution | | | | |
| l. Handling of contaminated waste | | | | |
| m. Cleaning of blood spillages | | | | |
| n. Other (specify): | | | | |
| 66. Are there any policies, protocols and guidelines with regard to IPC or environmental hygiene available in this ward or unit? | Available (copy seen) | Available (copy not seen) | Not available | Date of current version (if available) |
| a. Hand hygiene | | | | |
| b. Waste management (including handling and disposal) | | | | |
| c. Linen management (including handling and disposal) | | | | |
| d. Personal protective equipment (PPE) | | | | |
| e. General housekeeping or cleaning of the environment | | | | |
| f. Manual handling | | | | |
| g. Colour coding of cleaning equipment | | | | |
| h. Other (specify): | | | | |
| 67. For each resource or supply listed, is it available for use in this ward or unit? Mark all that apply | Yes, available at this time | Yes, usually available but not this time | No | Comments |
| a. Sufficient visibly clean water for handwashing | | | | |
| b. Sufficient visibly clean water for cleaning activities | | | | |
| c. Handwashing soap (liquid, bar, leaf or powdered form of soap) | | | | |
| d. Disposable hand-drying material | | | | |
| e. Alcohol-based hand rub | | | | |
| f. Single-use gloves | | | | |
| g. Disposable aprons | | | | |
| h. Reusable chemical-resistant gloves | | | | |
| i. Reusable chemical-resistant aprons | | | | |
| j. Detergent | | | | |
| k. Chlorine-based disinfectant | | | | |
| l. Disinfectant (other) | | | | |

| Questions | Answers | | | Comments |
|---|---|---|---|---|
| m. Colour-coded waste bags (note in comments if waste bags available but not colour coded) | | | | |
| n. Colour-coded buckets (note in comments if buckets available but not colour coded) | | | | |
| o. Microfibre cloths | | | | |
| p. Disposable cleaning cloths | | | | |
| q. Non-microfibre cleaning cloths | | | | |
| r. Disposable paper to use for cleaning | | | | |
| u. Dust pans | | | | |
| v. Microfibre mops | | | | |
| w. Cotton string mops | | | | |
| x. Warning or hazard signs to indicate cleaning task taking place | | | | |
| y. Toilet brushes | | | | |
| z. Safety ladder | | | | |

68. How many shifts are there of cleaners over a 24-hour period on this ward?
    a. Number of shifts: _____
    b. How many cleaners are there usually per shift: _____

69. Can you please indicate the usual frequency and timing of the cleaning on the ward of the following items over a 24-hour period:

| Item | How many times in 24 hours is this item usually cleaned? | Usual time of day of cleaning (1) | Usual time of day of cleaning (2) | Usual time of day of cleaning (3) |
|---|---|---|---|---|
| Ward floors | | | | |
| Ward sinks and taps | | | | |
| Bed frames | | | | |
| Patient lockers | | | | |
| Ward floor | | | | |
| Bathrooms | | | | |
| | | | | |

70. Is there a particular time of year when your ward is particularly busy or overcrowded with patients and presents a particular challenge for maintaining standards of cleaning? Yes No

71. If yes, what month(s) is this usually the case? _____

72. Any specific comments by data collectors:

## CLEAN Frontline Cambodia: observational checklist for hospital walkthrough

This checklist will be completed by a surveyor based on what they have seen when walking through different departments, wards or units of the referral hospital

Hospital name: _____ Date: _____/_____/_____

Start time of observation: _____ End time of observation: _____

Surveyor's name: _____

| Questions | Answers | Comments |
|---|---|---|
| **1. Paediatric ward** | | |
| a. Are the floors of the ward visibly clean, free from dust and soil and free of clutter (unnecessary or unused equipment or furniture)? | 0 = No<br>1 = Yes fully<br>2 = Mostly<br>97 = NA | |
| b. Is there a functional hand hygiene station (sink) designated to the ward? | 0 = No<br>1 = Yes<br>97 = NA | |
| c. If yes, is the sink visibly clean? | 0 = No<br>1 = Yes<br>2 = Mostly<br>97 = NA | |
| d. Is there a visibly clean water supply for the sink? | 0 = No<br>1 = Yes<br>97 = NA | |
| e. Is there any soap for handwashing next to the sink? | 0 = No<br>1 = Yes<br>97 = NA | |
| f. Is there any visibly clean hand-drying material (tissue or tower) next to the sink? | 0 = No<br>1 = Yes<br>97 = NA | |
| g. Is there alcohol-based hand rub available in the ward? | 0 = No<br>1 = Yes<br>97 = NA | |
| h. Are patient beds visibly clean (covered by clean, waterproof mattresses)? | 0 = No<br>1 = Yes<br>2 = Mostly<br>97 = NA | |
| i. Is there a safe box or sharps waste container properly used (only needles and syringes inside and not over 75% full) in the ward? | 0 = No<br>1 = Yes<br>97 = NA | |
| j. Is there a bin or bag for infectious non-sharps waste clearly labelled and colour coded (yellow) and properly used (no sharps, no domestic waste and not over 75% full) in the ward? | 0 = No<br>1 = Yes<br>97 = NA | |

| Questions | Answers | Comments | |
|---|---|---|---|
| k. Is there a bin or bag for domestic waste properly used (without sharps or infectious waste inside) in the ward? | 0 = No<br>1 = Yes<br>97 = NA | | |
| l. Is there a toilet designated to the ward? | 0 = No<br>1 = Yes<br>97 = NA | | |
| m. If yes, is it usable (unlocked and not blocked) and visibly clean? | 0 = No<br>1 = Yes<br>2 = Partially<br>97 = NA | | |
| n. How many cleaners were working on the ward during your observation? | No. of cleaners: | | |
| o. Did you observe the following cleaning activities in the ward? | Cleaner | Other staff | Comments |
| • Mopping the floors | | | |
| • Washing of walls | | | |
| • Replacement of cleaning fluid between washing episodes | | | |
| • Washing or disinfecting of mattresses | | | |
| • Washing of high-risk touch surfaces in patient zones | | | |
| • Removal or replacing of safe box or sharps waste container | | | |
| • Removal of infectious waste from bins | | | |
| • Removal of domestic waste from bins | | | |
| • Removal or replacement of bed linen | | | |
| • Wearing of plastic aprons | | | |
| • Wearing of disposable facemasks | | | |
| • Wearing of heavy-duty gloves | | | |
| • Replacing of disposable surgical gloves between patient contacts | | | |
| • Using absorbable material for cleaning spillages | | | |
| • Hand hygiene (washing or alcohol-based hand rub) before entering the ward | | | |
| • Hand hygiene (washing or alcohol-based hand rub) before leaving the ward | | | |
| • Hand hygiene (washing or alcohol-based hand rub) between patient contacts | | | |
| p. Draw a map of the ward with specific locations for taking samples of dipslides on a separate sheet with photos of the specific locations (Do not forget to put the name and code of the hospital and ward, such as Chhlorng RH, paediatric ward, on the sheet or taking photos) | | | |
| q. Any observed signs of overcrowding and congestion on the ward which may impact on keeping the ward clean?<br>• Are there patients on floor mattresses or multiple patients in a bed? Yes No<br>• Are there many visitors or guardians on the ward? Yes No<br>• Is there little space between the beds? Yes No | | | |

| Questions | Answers | Comments |
|---|---|---|
| **2. Medicine ward** | | |
| a. Are the floors of the ward visibly clean, free from dust and soil and free of clutter (unnecessary or unused equipment or furniture)? | 0 = No<br>1 = Yes fully<br>2 = Mostly<br>97 = NA | |
| b. Is there a functional hand hygiene station (sink) designated to the ward? | 0 = No<br>1 = Yes<br>97 = NA | |
| c. If yes, is the sink visibly clean? | 0 = No<br>1 = Yes<br>97 = NA | |
| d. Is there a visibly clean water supply for the sink? | 0 = No<br>1 = Yes<br>97 = NA | |
| e. Is there any soap for handwashing next to the sink? | 0 = No<br>1 = Yes<br>97 = NA | |
| f. Is there any visibly clean hand-drying material (tissue or tower) next to the sink? | 0 = No<br>1 = Yes<br>97 = NA | |
| g. Is there alcohol-based hand rub available in the ward? | 0 = No<br>1 = Yes<br>97 = NA | |
| h. Are patient beds visibly clean (covered by clean, waterproof mattresses)? | 0 = No<br>1 = Yes<br>2 = Mostly<br>97 = NA | |
| i. Is there a safe box or sharps waste container properly used (only needles and syringes inside and not over 75% full) in the ward? | 0 = No<br>1 = Yes<br>97 = NA | |
| j. Is there a bin or bag for infectious non-sharps waste clearly labelled and colour coded (yellow) and properly used (no sharps, no domestic waste and not over 75% full) in the ward? | 0 = No<br>1 = Yes<br>97 = NA | |
| k. Is there a bin or bag for domestic waste properly used (without sharps or infectious waste inside) in the ward? | 0 = No<br>1 = Yes<br>97 = NA | |
| l. Is there a toilet designated to the ward? | 0 = No<br>1 = Yes<br>97 = NA | |
| m. If yes, is it usable (unlocked and not blocked) and visibly clean? | 0 = No<br>1 = Yes<br>2 = Partially<br>97 = NA | |
| n. How many cleaners were working on the ward during your observation? | No. of cleaners: | |

| Questions | Answers | Comments | |
|---|---|---|---|
| o. Did you observe the following cleaning activities in the ward? | Cleaner | Other staff | Comments |
| • Mopping the floors | | | |
| • Washing of walls | | | |
| • Replacement of cleaning fluid between washing episodes | | | |
| • Washing or disinfecting of mattresses | | | |
| • Washing of high-risk touch surfaces in patient zones | | | |
| • Removal or replacing of safe box or sharps waste container | | | |
| • Removal of infectious waste from bins | | | |
| • Removal of domestic waste from bins | | | |
| • Removal or replacement of bed linen | | | |
| • Wearing of plastic aprons | | | |
| • Wearing of disposable facemasks | | | |
| • Wearing of heavy-duty gloves | | | |
| • Replacing of disposable surgical gloves between patient contacts | | | |
| • Using absorbable material for cleaning spillages | | | |
| • Hand hygiene (washing or alcohol-based hand rub) before entering the ward | | | |
| • Hand hygiene (washing or alcohol-based hand rub) before leaving the ward | | | |
| • Hand hygiene (washing or alcohol-based hand rub) between patient contacts | | | |
| p. Draw a map of the ward with specific locations for taking samples of dipslides on a separate sheet with photos of the specific locations (Do not forget to put the name and code of the hospital and ward, such as Chhlorng RH, paediatric ward, on the sheet or taking photos) | | | |
| q. Any observed signs of overcrowding and congestion on the ward which may impact on keeping the ward clean?<br>• Are there more pregnant women in labour than the number of available delivery beds? Yes No<br>• Are there many visitors or guardians in the room? Yes No<br>• Is there little space between the delivery beds? Yes No | | | |
| **3. Delivery room(s)** | | | |
| a. Are the floors of the delivery room(s) visibly clean, free from dust and soil, and free of clutter (unnecessary or unused equipment or furniture)? | 0 = No<br>1 = Yes fully<br>2 = Mostly<br>97 = NA | | |
| b. Is there a functional hand hygiene station (sink) designated to the delivery room(s)? | 0 = No<br>1 = Yes<br>97 = NA | | |
| c. If yes, is the sink visibly clean? | 0 = No<br>1 = Yes<br>2 = Mostly<br>97 = NA | | |

| Questions | Answers | Comments | |
|---|---|---|---|
| d. Is there a visibly clean water supply for the sink? | 0 = No<br>1 = Yes<br>97 = NA | | |
| e. Is there any soap for handwashing next to the sink? | 0 = No<br>1 = Yes<br>97 = NA | | |
| f. Is there any visibly clean hand-drying material (tissue or tower) next to the sink? | 0 = No<br>1 = Yes<br>97 = NA | | |
| g. Is there alcohol-based hand rub available in the delivery room(s)? | 0 = No<br>1 = Yes<br>97 = NA | | |
| h. Are delivery beds visibly clean (covered by clean, waterproof mattresses)? | 0 = No<br>1 = Yes<br>2 = Mostly<br>97 = NA | | |
| i. Is there a safe box or sharps waste container properly used (only needles and syringes inside and not over 75% full) in the delivery room(s)? | 0 = No<br>1 = Yes<br>97 = NA | | |
| j. Is there a bin or bag for infectious non-sharps waste clearly labelled and colour coded (yellow) and properly used (no sharps, no domestic waste and not over 75% full) in the delivery room(s)? | 0 = No<br>1 = Yes<br>97 = NA | | |
| k. Is there a bin or bag for domestic waste properly used (without sharps or infectious waste inside) in the delivery room(s)? | 0 = No<br>1 = Yes<br>97 = NA | | |
| l. Is there a bin or bag for placenta in the delivery room(s)? | 0 = No<br>1 = Yes<br>97 = NA | | |
| m. Is there a toilet designated to the delivery room(s)? | 0 = No<br>1 = Yes<br>97 = NA | | |
| n. If yes, is it usable (unlocked and not blocked) and visibly clean? | 0 = No<br>1 = Yes<br>2 = Partially<br>97 = NA | | |
| o. How many cleaners were working on the room during observation? | No. of cleaners: | | |
| p. Did you observe the following cleaning activities in the ward? | Cleaner | Other staff | Comments |
| • Mopping the floors | | | |
| • Washing of walls | | | |
| • Replacement of cleaning fluid between washing episodes | | | |
| • Washing or disinfecting of mattresses | | | |

| Questions | Answers | Comments | |
|---|---|---|---|
| • Washing of high-risk touch surfaces in patient zones | | | |
| • Removal or replacing of safe box or sharps waste container | | | |
| • Removal of infectious waste from bins | | | |
| • Removal of domestic waste from bins | | | |
| • Removal or replacement of bed linen | | | |
| • Wearing of plastic aprons | | | |
| • Wearing of disposable facemasks | | | |
| • Wearing of heavy-duty gloves | | | |
| • Replacing of disposable surgical gloves between patient contacts | | | |
| • Using absorbable material for cleaning spillages | | | |
| • Hand hygiene (washing or alcohol-based hand rub) before entering the ward | | | |
| • Hand hygiene (washing or alcohol-based hand rub) before leaving the ward | | | |
| • Hand hygiene (washing or alcohol-based hand rub) between patient contacts | | | |
| q. Draw a map of the ward with specific locations for taking samples of dipslides on a separate sheet with photos of the specific locations (Do not forget to put the name and code of the hospital and ward, such as Chhlorng RH, paediatric ward, on the sheet or taking photos) | | | |
| r. Any observed signs of overcrowding and congestion on the room which may impact on keeping the room clean?<br>• Are there more pregnant women in labour than the number of available delivery beds? Yes No<br>• Are there many visitors or guardians in the room? Yes No<br>• Is there little space between the delivery beds? Yes No | | | |
| **4. Maternity ward and pre- or post-delivery rooms** | | | |
| a. Are the floors of the maternity ward and pre- or post-delivery rooms visibly clean, free from dust and soil, and free of clutter (unnecessary or unused equipment or furniture)? | 0 = No<br>1 = Yes fully<br>2 = Mostly<br>97 = NA | | |
| b. Is there a functional hand hygiene station (sink) designated to the maternity ward and pre- or post-delivery rooms? | 0 = No<br>1 = Yes<br>97 = NA | | |
| c. If yes, is the sink visibly clean? | 0 = No<br>1 = Yes<br>2 = Mostly<br>97 = NA | | |
| d. Is there a visibly clean water supply for the sink? | 0 = No<br>1 = Yes<br>97 = NA | | |
| e. Is there any soap for handwashing next to the sink? | 0 = No<br>1 = Yes<br>97 = NA | | |

| Questions | Answers | Comments | |
|---|---|---|---|
| f. Is there any visibly clean hand-drying material (tissue or tower) next to the sink? | 0 = No<br>1 = Yes<br>97 = NA | | |
| g. Is there alcohol-based hand rub available in the maternity ward and pre- or post-delivery rooms? | 0 = No<br>1 = Yes<br>97 = NA | | |
| h. Are patient beds visibly clean (covered by clean, waterproof mattresses)? | 0 = No<br>1 = Yes<br>2 = Mostly<br>97 = NA | | |
| i. Is there a safe box or sharps waste container properly used (only needles and syringes inside and not over 75% full) in the maternity ward and pre- or post-delivery rooms? | 0 = No<br>1 = Yes<br>97 = NA | | |
| j. Is there a bin or bag for infectious non-sharps waste clearly labelled and colour coded (yellow) and properly used (no sharps, no domestic waste and not over 75% full) in the maternity ward and pre- or post-delivery rooms? | 0 = No<br>1 = Yes<br>97 = NA | | |
| k. Is there a bin or bag for domestic waste properly used (without sharps or infectious waste inside) in the maternity ward and pre- or post-delivery rooms? | 0 = No<br>1 = Yes<br>97 = NA | | |
| l. Is there a toilet designated to the maternity ward and pre- or post-delivery rooms? | 0 = No<br>1 = Yes<br>97 = NA | | |
| m. If yes, is it usable (unlocked and not blocked) and visibly clean? | 0 = No<br>1 = Yes<br>2 = Partially<br>97 = NA | | |
| n. Did you observe the following cleaning activities in the ward? | Cleaner | Other staff | Comments |
| • Mopping the floors | | | |
| • Washing of walls | | | |
| • Replacement of cleaning fluid between washing episodes | | | |
| • Washing or disinfecting of mattresses | | | |
| • Washing of high-risk touch surfaces in patient zones | | | |
| • Removal or replacing of safe box or sharps waste container | | | |
| • Removal of infectious waste from bins | | | |
| • Removal of domestic waste from bins | | | |
| • Removal or replacement of bed linen | | | |
| • Wearing of plastic aprons | | | |
| • Wearing of disposable facemasks | | | |

| Questions | Answers | Comments | |
|---|---|---|---|
| • Wearing of heavy-duty gloves | | | |
| • Replacing of disposable surgical gloves between patient contacts | | | |
| • Using absorbable material for cleaning spillages | | | |
| • Hand hygiene (washing or alcohol-based hand rub) before entering the ward | | | |
| • Hand hygiene (washing or alcohol-based hand rub) before leaving the ward | | | |
| • Hand hygiene (washing or alcohol-based hand rub) between patient contacts | | | |
| o. Draw a map of the ward with specific locations for taking samples of dipslides on a separate sheet with photos of the specific locations (Do not forget to put the name and code of the hospital and ward, such as Chhlorng RH, paediatric ward, on the sheet or taking photos) | | | |
| p. Any observed signs of overcrowding and congestion on the ward which may impact on keeping the ward clean?<br>• Are there more pregnant women in labour than the number of available delivery beds? Yes No<br>• Are there many visitors or guardians in the room? Yes No<br>• Is there little space between the delivery beds? Yes No | | | |
| **5. Waste storage or final waste disposal areas** | | | |
| a. Is there a waste storage in the hospital compound? | 0 = No<br>1 = Yes<br>97 = NA | | |
| b. If yes, is the waste storage awaiting removal from the hospital (or final disposal) appropriately fenced and protected? | 0 = No<br>1 = Yes<br>97 = NA | | |
| c. Is any staff or person responsible for the waste storage? | 0 = No<br>1 = Yes<br>97 = NA | | |
| d. What is their title? | | | |
| e. Are they trained? | 0 = No<br>1 = Yes<br>97 = NA | | |
| f. Do they visit wards to collect waste or is the waste brought to the storage by others? | 1 = Visit wards to collect wastes<br>2 = Wastes brought by others | | |
| g. If brought by others, who are they? | | | |
| h. Is there a functioning (in use and not full) needles pit in the hospital compound? | 0 = No<br>1 = Yes<br>97 = NA | | |
| i. Is there a functioning (in use and not full) placenta pit in the hospital compound? | 0 = No<br>1 = Yes<br>97 = NA | | |
| j. Is there a functioning high-capacity incinerator (that can burn sharps waste) in the hospital compound? | 0 = No<br>1 = Yes<br>97 = NA | | |

# CLEAN Frontline Project: interview guide for phone interview(champion)

## Expected duration: 30 minutes

## Aims

The aim of this interview is to investigate how champions feel and think about environmental hygiene and what contextual elements (relationship between champions and cleaners) help or hinder this activity.

| Name | (Will be anonymized) |
|---|---|
| Gender: | |
| Age: | |
| Professional skills | |
| Health facility: | |
| Date of interview: | |
| Interviewed by: | |

## Introduction

I am_____ from _____

- ✔ General purpose of the study (see additional text on separate page for below points)
- ✔ Aims of the interview and expected duration
- ✔ Who is involved in the process (other participants)
- ✔ Why the participant's cooperation is important
- ✔ What will happen with the collected information and how the participant or target group will benefit
- ✔ Any questions?
- ✔ Consent

## Key questions

### 1. Background information (to be used at the first interview only)

1.1. How long have you been working in this hospital?

1.2. What are your main roles and responsibilities related to cleaning tasks at this hospital?

1.3. Please describe your health facility

- » Number of staff, wards and beds
- » Number of cleaning staff

### 2. Adaptation (to be used at the first interview only)

2.1. How did you use the training from master trainers for the facility-based training?

- » What content has been taken or has not been taken to deliver training at the facility?
- » What approach has been taken or has not been taken to deliver training at the facility?

2.2 What are the enablers or challenges in adapting the training package?

- » Time
- » Content
- » Supporting material or environment

### 3. Training and its application

3.1 What do you think helps your ability to ensure environmental hygiene [more focus on the frequency and cleaning technique for patients' beds]? Anything else?

3.2 What barriers do you face in ensuring that environmental hygiene?

- » Probe: **workload**, motivation, supply and equipment, supporting environment

3.3 Considering the barriers, you have just described, which three do you consider to be the biggest (of high priority) and hence needing urgent action?

3.4 Did you provide training on environmental hygiene in the past few months? What did you think about the training (what was good? What was less good?)?

3.5 Do you think anything has changed since the training or refresher training in this facility? If so, what? And why or how? *Prompt: what are the mechanisms of change that are most important?*

3.6 Would you see the practice of what have been taught during training on the ward? What made that easier? What made that difficult? What is the impact of the training (good or bad) on the cleaners? What barriers to cleaning do they (cleaners) face?

3.7 How are you planning to give ongoing (supportive) supervision to people that you trained? Did you already start? What does the supervision cover?

- » Probe: setting up cleaning schedule

3.8 Have you received any kind of supervision (from DHS) since the trainings? From whom? What do you think about the supervision, (what was good? What was less good?)?

3.9 If this training would need to be delivered elsewhere, what would you do differently to ensure the success of the training? What would you do to help people implement what they learnt in training? (can be asked at the end of the project) **(to be used at the last interview only)**

### 4. Additional Information

4.1 Contextual changes within the training period

- » Cleaning staff turn over
- » Staff in charge of cleaning tasks
- » IPC policy and practice

# CLEAN Frontline Project
# Interview guide (Cleaning Staff)
# (Phone Interview)

## Expected duration: 15-20 minutes

## Aims

The aim of this interview is to investigate how trainers and healthcare workers (managers, nurses, ward attendants – anyone involved in environmental hygiene) feel and think about environmental hygiene and what contextual elements help or hinder this activity. **Note that environmental hygiene refers to both cleaning and disinfection, as well as waste disposal.**

| Name | (Will be anonymize) |
|---|---|
| Gender: | |
| Age: | |
| Education<br>(Can read and write?) | |
| Health facility: | |
| Date of interview: | |
| Interviewed by: | |

## Introduction

I am_____ from _____

- ✔ General purpose of the study (see additional text on separate page for below points)
- ✔ Aims of the interview and expected duration
- ✔ Who is involved in the process (other participants)
- ✔ Why the participant's cooperation is important
- ✔ What will happen with the collected information and how the participant or target group will benefit
- ✔ Any questions?
- ✔ Consent

## Key questions

### 1. Background Information (to be used at the first interview only)

1.1 How long have you been working in this hospital?

1.2 What are your main roles and responsibilities related to cleaning tasks at this hospital?

1.3 Please describe about your health facility

- » Number of staff, wards, bed
- » Number of cleaning staff

### 2. Training and its application

2.1 You received training conducted in the hospital in [month, day and time].

- » What did you learn during the training?
- » What do you remember most about the training?
- » How different was it from what you did before?
- » If you are running out of time, what areas will you give priority to (high- versus low-touch surfaces)?

2.2 Were you able to implement what you learned during training on the ward? What made that easier? What made that difficult?

2.3 Do you observe anything has changed since the training in this facility? If so, what? And why?

2.4 What barriers do you face in conducting environmental hygiene [more focus on the frequency and cleaning technique for patients' beds] after the training (by following the training modules)?

Probe: workload, motivation, supply and equipment, supporting environment

2.5 How has your workload changed? How did that affect you?

2.6 Are other priorities competing with these environmental tasks (patients' beds)?

What are they? What other activities do you carry out in your own ward apart from cleaning? How often and/or when necessary?

### 3. Cleaner empowerment

3.1 Considering the barriers you have just described, which three do you consider to be the highest priority and hence needing urgent action? How will you respond to this urgent need?

- » Did you feel empowered as a result of the training? (dare to ask for help or support)
- » Are your supervisors accessible when needed?

3.2 In a situation when you cannot perform your cleaning tasks (such as lack of time or equipment), do you feel you can ask for support from your champion or colleague?

3.3 How do you feel about being a cleaner in this hospital?

3.4 Do you think your colleagues respect the role of cleaning? To what degree do your colleagues respect the role of cleaning? Can you share examples of why or why not?

### 4. Supportive supervision

4.1 Have you received any kind of supervision (champion) since the training? From who? What do you think about the supervision. What was good? What was less good?

4.2 Has your cleaning schedule been set up? How? Did you receive any support? From whom? What are the priorities in the cleaning schedule?

4.3 Have you heard of the cleaning champions? What do you think about them? (If they are a champion – **ask what they think about their role.)** What makes them good champions? (Probe: for supportive supervision)

# Interview guide with master trainers or stakeholders

## Expected duration: 60 minutes

## Aims

The aims of the interview are to document the experiences of master trainers and key stakeholders on (1) the process of adapting and implementing the Tech Clean Package; and (2) how perceptions of environmental hygiene and contextual elements support or hinder this activity.

## Introduction

I am_____ from _____

- ✔ General purpose of the study (see additional text on separate page for below points)
- ✔ Aims of the interview and expected duration
- ✔ Who is involved in the process (other participants)
- ✔ Why the participant's cooperation is important
- ✔ What will happen with the collected information and how the participant or target group will benefit
- ✔ Any questions?
- ✔ Consent

## Key questions

1. **Can you tell me how about the process of adapting the Teach Clean package?**
   - » Who played key roles in the process?
   - » How was the content adapted? What content has been taken or has not been taken from Teach Clean? Why?
   - » What were the key timelines for adaptation?

2. **What do you think about the training for the champions? What works well or does not work well?**
   - » Facility
   - » Content
   - » Training technique
   - » Selection of participants

3. **What challenge have you faced in delivering the training?**

4. **How do you think the training was then delivered at the facility level? What went well and what less well?**

   4a. What do you think about the knowledge transferred from champions to the cleaning staff?
   - » What works well or does not work well?
   - » What are the possible challenges you observed?
   - » What could be done differently?

   4b. Do you think facilities managed to improve the quality of cleaning (technique, supplies management and cleaning fluid preparation)? Do you think they managed to increase cleaning frequency to daily cleaning of patients' beds?

5. **Have you engaged in any on-site or informal supportive supervision?**
   - » How was supervision designed?
   - » What did it focus on?
   - » How did you communicate with champions (WhatsApp, phone calls)?
   - » What did you observe during your visit?
   - » What would be the noticeable positive elements of cleaning tasks you have found during your visit?
   - » What would be the noticeable less improved elements of cleaning tasks you have found during your visit?
   - » What would you see the roles of support or supervision visit of the central for facility-based training? *(Perceptions as to whether it is a crucial mechanism for the sustainability of cleaning tasks)*

   5a. What issues did the facilities face in implementing the cleaning on a daily basis (patient's zone and patient's bed)? What things went well in implementation?

6. **What should champions have done better to contribute to the cleaning tasks?**

   *(Explore perceptions whether routine supportive supervision from champions is a mechanism for maintain the change of the cleaning task at the facility)*

7. **From your experience, what are the supporting environment (enablers) and hindering factors to enhance the environment hygiene (or IPC) in hospital?**
   - » Enablers
   - » Hindering factors

8. **From your experience of engagement closely with the CLEAN Frontline Project since the adaption and implementation, what could be done differently to ensure the sustainability of the intervention? If you had to roll this out at the national level, what do you think would help in making it a sustainable programme?**

9. **How do you feel about the interaction among the project team at central level?**
   - » What do you think about the relationship among the partners of the project?
   - » What were the positive aspects of the partnership?
   - » What should have been done better in this partnership?

# CLEAN Frontline Project: observation guide or checklist for training

## Aims

To observe the quality of training being delivered to the hospital champions and the extent to which the training package is contextualized and appropriately adapted for the Cambodia context.

### Training of trainers:

- Trainers
- Trainee participants

## Key aspects of the observation

### Quality of training:

» **Approach or methods of training:** how training is provided (participatory or adult learning techniques; exercise (simulation) based)

» **Contents:** what and how much content planned to be delivered is being delivered

» **Participants:** who and how much participation by champions (level of consistency in participation)

» **Enabling environment:** facility, supplies and equipment

### Dynamics of stakeholder involvement

» Interaction between trainers and trainees

### Identification information

Observation date:

Start time for observation: HH/MM

End time for observation: HH/MM

Training venue:

### Researcher's name:
### Observe and provide detailed information on:

Number of participants:

1. **Approach of training:**

   Describe whether the **training method worked well**– were they as participatory as the training institute (master trainers – DHS)?

   » Were the teaching methods successful in **engaging participants** (for example, demonstration, interactive tasks and discussion)?

   » Was the approach leveraging adult learning techniques? (for example, asking what they already do in their own routine; what barriers they face, contextualizing new learning in their own environment?)

   » Did any of the teaching methods **work particularly well or not well?** Why?

   » What worked well?

   » What did not work well?

   » How was the time allocation of each module? Was it appropriate?

   » How was the time allocated to individual activities?

» How was the time allocated to the course as a whole?

» How engaged were people – or did they seem distracted by their phones or laptops etc.?

## 2. Content

How were modules facilitated and delivered?

» Who facilitated the training in each module?

» Did facilitators changes in each module? Or any co-facilitators?

» If co-facilitator, how was the collaboration among facilitators?

» Was the content of the modules accessible to the training participants (that is, understandable and appropriately targeted)?

Was the content of the training modules carried out as planned?

» Did the training cover all modules or content?

» What was the speed (rushed, slow)?

» Were any modules emphasized more or less?

» Might any modules need more clarifications or discussion?

» Did the trainers emphasize any aspects more in certain modules?

» Were there any particular areas of modules or content **that were not covered** in the training **but should have been**?

» Were there any particular areas of modules or content **that were covered in the training but should not have been?**

» What advice did the trainers give the champions on how to carry out a) the training and b) the supervision of cleaners in their facilities?

## 3. Participant

Who attends the training?

How many participants? Did the number of participants change or was unchanged throughout the training?

| | Total | Women |
|---|---|---|
| Day 1 | | |
| Day 2 | | |
| Day 3 | | |
| Day 4 | | |

Did participants show or maintain interest in the modules throughout the training?

» Did the (master) trainers manage to get most to participate in exercises or discussions or only the enthusiastic few?

## 4. Environment

How was the facility for training? Appropriate?

» Did the materials used for training appear to be user-friendly for participants? Please describe what materials were used.

**Interaction between trainers (master trainers) and trainees (hospital champions)**

Relationships between trainers and those being trained (and those attending training)

a. Does the hierarchy of the champion (as the cleaners' supervisor) affect the effectiveness of the training?
b. Do gender and accessibility aspects affect the quality of the training?

If the champion (trainees) are a mixture of nurses (or different professional cadres) and cleaners – are they all trained together? Are there any issues?

» Prompts *about level of participation. For example: Who spoke up? Who was listened to? How inclusive were the trainers?*

## 5. Placeholder for other impressions that do not fit other categories

# CLEAN Frontline Project: questionnaire for cleaners

Before conducting the interview, ensure that the respondent fits the inclusion criteria (performs cleaning duties) and that the consent protocol has been followed and documented.

| Inclusion criteria | | | |
|---|---|---|---|
| | Cleaning refers to various activities in environmental cleaning in hospital. These include manual cleaning with detergent, chlorine solution, preparation of detergent and chlorine solution, waste management and linen management. All these environmental cleaning activities are important components of infection prevention and control (IPC) efforts.<br>Cleaners are those who perform cleaning in hospitals to keep the hospital safe and organized. | | |
| IC1 | Do you perform cleaning duties in this hospital?<br>Please tick ONE option | (0) No | |
| | | (1) Yes | |
| IC2 | Has written informed consent been obtained?<br>Please tick ONE option | (0) No | |
| | | (1) Yes | |

| Interview information | | |
|---|---|---|
| III1 | Respondent ID | [text] |
| III2 | Interviewer ID | [text] |
| III3 | Ward ID<br>Please refer to the "sample code" document and enter ONE number (1–3) | [text] |
| III4 | Hospital ID<br>Please refer to the "sample code" document and enter ONE letter (A–M) | [text] |
| III5 | Date<br>Type the date in NUMBERS for year, month and day (YYYYMMDD) | *In ODK: calendar option* |
| III6 | Time<br>Type the start time using the 24-hour clock format, such as 0815 | *In ODK: time option* |

| Respondent information | | | |
|---|---|---|---|
| RI1 | What is your gender?<br><br>Please tick ONE option | 1. Male | |
| | | 2. Female | |
| | | 3. Other | |
| RI2 | How old are you?<br>Type in NUMBER of years | | |
| RI3 | Have you ever received **any** training on environmental cleaning? If yes, what kind of training did you receive?<br><br>You may tick MORE THAN ONE option. | 1. None | |
| | | 2. On-the-job training | |
| | | 3. Formal training workshop or course (no certification) | |
| | | 4. Formal training or course with certification | |
| RI4 | **When** was your **most recent** formal training or certification training on environmental cleaning?<br><br>Type the date in NUMBERS for year month (YYYYMM). | | |
| RI15 | Since when have you worked at this hospital?<br><br>Type the date in NUMBERS for year month (YYYYMM). | | |
| RI16 | Think about the last day that you worked. How many hours did you spend cleaning?<br><br>Please put NUMBERS. | | |

| Year |
|---|
| |

*In ODK: calendar option*

*NA if RI5 ≤ 2 (respondent did not formal receive training)*

| Year |
|---|
| |

*In ODK: calendar option*

| Hours |
|---|
| |

Please read the text and questions aloud to the respondent. Information in blue is instructions to the interviewer and should not be read aloud.
Please **do NOT read out the response options** to the respondents. Based on the respondent's answer, tick the most appropriate response option.

| **Environmental constraints** | | | |
|---|---|---|---|
| EC0_C | Imagine you are performing daily cleaning in a patient's room. The patient is sick and cannot leave the bed.<br>Are you expected to clean the area around the patient bed including the bedrails and the IV stand (if available)?<br>Please tick ONE option | (0) No | |
| | | (1) Yes | |
| EC1_C | When you perform cleaning in a patient room, do you give priority to cleaning the area around the patient bed, including the bedrails and the IV stand (if available)?<br>Please tick ONE option | (0) No | |
| | | (1) Yes | |
| EC2_C | If you do not manage to give priority to cleaning the area around the patient bed including the bedrails and the IV stand, what prevents you from doing it?<br>You may tick MORE THAN ONE option. | 1. Lack of time | |
| | | 2. It is not part of my duties, or my supervisor does not expect me to | |
| | | 3. My supervisor does not value this | |
| | | 4. Lack of cleaning equipment | |
| | | 5. Lack of detergent or chlorine solution | |
| | | 6. The ward is busy with patients and visitors | |
| | | 7. There are too many items scattered around | |
| | | 8. The respondent has to give priority to other duties | |
| | | 9. Interruptions (for example, while cleaning, the doctor comes in to perform an examination, and you have to complete cleaning task later; or your ward manager asks you to focus on a different task) | |
| | | 10. Cleaner is not feeling well (sickness) | |
| | | 11. Others, please specify | |

Please read the text and questions aloud to the respondent. Information in blue is instructions to the interviewer and should not be read aloud .
Please **do NOT read out the response options** to the respondents. Based on the respondent's answer, tick the most appropriate response option.

| **Knowledge** | | | |
|---|---|---|---|
| K1 | Please let me know which materials and equipment you would require to clean up a **large blood spillage** on the floor.<br>Encourage the respondent to identify as many sources as possible and to be as specific as possible.<br>You may tick MORE THAN ONE option. | 1. Material for hand hygiene<br>Accept either soap or alcohol-based hand rub | |
| | | 2. Personal protective equipment<br>Accept mention of any of these: gown, plastic apron, reusable apron, gloves, reusable gloves, facemask, goggles, face shield, boots | |
| | | 3. Warning sign | |
| | | 4. Absorbent tissue | |
| | | 5. Cloths | |
| | | 6. Mops | |
| | | 7. Detergent cleaning solution | |
| | | 8. Chlorine solution | |
| | | 9. Bucket for cleaning solution | |
| | | 10. Blood spillage kit | |
| K2 | High-touch surfaces – such as door handles – are surfaces in the patient care area that are frequently touched by health-care workers and patients. They should be cleaned at least daily. **Please name as many examples of high-touch surfaces in the patient room as you can.**<br>Encourage the respondent to identify as many sources as possible and to be as specific as possible.<br>You may tick MORE THAN ONE option. | 1. Chair | |
| | | 2. Sinks | |
| | | 3. Bed frame | |
| | | 4. Bedside locker | |
| | | 5. Bed mattress or cover | |
| | | 6. IV stand | |
| | | 7. Light switch | |
| | | 8. Waste bin | |
| | | 9. Stair railing | |
| K3 | Imagine that you are cleaning the patient bed. Describe your cleaning process; how do you move from place to which place. Which part of the bed would you clean first? Which part of the bed next? And next.<br>Please tick ONE option. | 0. The respondent does **not** respect any of the two principles<br>(1. Cleaning from the cleanest area to the dirtiest<br>2. Cleaning from high to low) | |
| | | 1. The respondent respects the principle of cleaning from the cleanest area to the dirtiest.<br>For example: cleaning bedside trolley before clean linen contaminated with body fluids or faeces | |
| | | 2. The respondent respects the principle of cleaning from high to low.<br>For example: cleaning mattress before cleaning the feet of the bed | |
| | | 3. The respondent respects **both** principles<br>(1. Cleaning from the cleanest area to the dirtiest<br>2. Cleaning from high to low) | |

| Knowledge | | | |
|---|---|---|---|
| K4 | Imagine there is limited time and not all cleaning tasks can be completed. In the patient room, which parts or items in the room should be given priority for cleaning?<br>You may tick MORE THAN ONE option. | 1. Respondent mentions **high-touch** surfaces<br>For example: door handle, light switch, patient bed (bedrail), bed mattress or cover, stair rail, chair, IV stair, bedside table | |
| | | 2. Respondent mentions **contaminated** surfaces<br>For example: linens or floor with bodily fluids on them | |

| Implementation | | | |
|---|---|---|---|
| IMP_1 | Do you know who the on-site trainers on environmental cleaning at your facility are?<br>Please tick ONE option | (0) No or not sure | |
| | | (1) Yes | |
| IMP_2 | In the last three months, have you received feedback on your cleaning practice? If, yes how regularly?<br>Giving feedback refers to the trainer talking to you about the adequacy of the frequency and/or technique of your cleaning.<br>Please tick ONE option | (0) Never | |
| | | (1) Less than once a month | |
| | | (2) Once a month | |
| | | (3) More than once a month | |
| IMP_3 | Which method did the trainer use to provide feedback?<br>Give examples from the list. You may tick MORE THAN ONE option. | (1) One-to-one conversations | |
| | | (2) Team meetings | |
| | | (3) Performance charts | |
| | | (4) On-the-job feedback | |
| | | (5) Other: [text] | |
| IMP_NC5 | Which steps have you and your trainers planned to improve cleaning at your hospital in the coming months?<br>Please insert the NUMBER of new elements mentioned; write "0" if they have not discussed anything | Final score: | |

Please read the text and questions aloud to the respondent. Information in blue is instructions to the interviewer and should not be read aloud.

Most question will ask respondents to rate a statement on a six-point scale from disagree to agree (or appropriate to inappropriate). Please first ask the respondent whether they agree or disagree. Then ask them whether they _____ (insert previous answer: agree *or* disagree) strongly, moderately or slightly. If a respondent answers "agree" and then "moderately", then please tick the "moderately agree" option. The same procedure should be followed for questions about appropriateness.

| **Norms** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Now I would like to talk with you about how you and people in this hospital are expected to behave. | | | | | | |
| | First, I will ask you some general questions about your perception of the interactions within this hospital. For this set of questions, "people" means staff members **and cleaners** within this hospital.<br>Please emphasize that we are talking about **both clinical and cleaning staff**. | | | | | | |
| N0 | We will ask you about social norms. By social norms we mean ways of behaving that are considered "normal" by your colleagues, friends or other acquaintances. For example, taking off the shoes before entering someone's house is a social norm. There is no law that tells you to take off your shows. However, it is an informal rule that other people usually take off their shoes and expect you to do the same. So if you do not do it, they may remind you or tell you off. This is just an example; there are hundreds of other informal rules (social norms) that regulate our behaviour every day. Can you think of another example? [This is to determine whether the respondent understands the concept; examples may include an individual cannot walk naked in public and a woman cannot touch a monk.]<br>Respondent provides valid example: YES (1) or NO (2) | | | | | | |
| | I will now read multiple statements aloud to you. After each statement, I will ask you to rate the answer on a scale from agree to disagree. | | | | | | |
| | | **Strongly disagree** | **Moderately disagree** | **Slightly disagree** | **Slightly agree** | **Moderately agree** | **Strongly agree** |
| N1 | People are supposed to abide by many social norms in this hospital.<br>Do you agree or disagree? Strongly, moderately or slightly?<br>Please tick ONE option | | | | | | |
| N2 | People in this hospital almost always comply with social norms.<br>Do you agree or disagree? Strongly, moderately or slightly?<br>Please tick ONE option | | | | | | |
| N3 | In this hospital, if someone acts in an inappropriate way, others will strongly disapprove.<br>Do you agree or disagree? Strongly, moderately or slightly?<br>Please tick ONE option<br>Prompt: inappropriate way refers to someone who does not behave according to the social norms. | | | | | | |

| Norms | | | | | | | |
|---|---|---|---|---|---|---|---|
| N4 | In this hospital, there are **very clear expectations** for how people should act or behave generally.<br>Do you agree or disagree? Strongly, moderately or slightly?<br>Please tick ONE option<br>Prompt: Clear expectations refers to social norms: people know how they should behave. | | | | | | |
| N5 | People in this hospital **have a good degree of freedom** in deciding how they want to behave generally.<br>Do you agree or disagree? Strongly, moderately or slightly?<br>Please note that this is the opposite to the statement in N4.<br>Prompt: Freedom refers to being able not to follow the social norms without judgement or social consequences.<br>Please tick ONE option | | | | | | |
| N6 | People agree about what behaviour is appropriate versus inappropriate in most situations in this hospital.<br>Do you agree or disagree? Strongly, moderately or slightly?<br>Please tick ONE option | | | | | | |
| | The next questions are about cleaning the patient area around the patient bed, including the bedrails and the IV stand, as part of daily cleaning. | | | | | | |
| N7 | **Should** cleaning staff clean **the patient area around the bed** when performing **daily** cleaning?<br>Please tick ONE option | (0) No [skip N8] | | | | | |
| | | (1) Yes | | | | | |
| N8 | If yes, why?<br>You may tick MORE THAN ONE option. | 1. Risk of infection | | | | | |
| | | 2. Shows respect towards the patients | | | | | |
| | | 3. The patient environment should be nice and tidy (bed looks dirty) | | | | | |
| | | 4. Supervisor would scold me otherwise | | | | | |
| | | 5. Health-care staff reminds me to clean | | | | | |
| | | 6. Other: [open text] | | | | | |
| | We recently asked the previous question (N8) to many staff members who clean. | | | | | | |
| N9 | Based on your experience:<br>From 0 to 10, how many cleaning staff think that they **should** clean **the patient area around the bed** when performing daily cleaning?<br>Please enter respondent's best guess – a NUMBER between 0 and 10. | Response<br>(number between 0 and 10):<br>☐ | | | | | |

| Norms | | | | | | | |
|---|---|---|---|---|---|---|---|
| N10 | Think about staff members who clean.<br>Based on your experience:<br>From 0 to 10, how many do you think **actually clean** all the patient areas around the bed when performing daily cleaning?<br>Please enter respondent's best guess – a NUMBER between 0 and 10. | Response<br>(number between 0 and 10):<br>☐ | | | | | |
| | Now I will ask you some questions about a woman named Amara. She is a member of the cleaning staff in this hospital and often cleans the patient rooms. | | | | | | |
| | Amara just finished her cleaning shift but did **not** manage to clean every patient mattress in her ward. | | | | | | |
| N11 | How appropriate is this behaviour?<br>Appropriate or inappropriate? Strongly, moderately or slightly?<br>Please tick ONE option | **Strongly inappropriate** | **Moderately inappropriate** | **Slightly inappropriate** | **Slightly appropriate** | **Moderately appropriate** | **Strongly appropriate** |
| | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Amara's supervisor notices that she did **not** manage to clean every patient mattress in her ward. | | | | | | |
| N12 | Is the supervisor likely to react?<br>Please tick ONE option | (0) No [skip N13] | | | | | ☐ |
| | | (1) Yes | | | | | ☐ |
| N13 | What is the supervisor likely to do?<br>You may tick MORE THAN ONE option. | (1) Scold her | | | | | ☐ |
| | | Offer her help | | | | | ☐ |
| | | Talk about poor patient outcomes | | | | | ☐ |
| | | Supervisor will instruct her to finish cleaning (reminder) | | | | | ☐ |
| | | Organize an official warning meeting<br>*NA if N12 = 0 (supervisor unlikely to react)* | | | | | ☐ |
| | Imagine that the supervisor organizes a one-to-one meeting to give Amara a warning and instruct her to always finish her cleaning in the future. | | | | | | |
| N14 | How appropriate would it be for the supervisor to react this way?<br>Appropriate or inappropriate? Strongly, moderately or slightly?<br>Please tick ONE option | **Strongly inappropriate** | **Moderately inappropriate** | **Slightly inappropriate** | **Slightly appropriate** | **Moderately appropriate** | **Strongly appropriate** |
| | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Imagine the supervisor reacts differently and asks Amara whether she needs help with cleaning the patient mattresses in the future. | | | | | | |
| N15 | How appropriate would it be for the supervisor to react this way?<br>Appropriate or inappropriate? Strongly, moderately or slightly?<br>Please tick ONE option | **Strongly inappropriate** | **Moderately inappropriate** | **Slightly inappropriate** | **Slightly appropriate** | **Moderately appropriate** | **Strongly appropriate** |
| | | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Instructions: Please read the text and questions aloud to the respondent. Information in blue is instructions to the interviewer and should not be read aloud.

The question will ask respondents to rate a statement on a five-point scale from difficult to easy (or certain to uncertain). Please first ask the respondent whether they find the described behaviour easy or difficult. Then ask them whether they find it a little or very _____(insert previous answer: easy *or* difficult). If a respondent answers "easy" and then "a little", then please tick "a little easy". The same procedure applies for certain or uncertain.
Please only tick "neither easy nor difficult" if the respondent actively expresses uncertainty.

| **Perceived control or self-efficacy** | | | | | | |
|---|---|---|---|---|---|---|
| | I will now read multiple scenarios aloud to you. After each statement, I will ask you to rate whether you find it difficult to carry out the described behaviour and whether you are certain that you could still do it. | | | | | |
| | Getting the toilet completely clean when it is extremely dirty and you have limited equipment available. | | | | | |
| PC1 | Is that **difficult or easy**? A little or very?<br>Please tick ONE option | **Very difficult** | **A little difficult** | **Neither easy nor difficult** | **A little easy** | **Very easy** |
| | | | | | | |
| SE1 | Are you **confident or unconfident** that you could get the toilet completely clean?<br>A little or very?<br>Please tick ONE option | **Very unconfident** | **A little unconfident** | **Neither confident nor unconfident** | **A little confident** | **Very confident** |
| | | | | | | |
| | Getting all patient beds completely clean when the ward is full of patients and their caregivers. | | | | | |
| PC2 | Is that **difficult or easy**? A little or very?<br>Please tick ONE option | **Very difficult** | **A little difficult** | **Neither easy nor difficult** | **A little easy** | **Very easy** |
| | | | | | | |
| SE2 | Are you **confident or unconfident** that you could get the patient beds completely clean? A little or very?<br>Please tick ONE option | **Very unconfident** | **A little unconfident** | **Neither confident nor unconfident** | **A little confident** | **Very confident** |
| | | | | | | |
| | Finishing your cleaning task in your working hours. | | | | | |
| PC3 | Is that **difficult or easy**? A little or very?<br>Please tick ONE option | **Very difficult** | **A little difficult** | **Neither easy nor difficult** | **A little easy** | **Very easy** |
| | | | | | | |
| SE3 | Are you **confident or unconfident** that you can complete your cleaning tasks in the time available? A little or very?<br>Please tick ONE option | **Very unconfident** | **A little unconfident** | **Neither confident nor unconfident** | **A little confident** | **Very confident** |
| | | | | | | |

Instructions: Please read the text and questions aloud to the respondent. Information in blue is instructions to the interviewer and should not be read aloud.

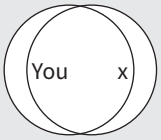
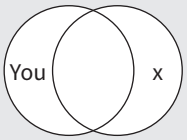
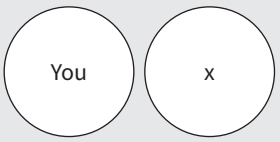
The question will ask respondents to rate a statement on a five-point scale from strongly agree to strongly disagree. Please first ask the respondent whether they agree or disagree. Then ask them whether they _____ (insert previous answer: agree *or* disagree) a little or strongly. If a respondent answers "agree" and then "a little", please then tick "agrees a little".
Please only tick "Neither agree nor disagree" if the respondent actively expresses uncertainty.

| **Role empowerment** | | | | | | |
|---|---|---|---|---|---|---|
| | I will now read multiple statements aloud to you. After each statement, I will ask you to rate the answer on a scale from agree to disagree. | | | | | |
| | | **Disagree strongly** | **Disagree a little** | **Neither agree nor disagree** | **Agree a little** | **Agree strongly** |
| RE1 | You have been taught the appropriate technique to clean the patient bed.<br>Do you agree or disagree?<br>A little or strongly?<br>Please tick ONE option<br>Example: a respondent who has never been taught should tick disagree strongly. | | | | | |
| RE2 | Your supervisor or trainer provides you with instructions on how frequently to clean each item in the patient room.<br>Do you agree or disagree?<br>A little or strongly?<br>Please tick ONE option | | | | | |
| RE3 | You find it easy to ask for help when you have little time to complete my cleaning tasks.<br>Do you agree or disagree?<br>A little or strongly?<br>Please tick ONE option | | | | | |

Instructions: Please read the text and questions aloud to the respondent. Information in blue is instructions to the interviewer and should not be read aloud.

The question will ask respondents to describe their feeling about a particular situation on a five-point scale from good to bad. Please first ask whether the described behaviour makes them feel good or bad. Then ask them whether they feel very or a little ____ (good *or* bad based on previous answer). If a respondent answers "good" and then "a little", please then tick "a little good".
Please only tick "not sure" if respondent actively expresses uncertainty.

| **Experiential attitudes** | | | | | | |
|---|---|---|---|---|---|---|
| | I will now read multiple statements aloud to you. After each statement, I will ask you how you feel in the described situations and ask you to rate it on a scale from good to bad. | | | | | |
| | | **Very bad** | **A little bad** | **Neither good nor bad** | **A little good** | **Very good** |
| AE1 | Some of the patients caught an infectious disease and are treated on the isolation ward. You have to clean the isolation ward.<br>When you do this, how does it make you feel?<br>Good or bad? A little or very? Please tick ONE option | | | | | |
| AE2 | Completing the cleaning of a mattress of a patient who urinated.<br>When you do this, how does it make you feel?<br>Good or bad? A little or very? Please tick ONE option | | | | | |
| AE3 | Cleaning a patient's bed while there are many visitors in the room.<br>When you do this, how does it make you feel? Good or bad? A little or very?<br>Please tick ONE option | | | | | |

| Organizational identity | | | |
|---|---|---|---|
| OI1 | How would you describe the values of this hospital?<br>You can give respondent prompts if needed: for example, a hospital may place great importance on collaboration between staff, providing good patient care, working efficiently etc.<br>You do NOT need to record the respondent's answer. | | |
| | *Provide the respondent with two circles out of cardboard.*<br>Imagine that you are the [blue] circle and the [red] circle represents this hospital. Now, I would like you to show me how close you feel to this hospital. For example, you could demonstrate to me that you feel a very close link by having the circles overlap a lot (*demonstrate).* Or you may feel more distant and move the circles further apart (*demonstrate).* | | |
| OI2 | Please use the circles to describe the relationship between you and **this hospital.**<br>Please tick ONE option | 1. Like this or less<br>  <br> | |
| | | 2. Like this or less<br>  <br> | |
| | | 3. Like this<br>  <br> | |
| End | | | |
| RI 20 | End time<br>Type the end time using the 24-hour clock format, such as 08:15 | | |

## National Institute of Public Health

## National Public Health Laboratory

# SCREENING FOR MICROBIAL CONTAMINATION IN THE HOSPITAL ENVIRONMENT

## Standard operating procedure

**Revision 00**

**Prepared by:** **Date:**

(Staff of microbiology unit)

**Reviewed by:** **Date:**

(Head of microbiology unit)

**Approved by:** **Date:**

(Chief of National Public Health Laboratory)

**Issued date:**

**Table of review or amendment**

| Revision no. | Date of issue | Detail of review or amendment |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

## 1. Objective

The purpose of this standard operating procedure is to describe the process of screening for the presence of microbial load and indicator pathogen (*Staphylococcus aureus*) in the hospital environment using dipslides. This work forms part of the CLEAN Frontline Project.

## 2. Responsibility

This standard operating procedure is applicable to all trained data collection and microbiology lab staff working at the National Public Health Laboratory (NPHL).

## 3. Principle

In hospitals, microbes are transmitted between patients and the environment. The main reservoirs are frequently touched sites, including furniture, clinical equipment and soft furnishings. Microbial transmission can lead to the development of hospital-acquired infections, which may be caused by antibiotic-resistant bacteria. This standard operating procedure is focused on quantitative and qualitative detection of environmental bacteria and fungi resident on hospital surfaces and equipment, which might include specific pathogens able to persist in the hospital environment. The best indicator of hospital hygiene is *S. aureus* on hospital surfaces, and this organism is a good choice for monitoring surface cleanliness when using microbiological methods. The method of choice uses sterile double-sided dipslides, with an elemental agar coating one side and a staphylococcal-selective agar on the other.

In order to isolate microbes from the environment, these need to be recovered from selected environmental surfaces, packaged securely and transported to the laboratory for incubation and processing. Appropriate steps to identify and quantify microbes are performed after 18–48 hours of initial incubation.

## 4. Material

- Fridge
- Aerobic ($O_2$) incubator (37°C)
- Wire or plastic disposable loops
- Small lamp for reading plates
- Magnifying lens
- Polystyrene boxes and cooling block

## 5. Reagents

- Dimanco dipslides (double-sided, nutrient agar and Baird-Parker (BP) agar)
- Blood agar (local production)
- Coagulase test kit (Staphaurex brand, Pro-Lab)
- *S. aureus* positive control strain (ATCC 25933)
- *S. epidermidis* negative control strain (ATCC 12228)

## 6. Standard and control

- ***Internal quality assurance***

Internal quality control will be conducted by double reading 10% of the dipslides. There will be approximately 3250 dipslides in total sent to the lab, so approximately 325 will need double reading. The second reading

of each 10th slide will be done blindly by another laboratory technician (should be unaware of the first-reader result). If there is any discrepancy between the first and second reading, a third reading will be performed locally and the majority opinion will be considered as the final result.

- *External quality assurance*

In external quality assurance, 5% of all samples (every 20th slide) will be captured in jpg format (ACC side only) and sent to an identified external examiner by the project PI for colony counting assessment. This will be performed on a weekly basis. Results will then be compared and graded as "Acceptable" if the results match with external review and graded as "Unacceptable" if there are discrepancies. If the results are graded as "Unacceptable", then further corrective action will be taken.

- *Data monitoring*

Data with final results of dipslides will be uploaded to a Redcap database within one week of completion of processing. The data in this database will be monitored by an external evaluator (London School of Hygiene and Tropical Medicine). Feedback will be provided by the London School of Hygiene and Tropical Medicine team after checking these data.

# 7. Sample

A double-sided dipslide (Dimanco Limited), coated with non-selective nutrient and Baird-Parker (BP) selective agar on the two surfaces.

# 8. Procedure

## 8.1. Day 1

### 8.1.1. Sample collection

8.1.1.1. Samples are collected on hospital surfaces according to a predefined testing schedule based on areas (such as wards), sub-areas (such as bays or rooms) and specific surfaces in the hospitals due to be investigated for evaluation of cleaning. See the study protocol for more information.

8.1.1.2. 30 samples need collecting every month from each of the 13 facilities. This can be in different days. The sampling day can be different as long as it is within the same month.

8.1.1.3. The finalized surfaces at each hospital of interest will be identified at the start of the study and a schedule of testing will be created. In a collection session, 30 dipslides tests will be performed (10 samples times three wards). No prior announcement of the planned testing will be given to the hospitals. Clinical and cleaning staff will not be informed of the study testing schedule.

8.1.1.4. Unused dipslides must be brought from NPHL to the study hospital in polystyrene boxes with cooling blocks. Ideally the transport temperature should be between 8°C and 15°C, so the transport boxes should not be exposed high temperatures or direct sunlight.

8.1.1.5. On each day of testing, the fieldworker starts at the first relevant location in the hospital with the appropriate materials. Record the date of the sample collection and the time of starting in the individual ward on the relevant form. Dress code for sample collection should indicate researcher status.

8.1.1.6. First, the labels are all completed with the planned sample collection details and stuck onto the transport containers.

8.1.1.7. The fieldworker should then wash their hands with soap and water before entering the ward.

8.1.1.8. Each individual dipslide is collected by pressing it into contact with the appropriate location for 10 seconds with firm pressure (25 g/cm$^2$) for the two sides of the side sequentially (first non-selective then selective), applied to adjacent but not overlapping areas of the relevant surface. Care should be taken not to touch the agar surfaces directly with fingertips while taking the sample. Once the sample has been collected, it should immediately be placed in the transport boxes with the cap fully sealed.

8.1.1.9. On each dipslide, a piece of paper will be applied where the surface code is provided with unique identifiers also for the ward and hospital.

### 8.1.2. Preparation and transport

8.1.2.1. The samples should be transported back to NPHL in a suitable transport box on the same day of the collection. After collection, it is not necessary to keep the dipslides cool, so ambient temperature indoors or outdoors (which may be in the range 20–30°C) is fine during transport to NPHL. However, dipslides need to be handled carefully to avoid accidental opening and should not be left in direct sunlight.

8.1.2.2. On receipt in NPHL, each box should be checked and registered following normal procedures and all information should be recorded daily as processing progresses as per normal procedures. The receiving technician must ensure that the lid for each sample is not excessively tightly sealed – a loosely sealed lid is ideal for incubation.

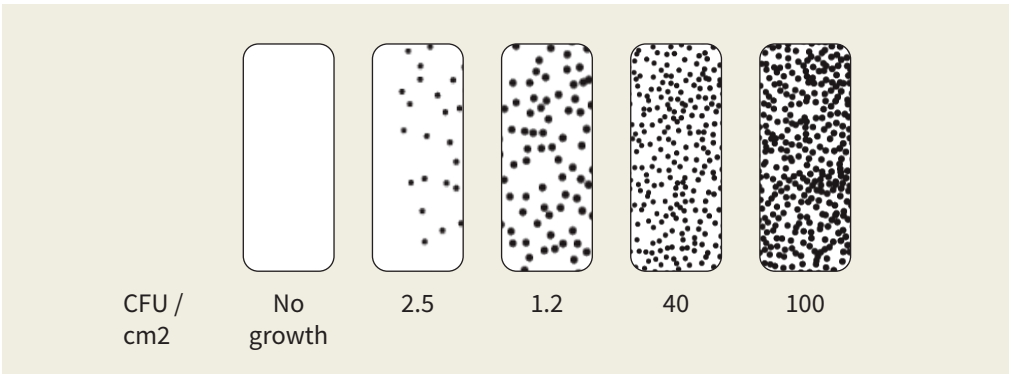
8.1.2.3. Incubation needs to happen on the same day of the sample collection. The dipslides should all be incubated for between 18 and 48 hours in an aerobic ($O_2$) incubator at 35–37°C. We suggest that slides have two nights of incubation (such as Monday to Wednesday) with removal from the incubator in the morning of the day they are going to be read. However, this is subject to adjustment in the preliminary stages of the project, based on project practicalities.

## 8.2. Day 3 (if having two nights of incubation)

### 8.2.1. Examine dipslides from day 1

8.2.1.1. The laboratory staff member removes the dipslides from the incubator.

8.2.1.2. Non-selective nutrient agar. Using a lamp and the enumeration reference diagram below as necessary, the non-selective side of each dipslide is quantified to a level of aerobic colony count (ACC).



The ACC result should then be assigned to the appropriate categories from the list below and recorded into the study spreadsheet table.

| CFU/cm | Result |
|---|---|
| 0 | No growth |
| >0 to <2.5 | Scanty growth |
| 2.5–12 | Light growth |
| 12–40 | Moderate growth |
| >40 | Heavy growth |
| Totally confluent | Unable to quantify |

8.2.1.3. If the growth on the dipslide is highly confluent, it may be difficult to estimate the original number of colonies, though this is likely to have been a heavy growth. This may be a problem if the incubation has been too long. Attempts should be made to quantify based on any "readable" areas of the dipslide. If this is not possible, a result of "Unable to quantify" can be recorded. However, if this occurs, it should immediately be discussed with senior staff and reasons for possible overgrowth (including excessive incubation time or slide contamination) should be discussed.

8.2.1.4. Staphylococcal-selective (BP) agar. The staphylococcal-selective side of the dipslide should then be examined to identify potential *S. aureus* colonies. Typical features of such a colony are large non-sticky charcoal-coloured colonies – these are potentially *S. aureus* which should be further investigated – see diagram below.


Aerobic colonies cultured on dipslide used to assess surface contamination in healthcare environment.
©Stephanie Dancer

**Coagulase test**

For this, the Pro-Lab Staphaurex coagulase test should be used, according to the manufacturer's instructions. Briefly, a one drop each of the coagulase test reagent and control reagent should be applied to a clean test card. Then a single colony of the test isolate should be picked off with a test stick and mixed into the two separate drops of reagent. If the isolate is coagulase-positive (likely to be *S. aureus*), then there should be visible granulation formed in the test reagent within 10 seconds of vigorous stirring. If the isolate is coagulase-negative, no granulations will appear in this time. If uncertain, repeat the testing. Always make use of control strains of *S. aureus* and coagulase-negative staphylococci and the control reagent in each testing session to be certain of reliable results.

8.2.1.5. Any potential *S. aureus* colonies (coagulase-positive) should be picked off with a wire loop for sub-culture. The colony is picked off the dipslide (attempting to get one colony only) and inserted into 5 ml of distilled water, mixed vigorously and then streaked onto blood agar (a purity plate). This should be incubated for 24 hours in an aerobic incubator ($O_2$ 37°C).

## 8.3. Day 4 (if two nights of incubation)

8.3.1 After incubation, any blood agar plates set up should be examined. The colonial appearance of any colonies should be examined looking for typical features of *S. aureus* – **large round golden-yellow colonies sometimes surrounded by a thin border of beta-haemolysis**. If there is mixed growth including other organisms, a repeat sub-culture should be performed from one colony with appearance of *S. aureus* to obtain a pure growth. If there are discrete colonies meeting the appearance of *S. aureus*, the coagulase test should be repeated (see above). If this second coagulase test is also positive, the isolate (now considered as a potential *S. aureus* isolate) should be stored by freezing. See separate standard operating procedure entitled "Isolate storage and inventory" for procedure.

## 8.4. Future work

8.4.1. At the end of the CLEAN Frontline study, we intend to perform MALDI-TOF testing for all the stored potential *S. aureus* isolates from frozen storage. This will enable confirmation of species identity. This will be done according to the relevant local standard operating procedure for use of this device.

8.4.2. At the end of the CLEAN Frontline study, we may also perform antibiotic susceptibility testing, depending on the availability of funds. This will be done according to the relevant local standard operating procedure.

## 9. Reporting results

Please see the procedure in 8.2.

## 10. Normal reference range

Please see the procedure in 8.2.

## 11. Reference

Adams CE, Smith J, Watson V, Robertson C, Dancer SJ. Examining the association between surface bioburden and frequently touched sites in intensive care. J Hosp Infect. 2017 Jan;95(1):76-80. doi: 10.1016/j.jhin.2016.11.002.

## 12. Safety precaution

Wear PPE properly with lab coats and shoe covers. All laboratory staff should wash hands with soap and water before and after handling dipslides.

## 13. Supplementary notes

Reporting result form.

## Acknowledgement

We are hereby confirming that we already read and understood this standard operating procedure. We pledge that we will follow all the regulations and procedures to ensure the good quality of our jobs and the overall goals of the NPHL.

It is our responsibility if there is any incident caused by the violation of that document(s).

Below are our name and signature:

| No. | Name of staff | Initials | Signature | Date |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
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| 11 | | | | |
| 12 | | | | |

## 0. Proposal name

CLEAN Frontline

## 1. Description of the data

### 1.1 Type of study

A stepped-wedge trial testing an environmental hygiene training in maternity and newborn health-care units to improve the microbiological cleanliness of hospital surfaces in Cambodia.

### 1.2 Types of data

Data will be collected through observation, a focus group discussions, interviews and environmental microbiology samples, which will produce quantitative and qualitative material. Data will be collected from staff performing cleaning duties and their supervisors at 13 health-care facilities with a high volume of deliveries. Other relevant stakeholders at the facility or local government levels will also be interviewed.

### 1.3 Format and scale of the data

Quantitative data will be entered into a database (such as Kobo Toolbox) and exported as CSV. Data will be held in STATA and Excel during analysis. Qualitative data will be captured using digital audio recording devices and shared via password-locked Word files. Microbiological samples will be collected from facility surfaces, stored and analysed following standard procedures.

## 2. Data collection or generation

### 2.1 Methods for data collection or generation

All information will be collected at the health facility level: qualitative information (from consultations with hospital cleaners, IPC committees, managers and district and regional government officials) and unstructured observations of cleaning practices.

Cleaners will be asked to complete a questionnaire that measures knowledge and beliefs. Information on candidate confounders, at the individual and contextual level, of the association between the intervention and the changes in cleanliness will also be collected, such as availability of cleaning material. During ongoing mentorship sessions by the same organization that provided the training (this will be selected during the adaptation phase of the study, such as the Department of Hospital Services), we will assess the knowledge, skills and motivation of the cleaning champions.

To inform the primary outcome measurement during the main trial, we will collect and culture surface samples using dip slides from a sample of frequent high-touch sites to assess the total bioburden (aerobic colony count/$cm^2$) and presence of *S. aureus*.

### 2.2 Data quality and standards

To ensure data quality, the questionnaire on Android tables will have in-built checks, informing the user if they have not provided all required information or have entered it incorrectly. Data collection supervisors will undergo data quality training and will review information collected at the end of each day, with remedial action performed if errors are found (such as recontacting participants to confirm details). Further validation will be performed during data analysis to ensure internal consistency and that no conversion issues have occurred when working with different tools. If a conversion error is found, the researcher will return to an earlier version of the data and correct the issue.

Microbiological samples collection and storage will require specialised training. We will follow standard methods for environmental sampling described elsewhere *(1,2)*.

## 3. Data management, documentation and curation

### 3.1 Managing, storing and curating data

Quantitative data will be collected using encrypted tablets and transferred electronically (without identifiers) to a managed storage facility immediately following completion (or at the end of the day where network access is unavailable). Laptops, memory sticks and other storage media used in the field will also be encrypted (using VeraCrypt or similar software) to protect files from unauthorized access. Automated file sync software (such as London School of Hygiene and Tropical Medicine's FILR or MyFiles system) will be configured to enable secure transfer between devices used in the field and institutional servers.

Each institution in this project or study applies standard procedures for data management and storage, with network servers backed up on a daily basis and stored in secure off-site locations. Network storage provides features such as access control and audit logging, ensuring that access is limited to specific users with a username and password. The London School of Hygiene and Tropical Medicine will store anonymized data in SharePoint to enable access within the study team. Identifiable material will be extracted from source data and stored in a separate, more secure location on the London School of Hygiene and Tropical Medicine's secure server (identifiers will be used to link these resources).

Paper copies will be kept in a locked cabinet at NIPH or WaterAid, accessible only to the authorized people on the research team.

### 3.2 Metadata standards and data documentation

The methods and instruments used to generate the data will be documented in research protocols and appendices, with deviations and amendments recorded as the study progresses. Analysis codes will be documented and annotated by the project team and/or any changes retained. Records of research progress, including expenditure, personnel, key activities and timing will be kept.

### 3.3 Data preservation strategy and standards

As the lead partner, the London School of Hygiene and Tropical Medicine will retain central master records for the study, which will then be archived in accordance with its research data retention policy for a minimum of five years. Data will be held in open, well-documented formats (CSV, RTF) during this time, with access granted to all partner organizations or institutions.

## 4. Data security and confidentiality of potentially disclosive information

### 4.1 Formal information or data security standards

The study will follow guidelines set out in the London School of Hygiene and Tropical Medicine Information Management and Security Policy. The policy has been drawn up in accordance with ISO 27001 requirements and is updated as needed to keep-up with legal, procedural and technological developments, such as GDPR.

### 4.2 Main risks to data security

Several mechanisms will be applied to protect personal data collected from health-care staff. Project staff, including data collectors, will be provided with security training to make them aware of the legal and ethical sensitivities that exist and procedures that must be adopted. Tablets and other storage devices used in the field will be encrypted before use and steps taken to keep them physically secure. Instances of device theft and loss will be recorded and reported to the co-investigator. Electronic data will be transferred to a secure network server at the earliest opportunity (immediately following questionnaire completion if a network connection is available, or at the end of the day if not). Data transfer will be encrypted to reduce risk of interception. Before analysis, data will be anonymized and a unique identifier assigned to each respondent and health facility. Personal details will be held separately on the London School of Hygiene and Tropical Medicine's Secure Server, which supports security features such as access control and audit logging. Personal details and linking identifiers will be deleted when no longer needed. Anonymized data will be kept for a minimum of five years following study completion.

Qualitative data, such as the focus group discussions and initial unstructured observations, will be shared only by the principal investigators via a password secure system. In addition, the reports will not use interviewees' names, facilities name or dates in the reporting of data from this qualitative assessment in order to avoid potential identification.

All hard copies will be kept in a locked cabinet at the NIPH or WaterAid, Cambodia.

Surface microbiological samples of surfaces will be stored anonymously at NIPH and results shared electronically with the London School of Hygiene and Tropical Medicine co-investigators.

## 5. Data sharing and access

### 5.1 Suitability for sharing

Non-identifiable aggregate data will be provided in project reports.

It will not be possible to share the human data collected from this study because such a small number of facilities (13) is involved that it would be hard to ensure confidentiality. Biological samples from surfaces will not be shared. Surface data will be shared but without hospital identifiers to ensure anonymity.

### 5.2 Discovery by potential users of the research data

A metadata record describing the data will be published in the London School of Hygiene and Tropical Medicine Data Compass and a DOI assigned, enabling discovery through research data catalogues, such as DataMed, that harvest the repository OAI feed or build on the DataCite API.

### 5.3 Governance of access

Quantitative or qualitative data can be shared for the purpose of verification only, due to the ease in which health facilities can be identified and the subsequent risk to participants. A Data Access Committee consisting of selected members of the study consortium, the London School of Hygiene and Tropical Medicine Research Data Manager and one external expert will be set up to handle access requests.

### 5.4 The study team's exclusive use of the data

The study requests a two-year embargo to allow time for analysis and publication. Data subsets sufficient to verify analysis outlined in publications will be made available on request following publication.

**5.5 Restrictions or delays to sharing, with planned actions to limit such restrictions**

To protect health facilities and study participants, end users will be required to complete a data access request form via the London School of Hygiene and Tropical Medicine Data Compass to access data.

**5.6 Regulation of responsibilities of users**

Data users must sign a data transfer agreement stating they will keep the information confidential, will only use it for validation purposes only or research that complies with the original consent and will not attempt to reidentify and contact participants or otherwise perform actions that will cause harm.

**6. Responsibilities**

The PI and named co-investigators at each collaborating organization are ultimately responsible for data management activities. Procedures and responsibilities will be defined in the study standard operating procedure and training provided.

**7. Relevant institutional, departmental or study policies on data sharing and data security**

| Policy | URL or reference |
|---|---|
| Data management policy | https://doi.org/10.17037/PUBS.00612422 |
| Information security policy | https://www.lshtm.ac.uk/aboutus/organisation/information-management-and-security |
| Data management standard operating procedures | Held on intranet – available on request |
| Data protection policy | https://www.lshtm.ac.uk/sites/default/files/Data-Protection-policy.pdf |

**8. Author of this data management plan (name)**

(London School of Hygiene and Tropical Medicine)

## References


1. Bogusz A, Stewart M, Hunter J, Yip B, Reid D, Ropbertson C et al. How quickly do hospital surfaces become contaminated after detergent cleaning? Healthcare Infect. 2013;18:3–9. doi: 10.1071/HI12063.
2. Adams CE, Smith J, Robertson C, Watson V, Dancer SJ. Examining the relationship between surface bioburden and frequently touched sites in intensive care. J Hosp Infect. 2017;95:76–80. doi: 10.1016/j.jhin.2016.11.002.

## CLEAN Frontline study

Disinfection of near-patient hospital surfaces is essential to stop hospital acquired infection (HAI) from occurring. The CLEAN Frontline study will test whether a training of environmental hygiene can improve environmental hygiene on the wards across 13 Cambodian hospitals.

**The training will be provided by the Department of Hospital Services.**

The study will run in the newborn, maternal, and C-section wards for____ months from [date] until [date].

The study is being conducted by the National Institute of Public Health, the Department of Hospital Services and the London School of Hygiene and Tropical Medicine, United Kingdom.

If you have any concerns or any questions, please contact:

- National Institute of Public Health
- WaterAid Cambodia
- London School of Hygiene and Tropical Medicine

# The CLEAN Frontline Study: information for and consent from study participants with cleaning duties

**To be either read by the respondent or read aloud by the investigator. The respondent will then either sign the consent form or make a thumb print to indicate that they agree to participate in the study.**

## Introduction

Disinfection of near-patient hospital surfaces is essential to stop hospital-acquired infections (HAI) from occurring.

### Purpose of the study

The CLEAN Frontline Study will test whether training in environmental hygiene can improve environmental hygiene on the wards across 13 Cambodian hospitals.

Your participation in this study is valuable and will provide key insights into the future use of cleaning fluids in this context and other low-income facilities.

Details of the study:

- The study will occur in your hospital_____ . The training will be provided to staff in the paediatrics, general medicine and maternity wards in each of the participating hospitals (13 referral hospitals in Battambang, Kompong Chhnang and Kratie).
- The training on environmental hygiene will be provided at some point during the 10 months from April 2022 to February 2023, and the study team will let the hospital know four weeks in advance of the training.
- Each of the participating hospitals will receive the training during the 10 months. The timing on which the hospital is trained when is chosen at random.
- An evaluation to assess the impact of the training on environmental hygiene will occur from April 2022 to February 2023.
- No human data is being collected during this study.
- The study will run for _____ months commencing on [date].

### Conditions for participation

You will participate in 1-4 days of training on environmental hygiene sometime.

### What would taking part involve?

Staff with cleaning responsibilities will be invited to participate in training on environmental hygiene. This is participatory training with seven contextualized aspects: (1) introduction to infection prevention and control, (2) personal hygiene and dress code, (3) hand hygiene, (4) personal protective equipment, (5) environmental cleaning, (6) waste management and (7) linen handling. The training will include both lecture-style teaching and hands-on exercises.

### Do I have to take part?

No. It is up to you to decide to take part or not. If you do not want to take part, that is okay. Taking part is voluntary and you are free to stop the discussion process at any time. If you decide not to take part, we will respect your decision. We will not ask you why you do not want to participate. There will be no complaint or punishment.

### Risk or discomfort

We do not anticipate any risk to you during this discussion. No information on your personal performance will be passed on to any of your colleagues or managers. All information we collect is strictly confidential and anonymous.

### What are the possible benefits?

We cannot promise the study will help you, but the information we get from the study will help our and the hospital and the NIPH knowledge and understanding to improve microbiological cleanliness in hospital settings.

### Cost or compensation

Taking part in this study will not result in any expense to you, and no compensation will be provided.

### Contact people for further questions or complaints

If you have a concern about any aspect of this study, you can ask the observer any questions and raise any concerns. If they cannot help, they will pass the question onto a senior member of the team. You may contact directly:

- National Institute of Public Health
- WaterAid Cambodia
- London School of Hygiene and Tropical Medicine

### Confidentiality

- All information will be kept strictly confidential. Any information about staff will also be anonymous. Your name and any identifying information will not be collected during this discussion.

### What will happen to information collected about me?

All information collected about you will be kept private. Only the study staff and authorities who check that the study is being carried out properly will be allowed to look at information about you. Data will be held by NIPH and will be sent to other study staff in London at the London School of Hygiene and Tropical Medicine. Transfer of data is necessary to analyse the data and draw conclusions on how to improve environmental hygiene in the hospital setting in Cambodia. Aggregate-level data will also be shared in the public domain for transparency – no individual identifiable data is collected as part of this trial. We will not ask you any identifiable information.

### Voluntary participation

Taking part is voluntary and you are free to stop your participation at any time. If you decide not to take part, we will respect your decision. We will not ask you why you do not want to participate. There will be no complaint or punishment.

## Permission to continue

“Do you have any questions for me?”

If informant has any questions, record questions and your response here:

_____

_____

_____

I,_____ (name of the respondent) have read and understood this text, understand what is expected of me and all my questions have been answered. I understand that I can ask for the observation to stop at any time without giving any reason. I freely accept to participate in this study.

_____ _____ **Date**: _____

*Respondent's name* *Signature*

_____ _____ **Date**: _____

*Witness's name* *Signature*

**Witness' signature:** A witness' signature and the thumbprint of the participant or nominated person are required only if the staff member is illiterate. If possible, this nominated person should be selected by the staff member and should have no connection to the study team.

I have witnessed the accurate reading of the consent form to the potential participant or nominated person, who has had the opportunity to ask questions. I confirm that the participant or nominated person has given consent freely.

Print name of witness: _____

Thumbprint of illiterate participant

Signature of witness: _____

Date: _____

**Investigator's signature:**

I have accurately read or witnessed the accurate reading of the consent form to the potential participant or nominated person, who has had the opportunity to ask questions. I confirm that the participant or nominated person has given consent freely.

I confirm that the participant or nominated person has given his or her consent and accepts to participate in the study.

Print name of investigator: _____

Thumbprint of illiterate participant

Signature of investigator: _____

Date: _____

A copy of this informed consent form has been provided to the participant or nominated person.
|___|___|___| (Initials of the principal investigator or assistant).

# The CLEAN Frontline Study: information on focus group discussions and consent from study participants with cleaning duties

**To be either read by the respondent or read aloud by the investigator. The respondent will then either sign the consent form or make a thumb print to indicate that they agree to participate in the study.**

## Introduction

Disinfection of hospital surfaces is essential to stop hospital-acquired infections (HAI) from occurring. We want to learn more about cleaners' experience and perception on cleaning techniques and products. To do this we are conducting focus group discussions. We shall use the findings to help improve environmental hygiene in hospital settings in Cambodia.

### Purpose of the focus group discussion

- To understand cleaners' practices, barriers and enablers for environmental hygiene
- To observe cleaners' cleaning fluids preparation and cleaning technique and practices
- To understand cleaners' perception of training on environmental hygiene

### Conditions for participation

We want to ask the participants some questions and observe them during cleaning practices. We will take a transcript of your answers and note your cleaning activities following an observation guide. Participation will be in Room X.

### What would take part involve?

The focus group discussions will take 45–90 minutes to complete. During this session, we will be asking you questions about environmental hygiene in this facility. No sensitive questions or personal questions will be asked.

### Do I have to take part?

No. It is up to you to decide to take part or not. If you do not want to take part, that is okay. Taking part is voluntary and you are free to stop the discussion process at any time. If you decide not to take part, we will respect your decision. We will not ask you why you do not want to participate. There will be no complaint or punishment, and your refusal to participate will not affect your work in the hospital.

### Risk or discomfort

We do not anticipate any risk to you during this discussion. No information on your personal performance will be passed on to any of your colleagues or managers. All information we collect is strictly confidential and anonymous.

### What are the possible benefits?

We cannot promise the study will help you, but the information we get from the study will help us, your hospital, and the NIPH's knowledge and understanding on ways to improve microbiological cleanliness in hospital settings.

### Cost or compensation

Taking part in this study will not result in any expense to you, and no compensation will be paid to you.

### Contact people for further questions or complaints

If you have a concern about any aspect of this study, you can ask the observer any questions and raise any concerns. If they cannot help, they will pass the question onto a senior member of the team. You may contact directly:

- WaterAid Cambodia
- London School of Hygiene and Tropical Medicine

### Confidentiality

All information will be kept strictly confidential by the research team. Any information about staff will also be anonymous. Your name and any identifying information will not be collected during this discussion. We strongly ask all the participants to keep all the information confidential. However, we cannot guarantee confidentiality among participants.

### What will happen to information collected about me?

All information collected about you will be kept private. Only the study staff and authorities who check that the study is being carried out properly will be allowed to look at information about you. Data will be held by NIPH and will be sent to other study staff in London, at the London School of Hygiene and Tropical Medicine. Transfer of data is necessary to analyse the data and draw conclusions on how to improve environmental hygiene in the hospital setting in Cambodia. Aggregate-level data will also be shared in the public domain for transparency – no individual identifiable data will be collected. We will not ask you any identifiable information.

### Voluntary participation

Taking part is voluntary and you are free to stop the observation process at any time. If you decide not to take part, we will respect your decision. We will not ask you why you do not want to participate. There will be no complaint or punishment.

## Permission to continue

“Do you have any questions for me?”

If informant has any questions, record questions and your response here:

_____

_____

_____

I,_____ (name of the respondent) have read and understood this text, understand what is expected of me and all my questions have been answered. I understand that I can ask for the observation to stop at any time without giving any reason. I freely accept to participate in this study.

_____ _____ **Date**: _____

*Respondent's name* *Signature*

_____ _____ **Date**: _____

*Witness's name* *Signature*

**Witness' signature:** A witness' signature and the thumbprint of the participant or nominated person are required only if the staff member is illiterate. If possible, this nominated person should be selected by the staff member and should have no connection to the study team.

I have witnessed the accurate reading of the consent form to the potential participant or nominated person, who has had the opportunity to ask questions. I confirm that the participant or nominated person has given consent freely.

**Investigator's signature:**

I have accurately read or witnessed the accurate reading of the consent form to the potential participant or nominated person, who has had the opportunity to ask questions. I confirm that the participant or nominated person has given consent freely.

I confirm that the participant or nominated person has given his or her consent and accepts to participate in the study.

A copy of this informed consent form has been provided to the participant or nominated person.
|___|___|___| (Initials of the principal investigator or assistant).

# Questionnaire for staff who clean

## Introduction

I am _____ from _____

### Purpose of the study

- To discover cleaning staff's insights and practices related to environmental hygiene
- To improve the quality of environmental hygiene
- To understand cleaning staff's feelings about their role in infection prevention and control

This project is in partnership with National Institute of Public Health, and your collaboration is very important to ensure its success and ultimately improve infection prevention practices in Cambodia. All cleaning staff across four wards in 13 hospitals will be asked to participate.

### What would take part involve?

We would like you to take part in one interview taking about 30–45 minutes. We will ask you questions about your knowledge and experience of cleaning and waste management at the hospital.

### Risk or discomfort

Please note that this interview is not aimed at testing you. We need your honest answers since this helps us to learn about improving things for everyone. All the answers will stay anonymous.

We may ask questions that you feel shy to answer or you do not want to answer. If this happens, you can refuse to answer or you can end the interview. You may find taking part in the interview is tiring. To minimize this, we will use short questions and sometimes ask you to demonstrate things.

### Benefits for participating

Benefit for this study is that the information that will be gathered will assist the government to provide the best services.

### Cost or compensation

Taking part in this study will not cost you anything. You will not be paid for taking part.

### Contact people for further questions or complaints

You can ask the interviewer any questions and raise any concerns. If they cannot help, they will pass the question onto a senior member of the team. You may contact directly:

- WaterAid Cambodia
- London School of Hygiene and Tropical Medicine

### Confidentiality

All information will be kept strictly confidential. Your name and any identifying information will be removed from publications so it will not be possible to link the responses to any particular person or setting. We are interested in what the whole group of respondents say and not any single person. Identifiable information will not be shared with your colleagues or facility managers

### Voluntary participation

Taking part in the interview is voluntary, and you are free to withdraw at any time. If you decide that you do not want to take part, we will respect your decision. There will be no complaint or punishment. But we will be happy if you can participate, because your views and experiences are very important for this study and the nation at large.

### Permission to continue

"Do you have any questions for me?"

If informant has any questions, record questions and your response here:

_____

_____

_____

I,_____ (name of the respondent) have read and understood this text, understand what is expected of me and all my questions have been answered. I understand that I can ask for the observation to stop at any time without giving any reason. I freely accept to participate in this study.

_____ _____ **Date**: _____

*Respondent's name* *Signature*

_____ _____ **Date**: _____

*Witness's name* *Signature*

**Witness' signature:** A witness' signature and the thumbprint of the participant or nominated person are required only if the staff member is illiterate. If possible, this nominated person should be selected by the staff member and should have no connection to the study team.

I have witnessed the accurate reading of the consent form to the potential participant or nominated person, who has had the opportunity to ask questions. I confirm that the participant or nominated person has given consent freely.

**Investigator's signature:**

I have accurately read or witnessed the accurate reading of the consent form to the potential participant or nominated person, who has had the opportunity to ask questions. I confirm that the participant or nominated person has given consent freely.

I confirm that the participant or nominated person has given his or her consent and accepts to participate in the study.

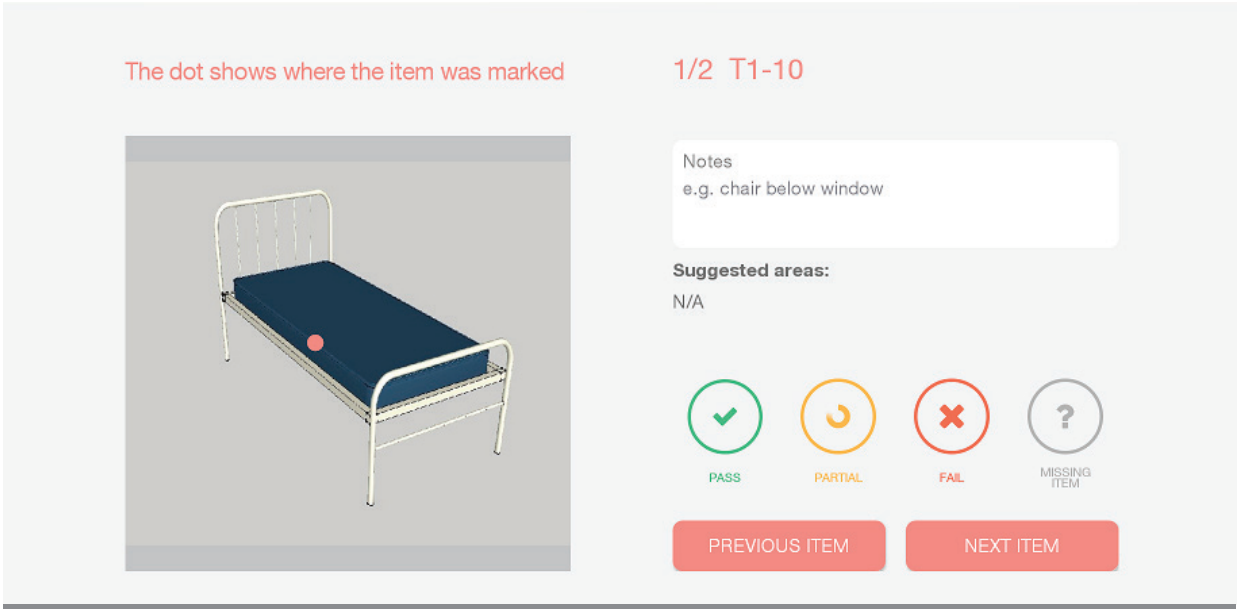
A copy of this informed consent form has been provided to the participant or nominated person.
|___|___|___| (Initials of the principal investigator or assistant).

Now we are going to start the interview. Feel free to ask any clarification and questions. If the question is unclear, please ask me to clarify it.

## United Republic of Tanzania study

Gon G, Kabanywanyi AM, Blinkhoff P, Cousens S, Dancer SJ, Graham WJ et al. The Clean pilot study: evaluation of an environmental hygiene intervention bundle in three Tanzanian hospitals. Antimicrob Resist Infect Control. 2021;10:8. doi: 10.1186/s13756-020-00866-8.

### 1. Guidance on gel dot positioning




Illustrated guidance on positioning of gel dots to assess quality of surface cleaning
©Clinell – Adapted for the EvaluClean app

### B) Layout

Illustration of hypothetical ward layout to guide selection of sampling sites (gel dot positioning) to assess environmental cleanliness
©Luca Gon and Giorgia Gon

## 2. United Republic of Tanzania study

Gon G, Kabanywanyi AM, Blinkhoff P, Cousens S, Dancer SJ, Graham WJ et al. The Clean pilot study: evaluation of an environmental hygiene intervention bundle in three Tanzanian hospitals. Antimicrob Resist Infect Control. 2021;10:8. doi: 10.1186/s13756-020-00866-8.

## 3. Sample size

Details of sample size calculations

- Each surface is considered a cluster.
- 10 surfaces per ward – for a total of 40 surfaces per hospital.
- We aimed to collect in total 20 samples per surface; 10 before the intervention across 14 weeks and 10 after the intervention across 14 weeks.
- This translates into 400 observations to be collected before and 400 after the intervention in each hospital.
- Our baseline predictions for cleaning behaviour are low. In the formative phase in two regions of the United Republic of Tanzania, the proportion of delivery beds was 15% (6 of 7 delivery beds were microbially clean). Table A.1.1 shows different scenarios, with the baseline percentage varying from 20% to 40%.
- We used the sample size formula for cluster-randomized trials to estimate which power scenarios we could expect from our sample size. We had at least 70% power to detect the scenarios shaded in grey in Table A1.1.

### Table A1.1. Sample size scenarios

| Number of surfaces per cluster | Clusters per facility | Baseline proportion | Post-int. proportion | ICC | Power |
|---|---|---|---|---|---|
| 10 | 40 | 20% | 30% | 0.01 | 97% |
| 10 | 40 | 20% | 30% | 0.15 | 73% |
| 10 | 40 | 40% | 50% | 0.01 | 77% |
| 10 | 40 | 40% | 50% | 0.15 | 45% |

## 4. United Republic of Tanzania study

Gon G, Kabanywanyi AM, Blinkhoff P, Cousens S, Dancer SJ, Graham WJ et al. The Clean pilot study: evaluation of an environmental hygiene intervention bundle in three Tanzanian hospitals. Antimicrob Resist Infect Control. 2021;10:8. doi: 10.1186/s13756-020-00866-8.

## 5. Sample topic guide for qualitative interviews

# Interview or focus group discussion topic guide (champions or cleaners)

### Expected duration: 45–60 minutes

### Aims

The aim of this interview is to investigate how trainers and health-care workers (managers, nurses and ward attendants – anyone involved in environmental hygiene) feel and think about environmental hygiene and what contextual elements help or hinder this activity. **Note that environmental hygiene refers to both cleaning and disinfection as well as waste disposal.**

### Participants

| ID# | Gender | Age group | Job title | Years at facility |
|---|---|---|---|---|
| | | | | |

Researcher name _____

Health facility number _____

Date |___|___/___|___/___|___|

Duration of interview

Location of interview

### Introduction

I am _____ from _____

- ✔ General purpose of the study (see additional text on separate page for below points)
- ✔ Aims of the interview and expected duration
- ✔ Who is involved in the process (other participants)
- ✔ Why the participant's cooperation is important
- ✔ What will happen with the collected information and how the participant or target group will benefit
- ✔ Any questions?
- ✔ Consent

**Ensure all major topics are covered, but cover them in whatever order is natural. Feel free to follow up on anything interesting or unexpected.**

**Ensuring environmental hygiene in the facility**

What do you think helps your ability to conduct or ensure (use the word ensure: for managers or trainers) environmental hygiene? Anything else?

What barriers do you face in conducting or ensuring environmental hygiene? (Prompts: time, other patient-caring activities, supplies, infrastructure, number of handwashing stations, water supply; quantity and quality, soap, waste disposal training or bins or equipment, workload, gender, staffing levels, knowledge, type of employment, conflict resolution, supervision, motivation etc.)

Considering the barriers you have just described, which three do you consider to be the highest priority and hence needing urgent action?

Do you think your colleagues respect the role of cleaning?

Are other priorities competing with these environmental tasks? (What other activities do you carry out in the maternity ward apart from cleaning; routinely and/or when necessary? Prompts: injections, dressing, drug dispensing, delivery). Which ones and how often?

You received the training of trainers at MUHAS in January 2019. What did you learn during the training? What do you remember most about the training? How different was it from what you did before?

Do you think anything has changed since the training in this facility? If so, what? And why?

Have you heard of the cleaning champions? What do you think about them (if they are champions – ask what they think about their role)? What makes them good champions? What should be the qualities of an ideal champion?

Were you able to implement what you learned during training on the ward? What made that easier? What made that difficult?

If you are interviewing a trainer or champion, please also ask: Did you provide training on environmental hygiene in the past few months? What did you think about the training. What was good? What was less good?

Has there been refresher training in your facility? When? Who facilitated it? What was the content of the refresher training? What did you think about the training? What was good? What was less good?

Have you received any kind of supervision since the training? From whom? What do you think about the supervision? What was good? What was less good?

How are you planning to give ongoing supervision to people that you trained (if you are interviewing champions).

What was your experience about people being able to change their practice after the training? Did people discuss problems they would face? Did you come across problems? What do you think makes people change their practice? What do you think motivates people?

If this training would need to be delivered elsewhere, what would you change to ensure the success of the training? What would you do to help people implement what they learned in training?

**Thank the respondents for their time. Enter the time the interview ended in the relevant boxes at the beginning of the questionnaire.**

## 6. Topic guide for an in-depth interview with training college

### Expected duration: 45–60 minutes

### Aims

The aim of this interview is to investigate how trainers and health-care workers (managers, nurses and ward attendants – anyone involved in environmental hygiene) feel and think about environmental hygiene and what contextual elements help or hinder this activity. **Note that environmental hygiene refers to both cleaning and disinfection as well as waste disposal.**

Participants ID#

Researcher name _____

Date |__|__/__|__/__|__|

Duration of interview

Location of interview

### Introduction

I am_____ from _____

- ✔ General purpose of the study (see additional text on separate page for below points)
- ✔ Aims of the interview and expected duration
- ✔ Who is involved in the process (other participants)
- ✔ Why the participant's cooperation is important
- ✔ What will happen with the collected information and how the participant or target group will benefit
- ✔ Any questions?
- ✔ Consent

We are hoping to get funds to repeat this project on a larger scale. To help us do this, could you tell us three things that you liked about the project – and three things that you think we should change in the future?

If these things are not covered in what they liked and what they did not like – probe on the following.

- What was their experience in adapting the tool?
- What was their experience in doing or conducting the training?
- What was the experience in supporting the training in the facilities?

What were the differences and similarities between the training in the three different hospitals and why do you think this happened?

The training manual included a module on supportive supervision – for the facility champions to follow up with the cleaners at their facility. What did they think of that module? Do they think that supervision of cleaners needs to be improved?

**Thank the respondents for their time. Enter the time the interview ended in the relevant boxes at the beginning of the questionnaire.**

## 7. United Republic of Tanzania study

Gon G, Kabanywanyi AM, Blinkhoff P, Cousens S, Dancer SJ, Graham WJ et al. The Clean pilot study: evaluation of an environmental hygiene intervention bundle in three Tanzanian hospitals. Antimicrob Resist Infect Control. 2021;10:8. doi: 10.1186/s13756-020-00866-8.

## 8. Selection of high-touch sites

High-touch sites are surfaces in the wards that are frequently touched, in particular by health-care workers, and thus pose a risk of pathogen cross-transmission. Studies in the United Kingdom and the United States summarized the most frequently touched high-touch sites. The high-touch sites near the patient pose the greatest risk of infection.

For this study, we chose to focus on patients' beds (mattress and frame – note: we anticipate mattresses to be sampled less frequently because sampling is only possible when no patients or bedsheets are present on the bed). This was found to be an important high-touch site in the literature. In addition, we conducted 10 30-minute observations to assess high-touch sites across the wards of interest in our study sites. For this observation, different wards were purposively sampled to provide a range of hospital environments. These observations took place during morning and afternoon shifts. The day and time of observation were chosen based on accessibility to the ward and logistic considerations. Beds were consistently the most touched area across the wards.

Bed frames and mattresses were also chosen based on the criteria listed in Table A.1.2, which we used to select which main high-touch sites to sample.

Beyond the bed frame and mattresses, we sampled four extra items in one facility since there was an insufficient number of beds: an equipment trolley, a bedside locker, a sink and a water tap used for hand hygiene. These were also found to be key high-touch sites in our formative research.

### Table A.1.2. Selection criteria for choosing evaluation site (red = NO; grey = YES)

| | Bed mattress | Bed frame | Trolley | Nursing table |
|---|---|---|---|---|
| 1. Minimal disruption of patient experience | | | | |
| 2. Key high-touch site across wards and thus poses risk to pathogen transmission to patients (within patient zone) | | | | |
| 3. Cleaned at least daily | | | | |
| 4. Sufficient in number in each ward | | | | |
| 5. Present consistently across wards to ease data collection | | | | |
| 6. Unlikely to move from room within the six months | | | | |
| 7. Needs to address cleaning behaviour | | | | |
| 8. Material okay for the use of gel dots | Cloth and patient movement makes it hard | | | |

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