A Technical Guide to Implementing a Continuous Quality Improvement Approach to Strengthen Infection Prevention and Control Programs at Health Facilities in MTaPS Program Countries

Background

Health care-associated infections (HAI) are a global patient safety problem resulting in prolonged hospital stays, the development and spread of antimicrobial resistance, and an increased financial burden on health systems and patients. A patient is at risk of acquiring an infection in a health facility in any country, but the risk is particularly high in low- and middle-income countries (LMICs). These countries typically have underfunded health systems and weak infection control measures, including a lack of infection prevention and control (IPC) products and poor hand hygiene practices. HAI surveillance requires resources and expertise that are not always available in LMIC health facilities, making it difficult to know and address the true burden of HAIs. A meta-analysis published in *The Lancet*[1] suggests that the prevalence of HAIs in LMICs (pooled) was approximately 15.5 per 100 patients, which is at least three times higher than the prevalence in high-income countries.

World Health Organization (WHO) guidelines and publications[2] establish a strong correlation between a country's IPC practices and its HAI rate. A comprehensive IPC study conducted in Uganda with MTaPS' assistance also established a correlation between facilities' IPC performance, as evaluated through the Infection Prevention and Control Assessment Framework (IPCAF), Hand Hygiene Self-Assessment Framework (HHSAF), and the HAI point prevalence survey; for example, three regional referral hospitals scoring "basic" in HHSAF and "inadequate" in hand hygiene compliance studies showed HAI prevalence of 26.2%, 16.4%, and 15.4%.

Reliable data from comprehensive studies, like those done with MTaPS' assistance in Uganda, Cameroon, and Senegal, that use standardized assessment tools such as IPCAF[3], HHSAF[4], the hand hygiene observation form, and a modified Centers for Disease Control and Prevention HAI surveillance tool, will inform the development of IPC improvement plans by hospital infection control committees (ICCs).

[1] Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. Lancet 2011; 377: 228–41. https://www.thelancet.com/action/showPdf?pii=S0140-6736%2810%2961458-4
[2] https://www.who.int/gpsc/tools/faqs/evidence_hand_hygiene/en/
[3] https://www.who.int/infection-prevention/tools/core-components/IPCAF-facility.PDF
[4] https://www.who.int/gpsc/country_work/hhsa_framework_October_2010.pdf

Purpose of this Implementation Guide

Facility ICCs are the major drivers of the IPC improvement process. Not all facilities have a fully functional ICC or even a single IPC champion; therefore, an MTaPS Global Health Security Agenda program goal is to help countries establish or strengthen ICCs by providing direct hands-on technical assistance and ongoing capacity strengthening by guiding them through IPC management processes. MTaPS will follow key guidance on improving core components of IPC at the facility level;[5] however, every step in implementing core IPC components requires ongoing performance analysis and a search for more efficient ways to improve IPC performance. The purpose of this document is to provide facility ICCs with a step-wise approach and simple frameworks that introduce continuous quality improvement (CQI) processes to respond to the question stemming from IPC surveys—How do we improve?—thus ensuring sustainable capacity building and desired IPC behavior change.

Take Key Steps to Implement CQI

CQI is an iterative process for identifying IPC performance challenges, developing and testing interventions, and mainstreaming them into facility practices. Adopting a CQI philosophy requires a long-term commitment from facility leadership and staff to continuously reassess their IPC behaviors and practices and learn from those assessments to maintain the high IPC standards defined in national guidelines. Health facilities implementing a CQI program to strengthen IPC practices may choose from a variety of established methods and tools, but all methods generally include the following key steps.

Establish a CQI team: The CQI team should be representative of the health facility, be a part of the facility ICC, and work closely with members of existing governance bodies such as the medicines and therapeutics committee. CQI should be included in the ICC terms of reference, especially if CQI is required by local accreditation rules. However, it may start off as a smaller independent group that is led by a CQI champion with a mandate from the facility leadership and initially focus on one problem or one ward before expanding to involve nurses, doctors, additional wards, and eventually the entire facility. Many facilities in LMICs already have quality improvement bodies or teams, and their lessons learned in implementing activities should be included in the CQI for IPC work. If an ICC does not exist, this body can take on the role of improving IPC by forming a sub-committee or engaging IPC personnel (e.g., nurses, clinicians) in this effort. Team members must have knowledge of the work and the resources to run CQI cycles.

Define priority goals: Using WHO's IPC self-assessment tools provides an excellent opportunity to collect baseline data and develop an understanding of the facility's IPC program. However, given limited resources, health facilities in LMICs must prioritize the high-risk/high-impact challenges to address through analyses such as cause-effect, root cause, and other techniques (discussed below).

Establish a baseline: Results from WHO self-assessment tools such as IPCAF and HHSAF provide good snapshots of the status of IPC practices at a facility; a basis for an IPC strengthening strategy; and, when used regularly, a measure of change and IPC program impact. Setting CQI cycle targets requires more granular data that can be obtained from data collection tools that focus on specific IPC practices; for example, the USAID-

[5] Improving infection prevention and control at the health facility: Interim practical manual supporting implementation of the WHO. Guidelines on Core Components of Infection Prevention and Control Programmes. Geneva: World Health Organization; 2018 (WHO/HIS/SDS/2018.10).

funded SIAPS Infection Control Assessment Tool for Primary Health Care Facilities[6] and the WHO hand hygiene assessment tools provide sample checklists that can be used to obtain granular data to inform specific interventions.[7] The CQI team may also need to develop checklists and data collection forms for specific tasks required to implement small changes.

Start small: When introducing CQI, it is important to implement new changes at the smallest feasible scale—one action, one station, one nurse. Facilities may need to break a bigger project into smaller parts because shorter and faster CQI cycles more efficiently demonstrate the strengths and value of a CQI approach. The CQI team may need to run multiple short CQI cycles to identify, test, and offer solutions for just one IPC challenge. For example, improving hand-washing behavior may have many solutions, such as improving access to hand hygiene products, the development and proper placement of job aids and reminders, removing educational gaps, identifying and rewarding role models, and addressing individual and cultural beliefs.

Adopt a patient-centered approach to CQI: Regardless of the actions, the goal is always safety, and priority interventions are those that directly improve patient, staff, and public safety by reducing threats of infection transmission and spread of drug resistance. For example, a hand hygiene compliance by moment study[8] in Ugandan health facilities conducted with MTaPS' assistance showed that the highest health care worker compliance was after touching a patient (40%) and the lowest was before a clean/aseptic procedure on a patient (15%), clearly indicating self-protection as a higher priority for the health care worker or a lack of belief that hand washing prevents cross-infection—both of which put patients at risk. A study result like this should inform priority interventions for ensuring patient safety; in addition, patient feedback can be used to measure CQI success.

Determine thresholds for success: Identify when an intervention is considered successful and ready to roll out to the entire facility, and schedule a date to reevaluate a successful intervention to ensure sustainability. Thresholds for success must reflect sufficient (for the time being) improvement, such as moving from a basic to intermediate score for hand hygiene compliance (e.g., from 75% to 80%) in a targeted ward, which will allow the CQI team to stop, analyze, and set a new target or move to the next priority challenge.

Build up the CQI plan of action systematically: Consider different approaches to reaching the desired improvement, and do not necessarily select the first intervention idea that comes up in CQI team discussions. Root cause and cause-effect analyses, discussed below, will help identify options to test through CQI cycles.

Collect and analyze data and publish evidence: Publicly available evidence (at the facility level and beyond) of the value and efficacy of quality improvement actions helps overcome possible staff resistance to CQI, recruit new CQI champions, and expand the program. Use proof of the success of selected actions to develop logic models (discussed below) to expand the CQI program in the facility and share it with other facilities. Solid data also help with decision making on improvement strategies, funding, and procurement priorities and may be essential to document improvements for accreditation or certification or to mobilize funding for IPC.

Sustain the CQI program: CQI is not a scheduled or ad hoc campaign, but an ongoing performance improvement and learning process. Solutions to problems should be constantly tested, analyzed, adjusted,

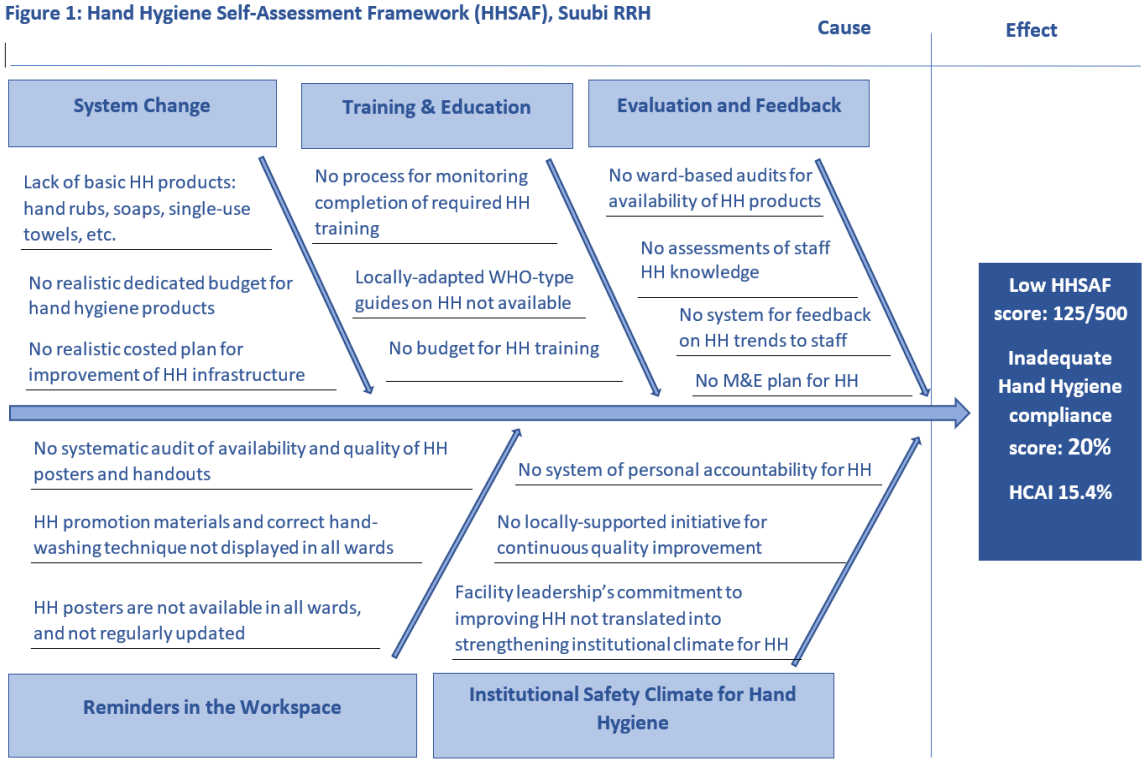
[6] http://siapsprogram.org/wp-content/uploads/2013/01/12-137-ICAT-PCH.FINAL_.pdf
[7] https://www.who.int/gpsc/5may/tools/evaluation_feedback/en/
[8] https://www.who.int/gpsc/5may/background/5moments/en/

perfected, and implemented to achieve sustainable improvements in patient safety and curb antimicrobial resistance. Good documentation of results, including through replicable logic models, demonstrate impact and help scale up and sustain the CQI program.

Identify Priority Targets for Improvement

As mentioned, tools such as IPCAF may identify a lot of IPC gaps that require attention. For CQI purposes, it is important to dig deep into these performance gaps to get to their root causes, narrow them down, and prioritize them to test and roll out improvement interventions. The two most common techniques for identifying cause-effect relationships and analyzing root causes are recommended for use in health quality improvement programs (annex 1). Cause-effect analysis can be done using a fishbone diagram, as in the example of HHSAF results at Suubi regional referral hospital in Uganda in July 2019 (figure 1).[9] The fishbone graph is a simple way to create an at-a-glance visual of key gaps in the elements of hand hygiene and prioritize challenges for further, more detailed analysis.

Figure 1: Hand Hygiene Self-Assessment Framework (HHSAF), Suubi RRH



In this example, it is clear that very low hand hygiene compliance of 20% is difficult to address if key hand hygiene products are not available. It is also clear that other problems contribute to low hand hygiene compliance, such as a lack of simple guidelines and visual materials and, most importantly, a lack of monitoring and evaluation of hand hygiene practices. However, addressing the availability of hand hygiene products is a good place to start. With strong commitment from facility leadership and the presence of local CQI champions, it is possible to run several improvement tasks simultaneously, (e.g., addressing access to hand

[9] For illustrative purposes, real data from an IPC survey in Uganda (2019) is used throughout this guide. However, the hospital name and examples of different types of analyses based on these data are simulations.

hygiene products, improving visual aids for hand hygiene, and educating staff). Because one problem may require multiple inputs and actions, the development of a logic model (below) for achieving a set goal is highly recommended.

Once the team has determined a primary cause of a problem, it must identify a root cause to target an intervention. A common technique used for root cause analysis is the "5 WHYs," which requires the CQI team to ask the same question—such as "Why is it occurring?"—several times to get deeper into the root cause. The real and lasting solution lies in treating the deeply rooted cause(s) of a problem rather than only the symptoms that appear on the surface. In a simulation example of a root cause analysis based on actual data from a HHSAF survey at Suubi regional referral hospital in Uganda (figure 2), the problem to resolve is a very low rate of hand hygiene compliance among staff.

Figure 2: Root Cause Analysis: Suubi RRH

Formulate the problem	HCW's HH compliance below 20% at Maternity ward
Why is this problem occuring?	**Primary Cause** Why is it occuring? 1 Lack of basic HH products in wards Why is it occuring? 2 Not enough HH products procured Why is it occuring? 3 Budget for HH products allocated based on previous consumption Why is it occuring? 4 Actual adequate need in HH products to comply with HH standards not known Why is it occuring? **Root Cause:** 5 No ward-based audits for availability of HH products ever conducted **NOTE: If there is no manageable solution to the final "Why", return to the one before it**
Required action	**What must be done to resolve the problem?** Assign an observer for three days within a week to: - Track the availability of HH products in Maternity Ward in relation to instances when the products (such as hand rubs) were required according to WHO standards: 1) before patient contact; 2) before aseptic task; 3) after bodily fluid risk exposure; 4) after patient contact; 5) after contact with patient surroundings - Observe HH behavior **Next steps** For IPC committee: Quantify and cost out the actual need (3 days); present results to the hospital leadership to discuss the need, required budget, and next procurement steps; If budget cannot be made available, conduct analysis of other options (donor, crowdfunding, or community enagagement e.g.) **Person responsible**: N. Esther Were **Start date**: 21-Oct-19 **Completion date**: 31-Oct-19 **Problem resolved?**

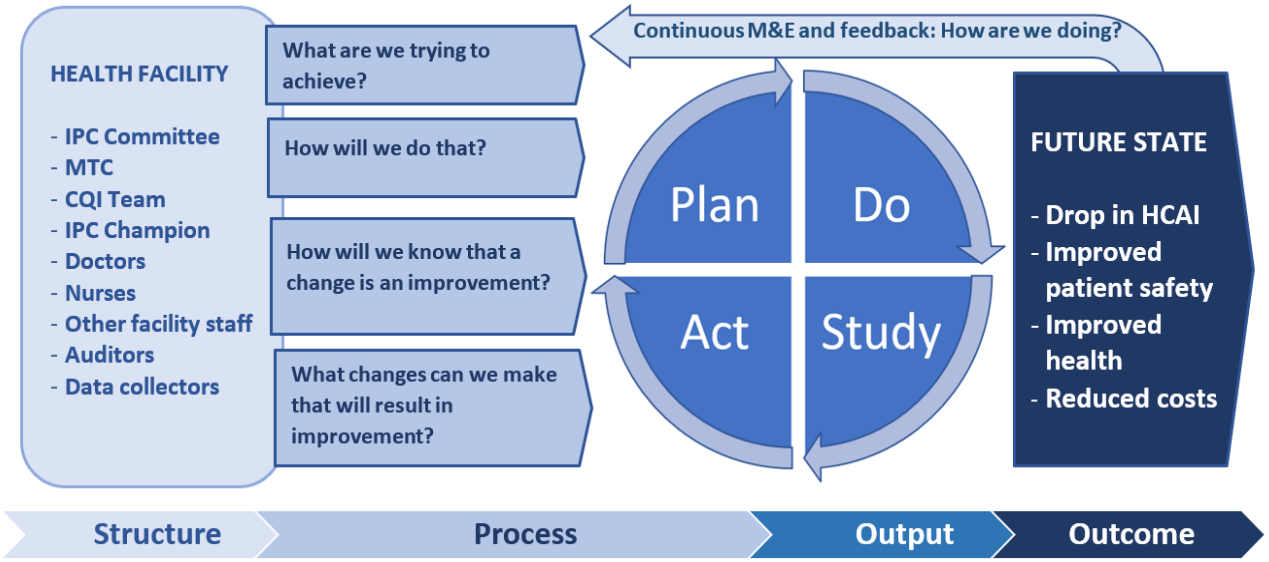
A reported cause of low hand hygiene compliance is frequent stock-outs of basic hand hygiene supplies, such as hand rubs, soaps, and disposable towels. In our simulation, deeper probing through follow-on "why" questions revealed that the hospital's procurement of hand hygiene products is based on historic consumption and that no audit had ever been done of product availability based on the number of patients and required hand hygiene standards. This finding effectively becomes a priority gap (root cause) to address. The CQI team

then develops an activity as a step toward resolving the problem of hand hygiene product availability and assigns responsibilities, creates timelines, and determines next steps.

Repeat CQI Cycles

Once the root cause has been identified and actions designed through the processes discussed above, they must be tested through CQI cycles for effectiveness and acceptability before being implemented facility-wide. Many frameworks and tools are available for quality improvement in health.[10] A common CQI method for the facility level is the Plan-Do-Study-Act (PDSA) or Deming cycle.[11] This guides a facility through prioritizing and testing small improvement steps and running multiple cycles with limited resources before implementing change on a large scale. The PDSA cycle adapted for IPC is shown in figure 3.[12]

Figure 3: The Plan-Do-Study-Act (PDSA) Cycle for IPC Continuous Quality Improvement



The four key steps to the PDSA framework are:

1. **PLAN: Develop a performance improvement mini-plan and an intervention for change**
   - Define an objective for change/improvement (what are we trying to achieve?)
   - Select a priority target that requires change: identify a cause for a specific performance failure (through root cause or cause-effect analyses)
   - Select desired changes at the smallest possible scale
   - Use the SMART approach to define an intervention:

[10] Kelly M. Pyrek. Infection Prevention Boosted by Quality Improvement Strategies. March 2014. Infection Control Today. https://www.infectioncontroltoday.com/

[11] The W. Edwards Deming Institute. The Plan-Do-Study-Act (PDSA) Cycle. https://deming.org/explore/p-d-s-a

[12] Adapted from Institute for Health Care Improvement http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementHowtoImprove.aspx

- **S**pecific: target one desired change in a specific IPC area (e.g., hand hygiene habits prior to patient encounter in one ward)
- **M**easurable: ensure data collection tools/check lists are available and parameters are definable
- **A**chievable: make sure there are no obvious obstacles to improving hand hygiene, such as absence of running water or hand sanitizers; set the target at a realistic threshold, such as increasing compliance rate for hand hygiene from 5% to 25%, which may be sufficiently reasonable and achievable for the current round of quality improvement
- **R**elevant: link evidence to gap; for example, data that bad hand hygiene results in increased HAI in a maternity ward
- **T**ime-bound: set shorter PDSA cycles for small incremental improvements, which are more efficient than long, ambitious intervention programs

- Identify the measurement of change (e.g., indicators, parameters, thresholds) and data collection process and means (e.g., checklists)
- Define the specific intervention to be tested to achieve change
- Identify responsible persons and timeline

2. DO: Implement the plan

- Test the intervention
- Document implementation steps
- Collect data for measurement
- Collect feedback from the implementers and the intervention targets
- Document implementation barriers and enablers

3. STUDY: Analyze the results

- Analyze collected data and gather feedback from the testers, staff, and patients when possible
- Determine whether the data collection tools, sources, and methods were adequate to measure the intervention's effect
- Study the outcome: check the result against the goal and target measurements
- Study the process: see if there is a more efficient way to achieve the same result
- Sum up the efficacy of the tested intervention in a short document (what worked, what didn't, barriers, enablers)

4. ACT: Decide on action and next steps (three As)

- **Abandon**: the intervention did not work, and the result was not achieved (i.e., wrong approach, premature intervention); intervention must be completely reconsidered and new PDSA cycle must be run
- **Adjust**: the intervention did not fully achieve desired results but was generally appropriate; barriers have been identified, measurements adjusted if necessary, team supplemented with missing expertise, intervention steps adjusted; new PDSA cycle must be run for proof of adjustments**.** *Multiple PDSA cycles may be needed to identify an optimal intervention*
- **Adopt**: the intervention achieved desired results; document the process for replicability and roll out as a standard process and measurement to entire facility or other facilities

A simple PDSA cycle worksheet could be developed to guide the process (figure 4). A PDSA worksheet template is in annex 2

Figure 4: PDSA Worksheet example

Facility: Suubi regional referral hospital **Date:** September 2, 2019
CQI team: Esther Were, Gloria Twesigye

Problem to be addressed: Low compliance with HH standards in Maternity Ward attributed by staff to frequent stock-outs of HH products (hand rubs).

Assumptions (theory or solution to be tested): Stock-outs of hand rubs are a result of improper quantification of needs that is not done based on patient encounters and HH standards. An audit by direct observation of availability of HH products to satisfy HH standards will provide evidence for product needs and required budget

		Description	Person	Dates	Done?
Plan					
	Steps to perform	Observe for 3 hours during three days of the week HH activity of staff in Maternity Ward. Record events when HH was not adequate due to lack of products. As a side observation, record instances of non-compliance when the HH products were available	EW, GT	Sept 23–27	Yes
	Measurements, thresholds	Standard HH checklist; current HH compliance rate of 20% is a baseline			
Do					
	Actions	Observations took place on September 23, 25, and 27			
	Observations	Sept 23: Ward ran out of hand rubs in 2 hours Sept 25: New supply, full availability Sept 27: Empty stations in the morning, full next 2 hours	EW, GT	Sept 23–27	Yes
Study					
	What worked, what didn't	Rate of HH compliance increased to 55% during the time HH products were fully available			
	Data collected	Observation allowed to count number of instances when hands must be washed according to standards; information to be used for estimation of weekly need in HH products at the Ward			
	Lessons learned	Availability of products alone does not ensure full compliance with HH standards; Staff was aware of the observation by CQI team Audits should be made a regular procedure to inform IPC program			
Act					
	Abandon				
	Adjust	Make adjustments to checklists	TML	Oct 7	
	Adopt	Adopt as a regular process in the Ward			
Next steps					
	Next PDSA	Discuss procurement with director; measure compliance in the situation of full supply of HH products	TML	Oct 28	

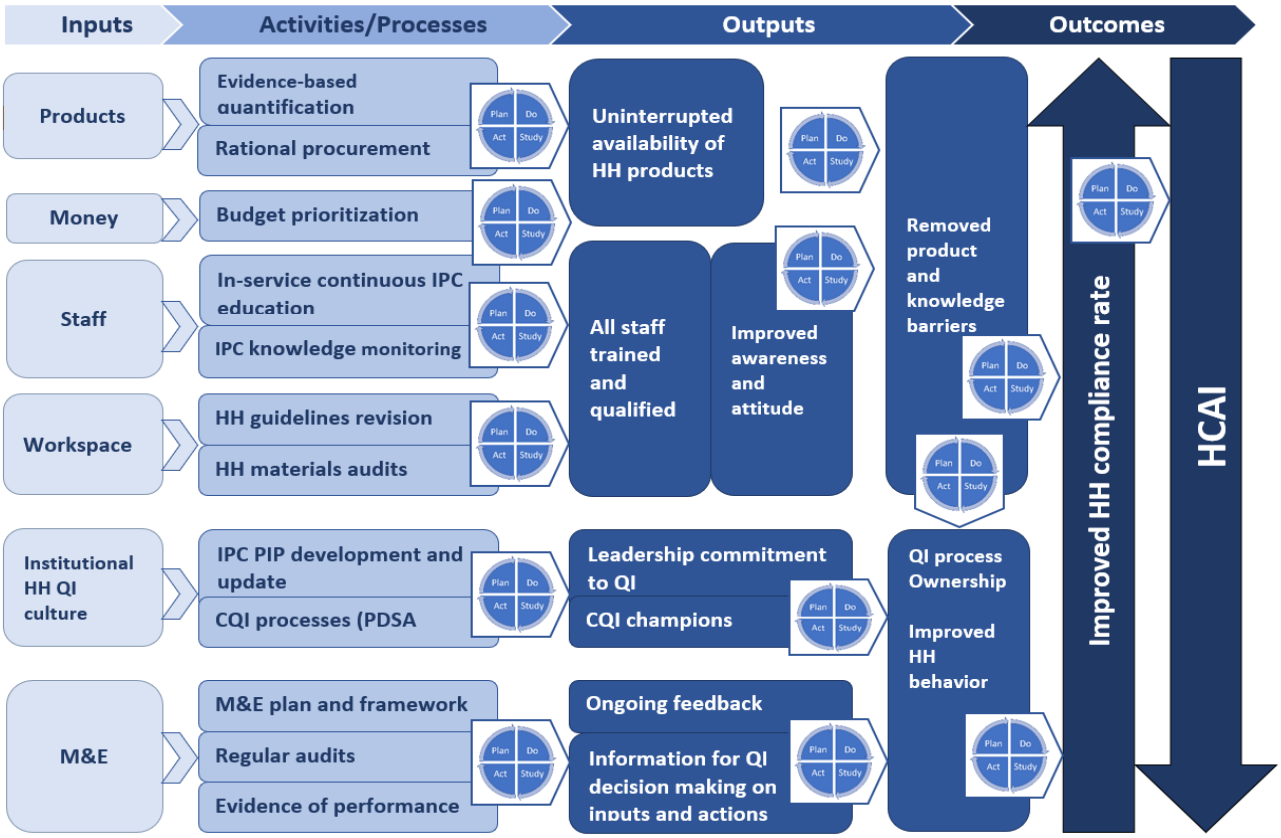
Apply Logic Frameworks

In this example, which was based on an HHSAF survey and fishbone analysis, there was more than one cause for low hand hygiene compliance. A logic framework is the best way to present a series of assumptions and proposed solutions for testing via multiple PDSA cycles, which then become the backbone of a performance implementation plan.

The example (figure 5) is a logic framework developed for Suubi regional referral hospital that is based on actual HHSAF results and mock cause-effect and root cause analyses. The assumptions made here regarding

activities that result in outputs and outputs that contribute to actual outcomes will require testing using multiple PDSA cycles at every step. For example, lack of hand hygiene products is often assumed to be the sole reason for low hand hygiene compliance; however, studies have shown other contributing factors, many in the realm of human behavior.[13]

Figure 5: Mock Logic Model for HH Performance Improvement Plan at Suubi Referral Hospital



Implement and Mainstream

Even the best solutions to improve IPC practices tested through PDSA cycles will only be successful if they become a mainstream practice for the entire facility staff. The CQI team should describe results of PDSA tests and work with the ICC and leadership to adopt the intervention as a required practice, thus moving through the facility's IPC performance improvement plan and adding CQI methods to its performance monitoring framework.

[13] Kelvin Kong, Sarah Kong. A quality improvement project in a hospital in rural Nepal – improving infection control practice using the 'Plan, Do, Study, Act' (PDSA) cycle. International Journal of Infection Control, 2013; 9(3) http://www.ijic.info/article/view/11225.

Annex 1: CQI References and Resources

Tools and frameworks

Free downloadable templates for planning CQI and collecting and analyzing data:

- Institute for Healthcare Improvement (IHI): Quality Improvement Essentials Toolkit http://www.ihi.org/resources/Pages/Tools/Quality-Improvement-Essentials-Toolkit.aspx?gclid=EAIaIQobChMIvZnFn72m5QIVh8DICh377ALYEAAYASACEgK0rPD_BwE

Downloadable CQI tools:

- Smartsheets. Where Data Serves People: Benefits of the Continuous Quality Improvement Approach https://www.smartsheet.com/continuous-quality-improvement https://www.smartsheet.com/free-root-cause-analysis-templates-complete-collection

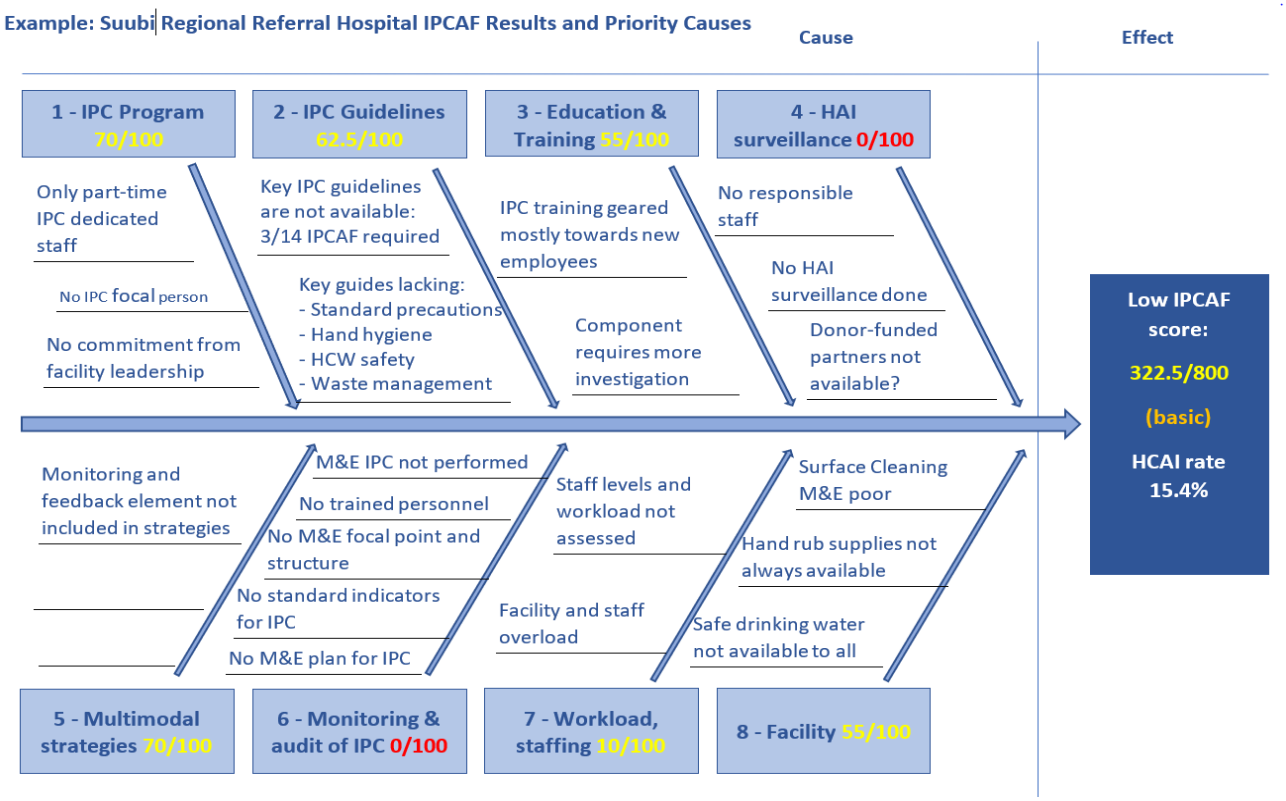
For in-depth learning

USA Joint Commission Guide: Measuring Hand Hygiene Adherence: Overcoming the Challenges. The Joint Commission Mission. 2009 https://www.jointcommission.org/assets/1/18/hh_monograph.pdf

Addressing Healthcare-Associated Infections (HAIs) in Nursing Homes Using Quality Assurance & Performance Improvement (QAPI). Quality Improvement Organizations. Health Services Advisory Group https://www.hsag.com/contentassets/ef5acda40bd64e228efa9a104fcea205/addressing-hai-in-nhs-using-qapi-handout_pubbed_final_508.pdf (with additional links to CQI materials)

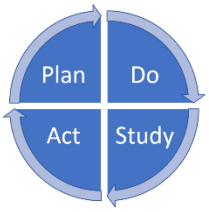
Infection Prevention Boosted by Quality Improvement Strategies. Infection Control Today https://www.infectioncontroltoday.com/best-practices-compliance/infection-prevention-boosted-quality-improvement-strategies

Annex 2: Example of IPCAF-based Cause-Effect Analysis



Annex 3: Templates

PDSA Worksheet



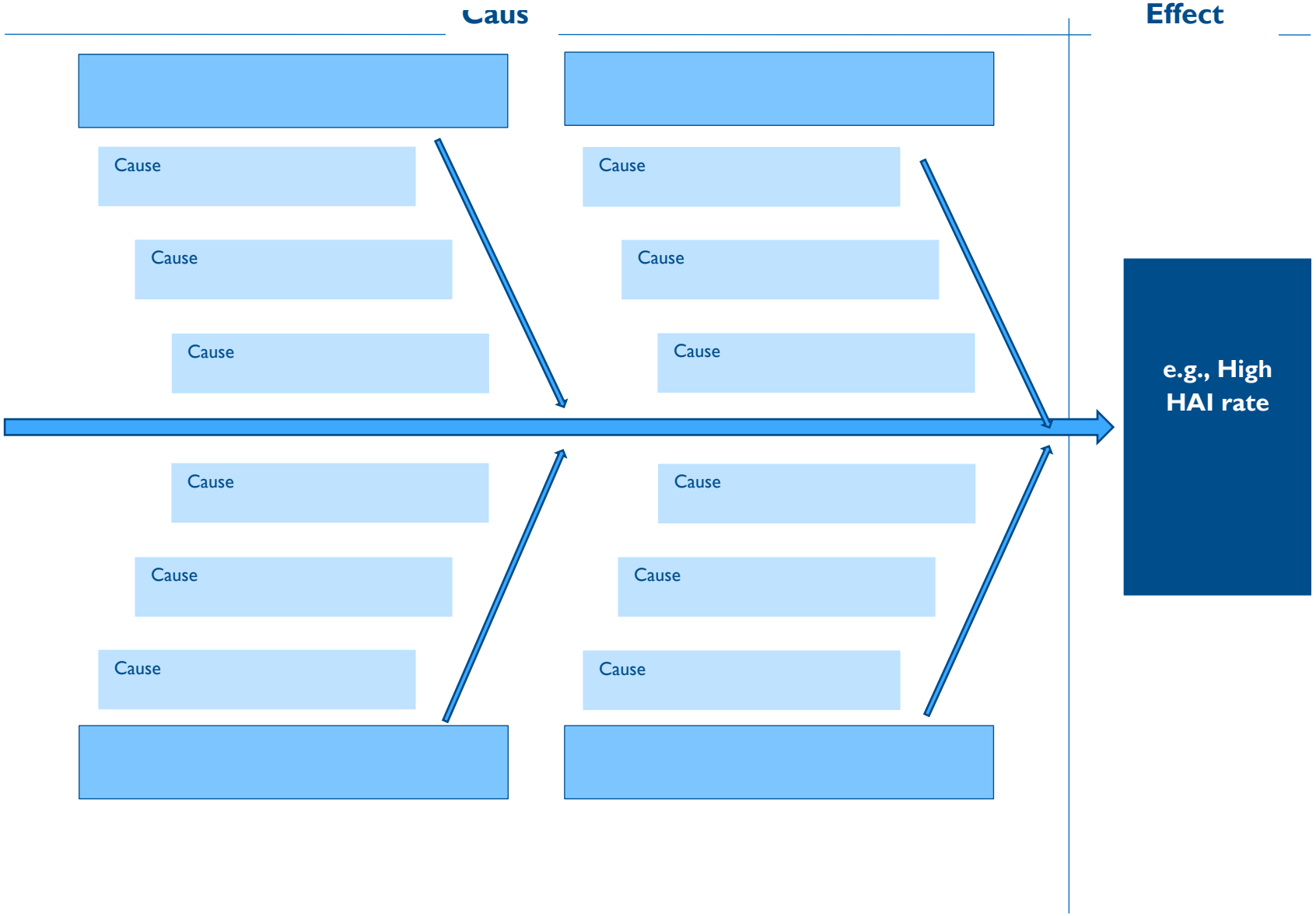
Facility_____
Date_____

CQI team-

_____

Problem to be addressed:					
Assumptions (theory or solution to be tested):					
		Description	**Person**	**Dates**	**Done?**
Plan					
	Steps to perform				
	Measurements, thresholds				
Do					
	Actions				
	Observations				
Study					
	What worked				
	What didn't work				
	Data collected				
	Lessons learned				
Act					
	Abandon				
	Adapt				
	Adopt				
Next steps					
	Next PDSA				

Cause and Effect Analysis



Root Cause Analysis: Five WHYs (embeded Excel file, adapted from Smartsheets)

Formulate the problem	(Formulate the problem here)
Why is this problem occuring?	**Primary Cause** Why is it occuring? 1 It is happening because Why is it occuring? 2 It is happening because Why is it occuring? 3 It is happening because Why is it occuring? 4 It is happening because Why is it occuring? **Root Cause:** 5 It is happening because **NOTE: If there is no manageable solution to the final "Why", return to the one before it**
Required intervention / action	**What must be done to resolve the problem?** Describe intervention here **Person responsible** **Start date** **Completion date** **Next steps** (e.g. test by running a PDSA cycle) **Problem resolved?**

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