# Infection Prevention and Control in ASEAN Member States

## Landscape Assessment Report

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**Infection Prevention and Control in ASEAN Member States: Landscape Assessment Report**

The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967. The Member States of the Association are Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, and Viet Nam.
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ASEAN: A Community of Opportunities for All

# Infection Prevention and Control in ASEAN Member States

## Landscape Assessment Report

The ASEAN Secretariat

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## Acronyms

**AMR:** Antimicrobial Resistance

**AMS:** ASEAN Member States

**ASEAN:** Association of Southeast Asian Nations

**ASP:** Antimicrobial Stewardship Programme

**CAUTI:** Catheter-Associated Urinary Tract Infection

**CABSI:** Catheter-Associated Bloodstream Infection

**CLABSI:** Central Line-Associated Bloodstream Infection

**CC:** Core Component

**CDC:** Centers for Disease Control and Prevention

**CME:** Continuing medical education

**COVID-19:** Coronavirus disease 2019

**CPE:** Carbapenemase-producing Enterobacterales

**CRE:** Carbapenem-resistant Enterobacterales

**CRO:** Carbapenem-resistant Organism

**ESBL:** Extended-spectrum beta-lactamase

**FP**: Focal Point

**HAI:** Healthcare-Associated Infections

**HCAI:** Health care-Associated Infections

**HCF:** Healthcare Facility

**HIC:** High-Income Country

**HW:** Healthcare Worker

**HCWM:** Healthcare Waste Management

**HH:** Hand Hygiene

**ICU:** Intensive Care Unit

**IPC:** Infection Prevention and Control

**IPCAF:** Infection Prevention and Control Assessment Framework

**IPCAT:** Infection Prevention and Control Assessment Tool

**JEE:** Joint External Evaluation

**KAP:** Knowledge, Attitude and Practice

**LIC:** Low-Income Country

**LMIC:** Low-Middle Income Country

**MDR:** Multidrug Resistant

**MDRO:** Multidrug Resistant Organism

**M&E:** Monitoring and Evaluation
**MOH:** Ministry of Health
**MR:** Minimum Requirements
**MRSA:** Methicillin-resistant Staphylococcus aureus
**OHS:** Occupational Health and Safety
**PDR:** People's Democratic Republic
**PPE:** Personal Protective Equipment
**PX-UV:** Pulsed-Xenon Ultraviolet
**SOP:** Standard Operating Procedure
**SSI:** Surgical Site Infection
**TF:** Task Force
**U.S. CDC:** United States Centers for Disease Control and Prevention
**UTI:** Urinary Tract Infection
**VAP:** Ventilator-Associated Pneumonia
**WASH:** Water, Sanitation and Hygiene
**WGS:** Whole-genome sequencing
**WHO:** World Health Organization

# Acknowledgments

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# Executive Summary

## Introduction

Effective infection prevention and control (IPC) help reduce healthcare-associated infections (HAIs), improve patient safety, combat antimicrobial resistance (AMR), and strengthen preparedness and response for outbreaks and pandemics. The Association of Southeast Asian Nations (ASEAN) through the ASEAN Health Sector and the U.S. Centers for Disease Control and Prevention (CDC) collaborate through the ASEAN-US IPC Task Force to strengthen IPC in the region, guided by the ASEAN-U.S. IPC Task Force Work Plan 2023-2025 and under the umbrella of the ASEAN-U.S. Health Cooperation. To guide further improvements, an understanding of current regional IPC capacities at national and healthcare facility (HCF) levels is needed.

## Objective

This regional IPC landscape assessment aims to provide an overview of the implementation of IPC programmes in ASEAN Member States (AMS), covering their structure, strengths, challenges, and opportunities, to inform AMS and guide the Task Force to set priorities for the future.

## Methodology

**The IPC Landscape Assessment, conducted from December 2023 to June 2025, used three main information sources.** These include self-administered World Health Organization (WHO) standardised assessments of national IPC programmes, Infection Prevention and Control Assessment Tool-Minimum Requirements (IPCAT-MR) and Infection Prevention and Control Assessment Framework-Minimum Requirements (IPCAF-MR) for healthcare facility (HCF) IPC programmes, and a desk review of published articles and relevant documents (e.g. policies, guidelines, action plans). The assessment analysed data from nine AMS for the national IPC programs and eight AMS for the HCF IPC programmes and processed the data in Excel and Looker Studio. The data above was complemented by uploaded country materials and literature from multiple databases and official sources. Findings for each Core Component (CC) were synthesised across the three approaches and the Task Force (TF) members reviewed, revised, and approved them.

## Findings

**All 10 AMS have national IPC programmes.** Nine AMS shared detailed data from the WHO IPCAT-MR at the national level. These countries have an average total score of 80% across the six CC. Eight countries shared detailed data from the facility-level using the WHO IPCAF-MR tools for primary, secondary and tertiary care. Total scores for 890 HCFs across eight AMS have a weighted average of over 80% with primary level facilities scoring 81% (n=482), secondary level facilities scoring 89% (n=274), and tertiary level facilities 88% (n=134), indicating strong performance

across the eight CC MR indicators. Average CC scores for HCFs were weighted to account for the different number of hospitals submitting data from each AMS.

**The strongest and most consistent performance among AMS is seen in IPC guidelines, multimodal strategies at national and HCF levels.** CC minimum requirements (MR) indicators showing strong and consistent performance were *IPC guidelines* (CC2) at national and HCF levels (both >90% average score), *IPC programmes* (CC1) at the national level (89% average score), and *Multimodal strategies* (CC5) (100% and 88% average scores for national and facility levels, respectively), *Built environment, materials and equipment for IPC* (CC8) (≥90% average score) at all HCF levels. The achievement of other CC MR indicators varies at the national and facility levels. *IPC education and training (CC3)* and *IPC programmes* (CC1) (92% and 88% average scores, respectively) demonstrate robustness at the tertiary HCF level only.

**Least consistent performance among AMS is seen in IPC education and training and monitoring/audit of IPC practices and feedback at national and HCF levels; and workload, staffing and bed occupancy at facility level.** CC MR indicators implemented least consistently at national level are *IPC education and training* (CC3) (67% average score) and *Monitoring/audit of IPC practices and feedback* (CC6) (64% average score). Across all HCF levels, workload and staffing are a recurrent issue, reflected by the lowest average score of *Workload, staffing and bed occupancy* (CC7), particularly at the primary HCF level (average score of 58%, six AMS with HCF scoring between 0 and 92%, with only one AMS having a score ≥70%). The scores for *Healthcare-Associated Infections* (*HAI) surveillance (CC4)* have room for improvement (83% average score at secondary level facilities, 85% at tertiary level facilities, and 78% nationally).

### Achievements and Strengths

At national and facility levels, the assessment identified the following:

- **Supportive documents related to IPC are available.** These include legislation, IPC policy, standards, national IPC activities plan, and/or IPC roadmap to operationalise IPC programmes, and national IPC guidelines have been developed based on scientific evidence and regularly updated for most AMS.
- **HAI surveillance is well-structured.** The average CC score is 83% at secondary and 85% at tertiary hospitals, and multidisciplinary approaches and strategic national plans are in place. Notably, one tertiary facility has implemented an advanced surveillance system, including use of a referral laboratory for whole genomic sequencing (WGS).

- **Multimodal strategies, essential at national and facility levels, address all CC MR indicators nationally.** All AMS have at least one knowledgeable national IPC focal point responsible for coordinating and supporting IPC improvement, reflecting a solid foundation and a multimodal approach.
- **Built environment, materials and equipment for IPC show an average score of 81%.** This applies across all facility levels, and some HCFs mention having or planning infrastructure improvements that have notably enhanced IPC effectiveness.
- **Workload, staffing and bed occupancy (CC7) has a higher average score in secondary level facilities (86%), compared to the primary (58%) and tertiary facilities (74%).** Some secondary level HCFs have clear workforce management policies, optimal patient flow strategies, and management of overcrowding. Some primary HCFs adopt virtual and/ or pre-booking consultations and triage systems to address overcrowding.

While IPC programmes are established across all AMS, challenges persist at both, national and facility levels, with varying degrees of progress in meeting the CC MR indicators:

- **IPC programmes (CC1) implementation across AMS remains inconsistent.** National-level scores range from 44% to 100%, and HCFs scores fluctuate (averaging 71% at the primary level [six AMS], 75% at the secondary level [seven AMS], and 88% at the tertiary level eight AMS]). Major barriers to full operationalisation of IPC programmes include limited resources (e.g. lack of dedicated budgets in low-income countries), staffing constraints, gaps in IPC education and training, and weaknesses in monitoring/audit and feedback of IPC practices.
- **Staffing shortages (CC7) are a recurrent issue across HCF levels.** Four AMS report a weak score of <50% for CC7 principally at primary level. Multiple AMS report gaps in the number of full-time IPC nurses, infectious disease specialists, and epidemiologists. This shortage leads to high workloads, multitasking, and lower compliance with IPC measures.
- **Monitoring/audit of IPC practices and feedback (CC6) has the lowest average score at the national level (64%).** The assessment highlights the absence of structured national monitoring and audit frameworks for IPC practices, standardised national IPC indicators, feedback mechanisms, systematic analysis of audit results, and application of findings to policy and activity planning.
- **IPC education and training (CC3) is the CC MR indicator with the second-lowest average score at the national level (67%)**. Lack of accredited and competency-based training, accredited curricula and recognised education pathways for IPC professionals, and national systems

to regularly monitor and evaluate the IPC training programmes are identified as challenges by most AMS. Further, information on IPC as part of the pre-service curricula of all health professionals is limited.

- **HAI surveillance (CC4) faces a range of challenges.** These include limited human and technical resources, a lack of standardised definitions, inconsistent or limited surveillance systems (e.g. annual point-prevalence survey only), standardised data collection and reporting or under-reporting, comprehensive assessments of HAI and AMR, deficiency of safety culture, and action planning. Moreover, the high prevalence of HAIs in the region, exacerbated by multidrug resistant organisms, could have significant negative impacts on patient outcomes and healthcare costs.
- **While multimodal strategies (CC5) MR indicators are achieved nationally (average score 100%), gaps persist.** Gaps relate to translating national multimodal strategies to the HCF level or establishing facility-specific strategies, and lack of coordination and integration between IPC and antimicrobial stewardship programmes, and inclusion of emerging technology (e.g. WGS, telehealth), are observed. Family and caregivers are not incorporated into IPC strategies, IPC guidelines, and training.
- **An adequate building environment, along with suitable equipment and materials (CC8), is essential for effective IPC practice.** While CC8 has an average score ≥90 across HCF levels, significant gaps remain, including inadequate and/or insufficient apparatus for reprocessing medical equipment, healthcare waste management (HCWM) systems, poor water, sanitation, and hygiene (WASH) infrastructure, and facility layouts. Additionally, all but one AMS report that national standards for HCF buildings have yet to be identified, which further complicates efforts to enable HCF environment in supporting IPC requirements.

## Future considerations

Although some CC MR indicators show strong IPC implementation and meet certain MR, further improvements are needed at both national and HCF levels to sustain and strengthen IPC programmes and practices. The following recommendations seek to strengthen IPC programmes at both national and facility levels:

- **Leadership and policy and enabling environment:** Strong national leadership and policy backing with dedicated and appropriate funding would ensure provision of essential equipment and materials, alongside upgrading infrastructure with a focus on needs to allow IPC compliance.
- **Adequate human resources:** Ensure dedicated and appropriate staffing at recommended staff-patient ratios, and IPC professional to hospital bed ratios.

- **Capacity building and workforce development:** Develop accredited IPC training curricula for healthcare workers and IPC professionals (pre- and in-service training) and establish professional career pathways to retain skilled IPC staff, epidemiologists and auditors.
- **Updated, contextualised guidelines:** Regularly update IPC guidelines and standard operating procedures and contextualise to AMS by adapting international or national guidelines to local cultural, economic and resource realities.
- **Monitoring and evaluation:** Strengthen IPC monitoring/audit systems by establishing audits, standardised national and performance indicators, and feedback loops to guide targeted interventions.
- **Multisectoral collaboration:** Nurture multisectoral collaboration and research among policymakers, researchers, and healthcare providers within and between countries.
- **Strengthen multimodal strategies:** Integrate antimicrobial stewardship and innovative technologies.
- **Sustain HAI surveillance systems:** Develop standardised national or regional case definitions with robust surveillance plans and trained staff for data collection and analysis.

## Conclusion

**IPC programmes exist across all AMS. However, implementation varies widely between national and the three HCF levels, and targeted efforts are needed to sustain progress.** While some minimum requirements of CCs, particularly IPC guidelines and multimodal strategies, are in place, major gaps remain in all levels, such as *IPC programme implementation* (CC1), *education and training* (CC3), and *monitoring/audit and feedback* (CC6). At the facility level, specific key challenges include *HAI surveillance implementation* (CC4), *workload, staffing, and bed occupancy* (CC7) including the availability of trained IPC professionals and lack of *built environment and materials* (CC8). Sustaining progress requires addressing shortages in resources, trained professionals, supportive environments, and safety culture, with targeted efforts to strengthen these weakest components to improve patient safety, protect healthcare workers, and prevent future outbreaks.

# Introduction and Approach

## Background

Effective infection prevention and control (IPC) programmes are crucial to reducing healthcare-associated infections (HAIs), enhancing patient safety, combating antimicrobial resistance (AMR), preventing emerging infectious diseases, and strengthening preparedness and response for future outbreaks and pandemics. Together, the Association of Southeast Asian Nations (ASEAN) and the United States Centers for Disease Control and Prevention (U.S.CDC) have demonstrated the value of collaboration to improve IPC programmes across the ten ASEAN Member States (AMS) through the ASEAN-US IPC Task Force. To improve IPC capacity at the national and facility level in the region, an understanding of the current capacity is necessary to identify further opportunities for collaboration on improving IPC in the region.

## Objectives

The aim of this regional IPC landscape assessment is to evaluate the current capabilities of AMS in IPC at both the national and healthcare facility (HCF) levels. This includes documenting key achievements, identifying challenges and gaps, and developing recommendations that will enhance IPC efforts across the region. The assessment findings will also support and inform other Task Force activities under the 2023–2025 work plan of the ASEAN-US IPC Task Force, ultimately strengthening regional healthcare systems' capacity to prevent and control infections.

## Brief Methodology

IPC Landscape assessment activity Core Group members, led by Cambodia, guided this activity from January 2024 to June 2025. The regional IPC landscape assessment findings were generated by reviewing three information sources (Figure 1).

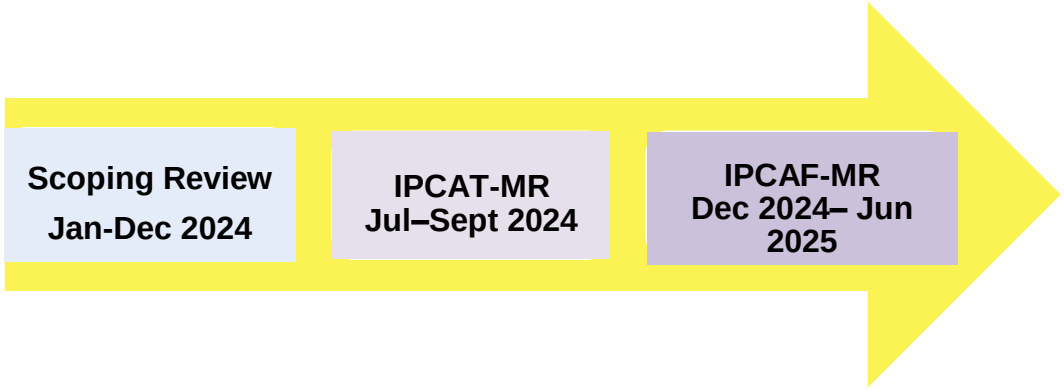


*Figure 1. Overview of the IPC landscape assessment methodology*

1. **National IPC programme self-assessment:** using the World Health Organization (WHO) Infection Prevention and Control Assessment Tool-Minimum Requirements (IPCAT-MR) tool, with data entry and data management activities were carried out via the REDCap platform, while data analysis used the pivot table feature on Excel, with Looker Studio for data visualisation. Nine out of 10 AMS submitted data. Lao People's Democratic Republic (PDR) did not submit data. IPCAT-MR scores for each Core Component (CC) and overall were calculated for each country and averaged across the nine AMS. National documents and additional information (e.g. policies, guidelines, protocols) uploaded by self-assessors were summarised.
2. **HCF IPC programme self-assessment:** This used the WHO Infection Prevention and Control Assessment Framework-Minimum Requirements (IPCAF-MR) tool and REDCap platform to enter and analyze raw data with an option to upload additional relevant IPC documents (e.g. IPC action plans, multimodal strategies). Data from eight AMS (Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, the Philippines, Singapore, and Thailand) were summarised. Average scores for each IPCAF-MR CC were calculated by country and hospital level. Where CC scores were averaged across countries, a weighted average was calculated to account for the different number of hospitals submitting data in each AMS. Additional documents uploaded were summarised and listed per country and CC to create a regional document library for Task Force (TF) members.
3. **Desk review of articles, reports, and documents related to IPC:** Search platforms used included: PubMed, Google Scholar, ScienceDirect, U.S. CDC, WHO, Non-Government Organisations, and Ministry of Health (MOH) websites; keyword searches linked to the IPC programmes CCs and to the 10 AMS.

For detailed information on the methodology, including search keywords, refer to Annex 1: Detailed Methodology.

### Limitations

Not all AMS have provided data at country or HCF level. National IPC self-assessment data are missing for one AMS. Eight of 10 AMS provided data for facility assessments. Some AMS submitted data on a small number of HCFs, (see Annex 3 for the number of self-assessed HCF per AMS and per level). Calculation of weighted averages, where appropriate, was used to account for variation in the number of healthcare facilities included for each country.

Also, there was no external validation of the national or facility submitted self-assessment data. These limitations should be considered by those reading the results and recommendations in this document.

## Key Results and Findings

**The key findings are based on data from three sources.** These include a self-administered survey of the IPC programme at the national and the three HCF levels (primary, secondary and tertiary level), using the WHO IPCAT-MR and IPCAF-MR tools, complemented by information retrieved from HCF feedback (open questions), and the scoping review of 281 studies, articles, reports, and documents related to the IPC CC indicators.

**Nine out of 10 AMS completed the self-administered IPCAT-MR.** Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam completed the self-administered IPCAT-MR. For the HCF level, a total of 890 HCFs from AMS (Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, the Philippines, Singapore, and Thailand) completed the self-administered IPCAF-MR survey across the three HCF levels (primary, secondary, tertiary). Specifically, 482 primary level HCF, 274 secondary level HCF, and 134 tertiary level HCF completed the self-assessment.

**All AMS have a national IPC programme based on the scoping review and the IPCAT-MR self-assessment results.** The average result of the six CC collected from nine AMS using the IPCAT-MR was 80% (range of 44 to 100%). Multimodal strategy, IPC guidelines, and IPC programmes have the highest average score (>85%), followed by HAI surveillance with an average score of 78%. The two CC with the lowest average scores are IPC education and training (61%) and monitoring/audit of IPC practices and feedback (64%).

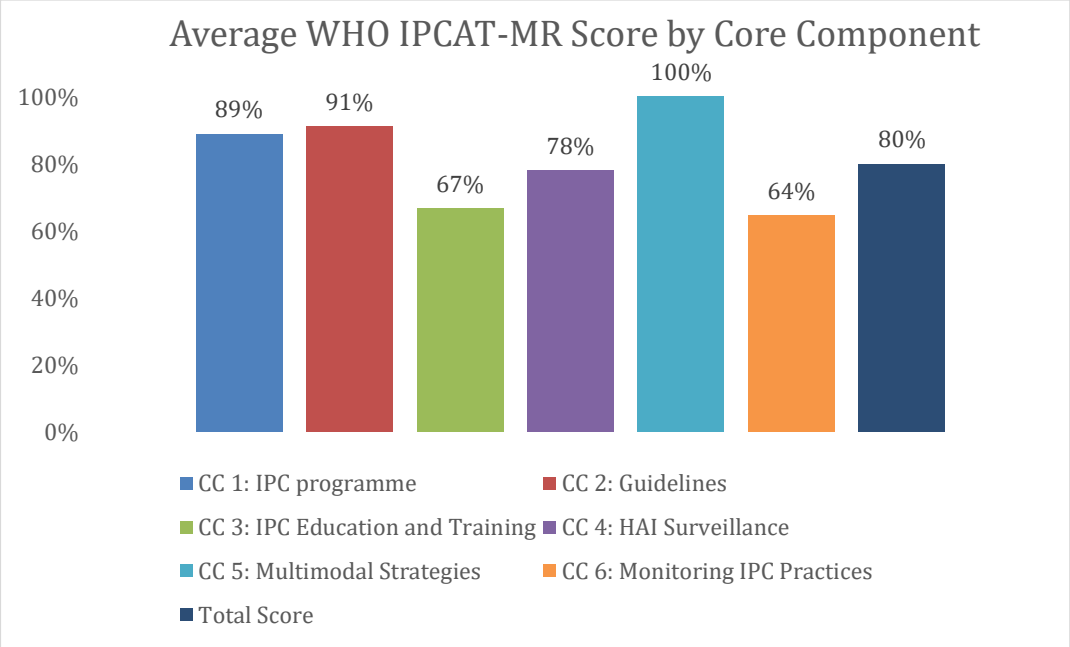


*Figure 2. Average scores for WHO IPC Core Components as measured by the IPCAT-MR self-assessment. Data were submitted by nine of 10 countries.*

**HCF scores among the eight CCs vary by level.** Based on the IPCAF-MR, the total weighted average score of the eight CC varies across the three HCF levels**.** For the 482 primary HCFs, the average score is 81%, for the 274 secondary HCFs, the average score is 89%, and for the 134 tertiary HCFs, the average score is 88%. The figures below illustrate the variation of the average total scores per AMS and per HCF level.

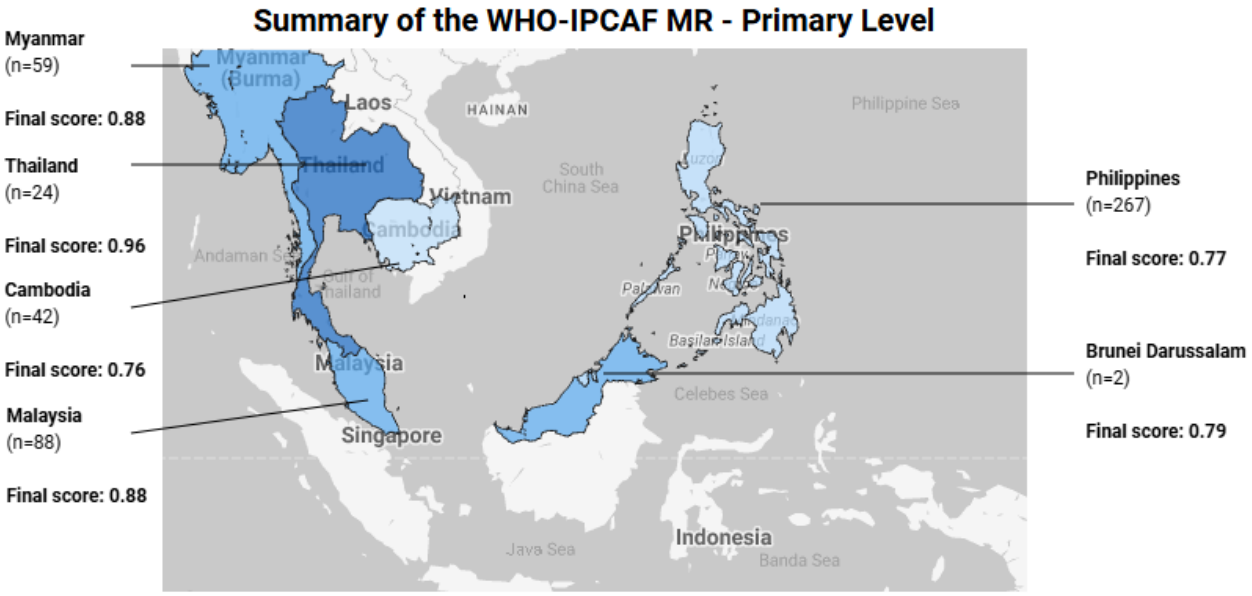


*Figure 3. Average total scores from IPCAF-MR self-assessment for primary healthcare facilities. Data were submitted by 482 HCFs from six countries.*

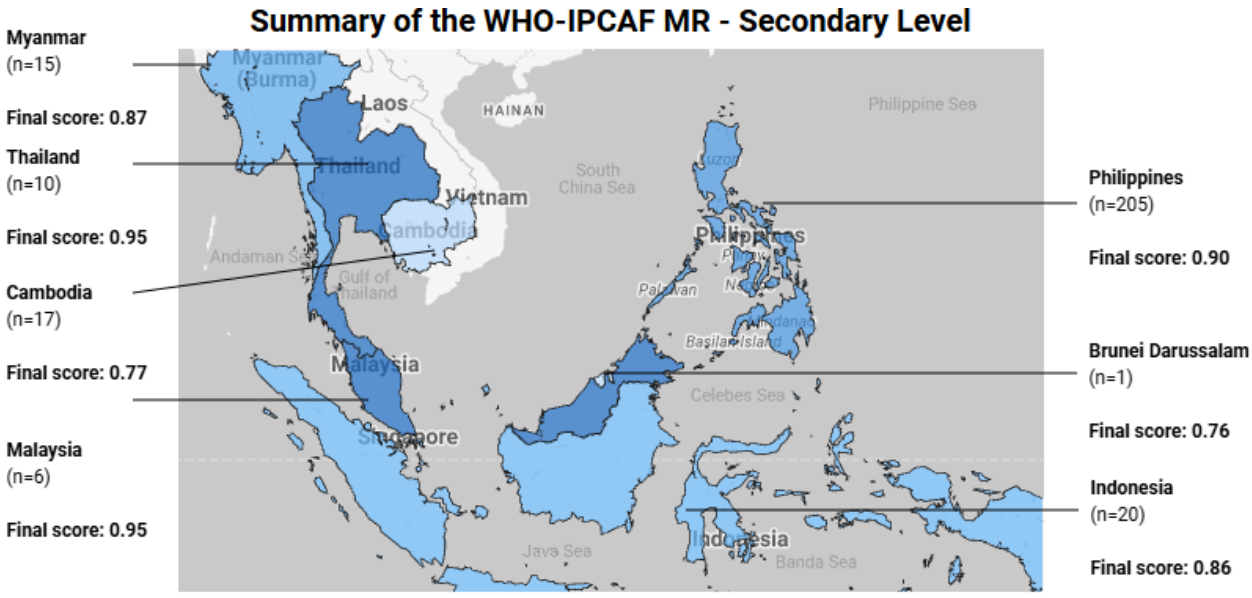


*Figure 4. Average total scores from IPCAF-MR self-assessment for secondary healthcare facilities. Data were submitted by 274 HCFs from seven countries.*

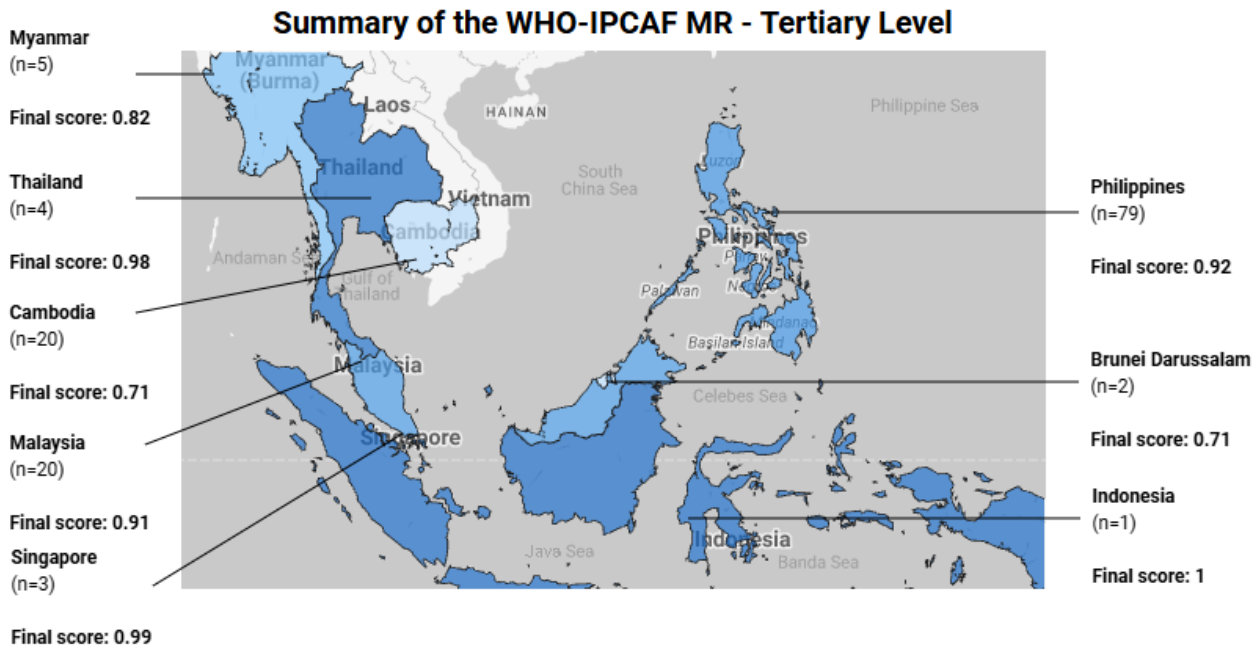


*Figure 5. Average total scores from IPCAF-MR self-assessment for tertiary healthcare facilities. Data were submitted by 134 HCFs from eight countries.*

### Achievement of All WHO Minimum Requirements (MRs):

**Fewer than 30% of HCFs attain all MRs at any level.** In terms of HCFs achieving all CC MRs: 16.37% of the 482 primary HCFs, 24.09% of 274 secondary HCFs, and 29.85% of 134 tertiary HCFs (see figures 6, 7, and 8, below).

**Consistently IPC guidelines (CC2), Multimodal strategies (CC5) and Built environment, materials and equipment for IPC (CC8) score among the highest across the three HCF levels.** Average scores are respectively ≥93% for CC2 ≥88% for CC5, and ≥90% for CC8. Similarly, the percentage of HCF that has reached all CC MR is the highest for the MRs in CC2 and CC5, reaching ≥86% for any level (see figures 4, 5, and 6).

**While CC8 has an average score ≥90 across all HCF levels, significant gaps remain.** Gaps related to inadequate and/or insufficient apparatus for reprocessing medical equipment, healthcare waste management (HCWM) systems, poor water, sanitation, hygiene (WASH) infrastructure, and facility layouts. Between 49 to 58% of HCFs reach all of the CC8 MRs across the three levels (see figures 4, 5, and 6).

**HAI surveillance also has room for improvement.** The average score for *HAI surveillance* (CC4)[1] is 83% at secondary-level facilities, 85% at tertiary-level facilities, and 78% at national level.

**Workload, staffing and bed occupancy underperform.** The lowest average score among all CC at the primary and tertiary level (respectively 58% and 74%) relate to *workload, staffing and bed occupancy* (CC7). At the secondary HCF level,

[1] HAI surveillance is a CC of HCF IPC programme for secondary and tertiary HCF levels only

CC7 has an average of 86%). However, results vary widely across AMS; for example, at the primary HCF level, average scores range from 0% to 92%, with only one AMS achieving a score above 70%. Likewise, CC7 has the lowest percentage of HCFs achieving all CC MRs, at the primary and tertiary levels, respectively, with 41.26% and 49.25% HCFs (see figures 4, 5, and 6).

**Regarding IPC programmes (CC1), IPC education and training (CC3), and Monitoring/audits of IPC practices and feedback (CC6), average scores fluctuate across HCF levels.** Despite achieving some of the MR indicators, there is room for improvement in those CC, especially at primary and secondary level for *IPC programmes* (CC1), with 71% at the primary and 75% at secondary HCF levels; and at primary level for *IPC education and training* (CC3) (70%) and *monitoring/audits of IPC practices and feedback* (CC6) (79%).

**The percentage of HCFs reaching all MRs for CC1 and CC3 varies depending on the HCF level.** For instance, for the secondary HCF level, CC1 has the lowest percentage, with 52.55% of the self-assessed HCFs reaching all CC1-MRs, whereas it is over 60% for both the primary and secondary levels. Regarding CC3, 49.10% of HCF reach all MRs at the primary level, but only 85.82% at the tertiary level (see figures 4, 5, and 6).

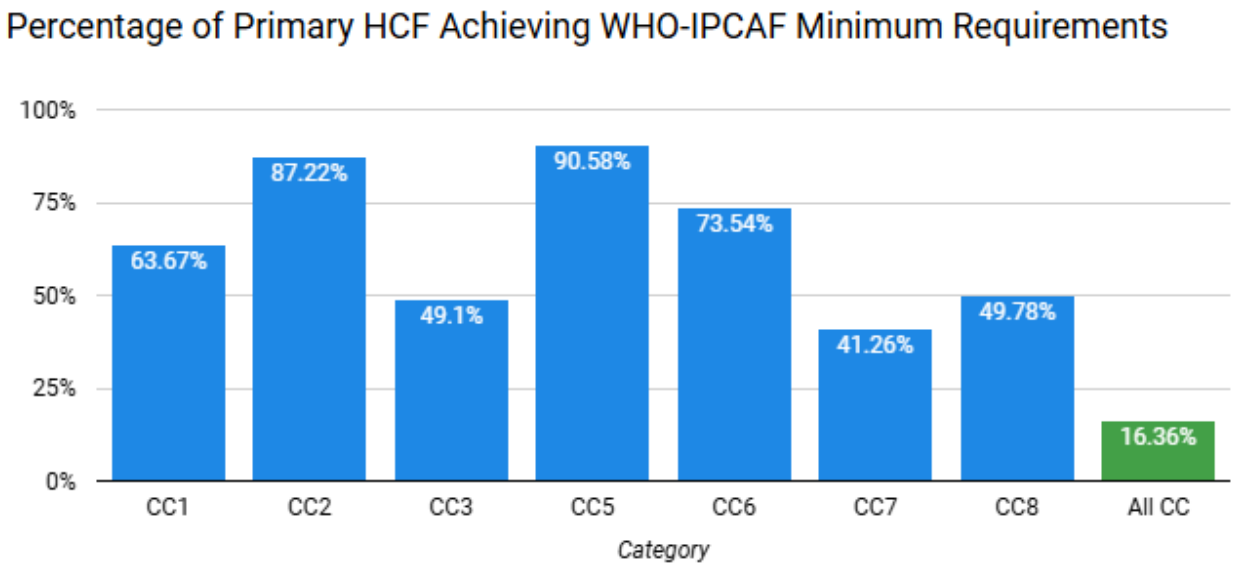


*Figure 6. Percentage of Primary HCF that Achieved All WHO Minimum Requirements, by each Core Component and Overall Scores.*

**There is variance in achievement at the primary HCF level**. *Multimodal Strategies* (CC5) is the most fully implemented, with 90.5% of HCF meeting all MRs indicators. In contrast, *Workload, Staffing, and Bed Occupancy* (CC7) is the least implemented, with the fewest HCFs (41.2%) meeting the MRs. However, only 16.3% of primary HCF respondents meet all minimum IPC programme requirements.

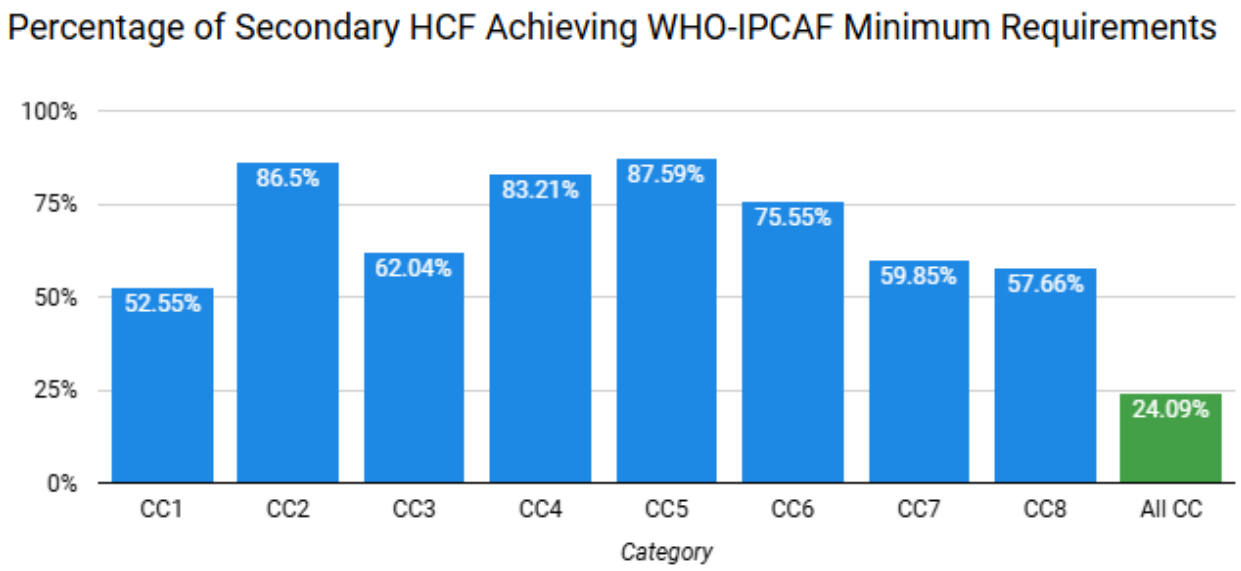


*Figure 7. Percentage of Secondary HCF that Achieved All WHO Minimum Requirements, by Core Component and Overall.*

**Achievement is also mixed at the secondary HCF level.** *Multimodal Strategies* (CC5) is the most fully implemented, with 87.6 % of HCF meeting all MRs indicators. In contrast, the *IPC programmes* CC (CC1) is the least implemented, with 52.5% of HCFs meeting the MRs. However, only 24.1% of secondary HCF respondents meet all minimum IPC programme requirements.

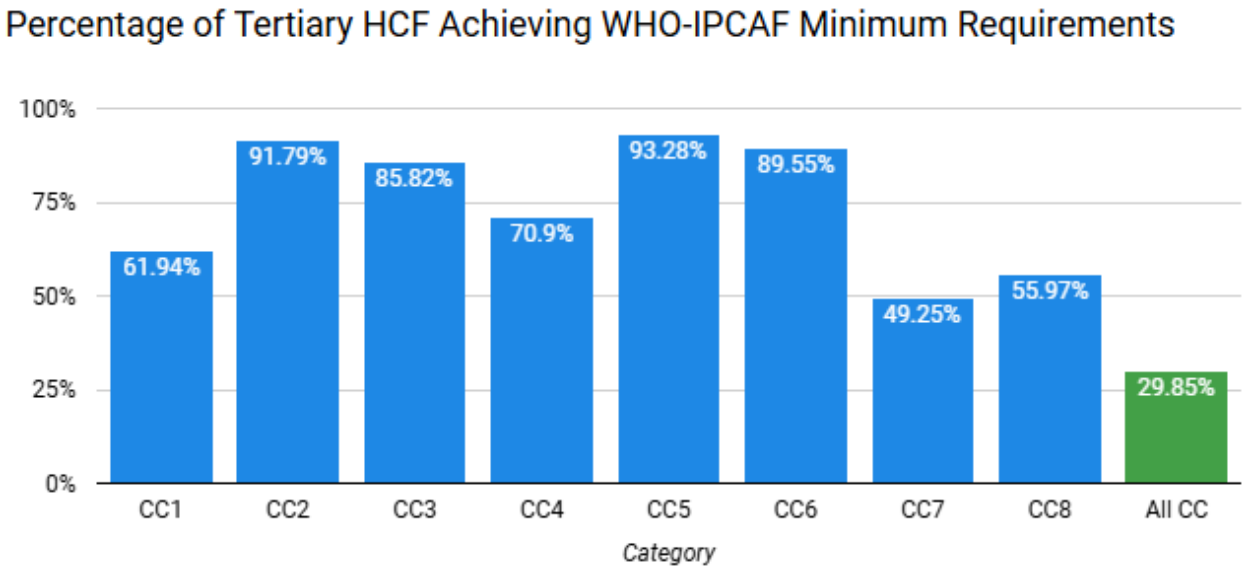


*Figure 8. Percentage of Tertiary HCF that Achieved All WHO Minimum Requirements, by Core Component and Overall.*

**A similarly mixed pattern is revealed at the tertiary HCF level.** *Multimodal Strategies* (CC5) is the most fully implemented, with 93.3 % of HCF meeting all MRs indicators. In contrast, *Workload, Staffing, and Bed Occupancy* (CC7) is the least

implemented, with 49.2% of HCFs meeting the MRs. However, only 29.8% of tertiary HCF respondents met all minimum IPC programme requirements.

**Below is a synthesis of the key findings from the national and HCF IPC programme assessments and the desk scoping review reports.** For detailed information on the findings and data, refer to *Annex 2 - Report of national IPC programmes assessment (IPCAT); Annex 3 - Report of HCF IPC programmes assessment (IPCAF); Annex 4 - Key findings of the scoping review; and Annex 5 – List of documents related to IPC, per AMS and Core Component.*

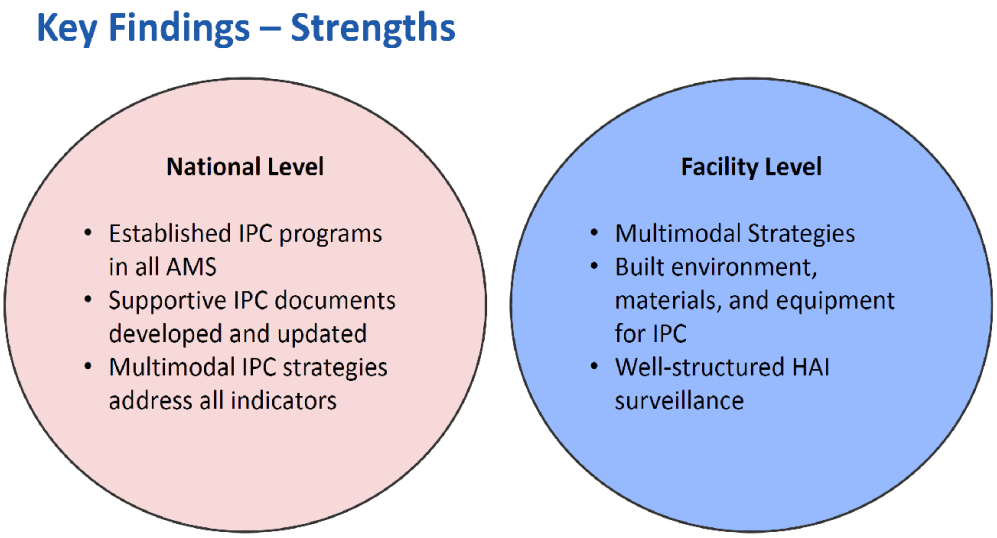


*Figure 9. Key strengths identified in the IPC landscape assessment*

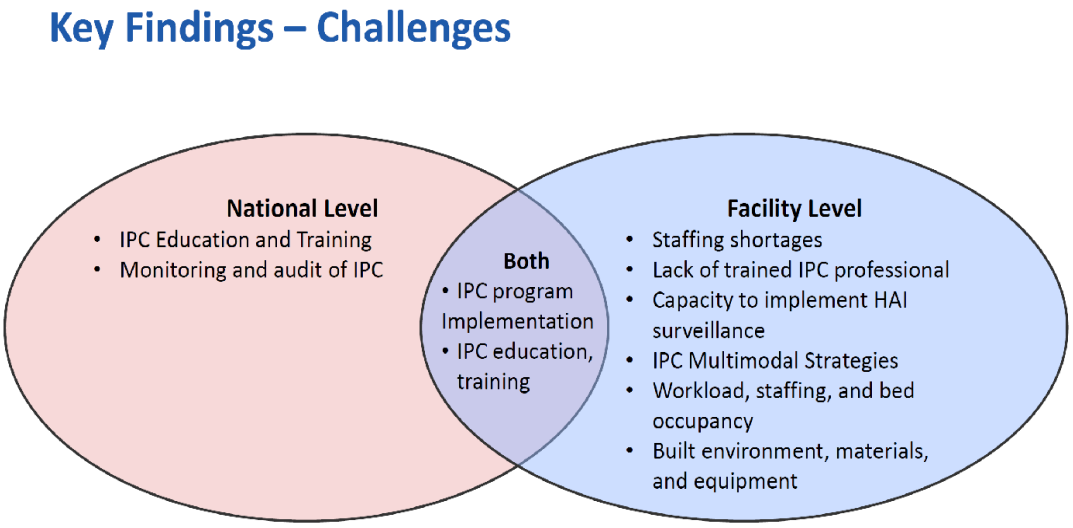


*Figure 10. Key challenges identified in the IPC landscape assessment*

## Core Component 1: IPC Programmes

### *Strengths and Key Achievements*

**All 10 AMS have a national, documented IPC programme and most have a designated full-time focal point (FP).**

All 10 AMS have a national IPC programme, and self-assessment data from the WHO IPCAT-MR were submitted by nine. The nine countries have an average total score of 89% for the IPC programme CC (Figure 2, Annex 2). Six of nine (67%) AMS met all MR indicators under CC1, and all nine have a designated IPC FP. IPC FP were full-time or equivalent (seven, 78%), part-time (two, 22%). One AMS noted that their focal point (FP) had not received formal IPC training in HAI prevention. At least three AMS have a well-structured multidisciplinary IPC committee with defined terms of reference. All AMS have documents to operationalise the national or HCF IPC programmes, such as legislation, IPC policy, standards, national IPC activity or AMR plan with IPC components, or an IPC roadmap (Annex 4),[2] (Annex 5).

One AMS specified comprising professionals from the government, academia, and the private sector, to implement the national IPC programme (Annex 2), (Annex 4).[3] One AMS has a national IPC programme but has yet to develop a formal endorsed plan or a dedicated and protected budget with at least one full-time equivalent appointed IPC FP (Annex 2).

**At the tertiary level, 88.8 % of HCFs report having one full-time trained IPC FP per 250 beds**

At the HCF level, overall, most HCF respondents report having an IPC programme in place. At the tertiary level, on average almost all HCFs (88.8 %) report having an HCF IPC programme with one full-time trained IPC focal point per 250 beds, while at secondary and primary levels, an average of over 70% of the HCFs have a trained IPC focal point or link-person (Annex 3).

### *Identified Gaps and Challenges*

**IPC programme implementation varies across HCF levels and AMS.**

Despite most of the AMS and HCF levels having an IPC programme, variability in implementation is observed across HCF levels and AMS, as reported by the IPCAF-MR. For instance, the weighted average CC1 score is lower at the primary (71%) and secondary (75%) HCF levels than the tertiary level (88%). In one AMS, the average CC1 score is lowest across secondary (33%) and tertiary (50%) levels, and in another AMS, the average score (59%) is lowest in primary level facilities (Annex 3).

**Dedicated budgets for IPC programmes are inconsistent and pose a challenge to IPC implementation.**

[2] Desk review reference: 242
[3] Desk review references: 242

An active IPC programme is defined by WHO as having a functioning structure, an annual work plan, and a budget. Inconsistent resource allocation, formal endorsement of plans, dedicated/protected budgets, or limited funding aligned with IPC plans remain critical barriers, particularly in low-income countries (LICs) and rural areas. For instance, the desk review identified that only three of 11 ASEAN countries have both an IPC plan and ≥ 50% dedicated IPC budget (Annex 2), (Annex 4).[4] Limitations to spending for HCWM implementation is a reality for some low-middle income countries (LMICs), with an allocated budget of US$0.2–0.4 per bed per year (Annex 4).[5] There are limited economic data in the literature on the cost-effectiveness of IPC interventions, despite some studies demonstrating financial losses of HAI and AMR. For instance, carbapenem-resistant Enterobacterales (CRE) HAIs are associated with significantly high costs to hospitals (Annex 4).[6]

**Personnel-related gaps were identified including shortage of trained IPC professionals, weak Occupational Health and Safety (OHS) programmes and low Healthcare Worker (HW) vaccination coverage.**

There is a shortage of trained IPC professionals, weak OHS programmes, a weak safety culture, and lack of strong management commitment to IPC. In spite of most of the AMS and HCF reporting having dedicated and trained IPC focal points, other studies report a shortage of trained IPC professionals, IPC nurses, and infectious disease specialists, as well as a lack of time and incentives (e.g. salaries), and limited policy support for the retention and career development of IPC professionals (Annex 4).[7] Some AMS lack specific laws and policies to implement IPC programmes, e.g. related to HCWM (Annex 4).[8] Low awareness of OHS, limited access to OHS service by HWs, lack of enforcement of policies despite availability, and cultural and economic barriers, may contribute to low vaccination coverage among HWs for preventable diseases (e.g. Hepatitis B, measles, rubella, and influenza) (Annex 4).[9] Further, weak safety culture and insufficient leadership and management commitment to IPC, an essential component of patient safety and quality of care, are reported (Annex 4).[10]

## Core Component 2: IPC Guidelines

### *Strengths and Key Achievements*

**IPC guidelines are a strength of national and facility IPC programmes.**

The average score for CC2, IPC guidelines, is 91%, making it the strongest CC at the national level (Figure 2, Annex 2). Five AMS meet all MR indicators for CC2,

[4] Desk review references: 9, 10, 11, 12
[5] Desk review reference: 13
[6] Desk review references: 33, 34, 35, 36
[7] Desk review references: 20, 21, 22, 23
[8] Desk review references: 3, 12, 17
[9] Desk review references: 25, 26, 27, 28, 66, 67
[10] Desk review references: 3, 13, 24

and the remaining four have an average score of 80%. All AMS confirm that IPC guidelines are based on scientific evidence and align with national or international standards, cover public and private HCFs, and are adapted to local conditions. Six AMS confirm that they update their guidelines at least every five years, and some share their IPC guidelines via public platforms. Only one national IPC programme does not have a mandate to produce guidelines for preventing and controlling HAI (Annex 2). At the HCF level, CC2 scores are similar across the three levels of care, with an average score >93% (93% for primary level, 95% for secondary and tertiary levels). Facility HCF guidelines largely follow national IPC guidance (Annex 3).

**All AMS have national IPC technical guidelines to support effective IPC implementation.**

Desk review findings supported self-assessment data (Annex 4).[11] Several AMS have implemented diverse IPC guidelines and Standard Operating Procedures (SOPs) to perform adequate IPC practices and prevent HAI. Guidelines include the following, among others: environmental cleaning (e.g. Pulsed-Xenon ultraviolet disinfection); HCWM procedures; AMR and *Methicillin-resistant Staphylococcus aureus* (MRSA) decolonisation protocols; needle-stick injury response and staff protection SOPs, and public health emergency preparedness and control, for instance for Coronavirus disease 2019 (COVID-19) resuscitation procedure.

### *Identified Gaps and Challenges*

**Not all AMS have made IPC and OHS guidelines publicly available, and some guidelines are not routinely updated or tailored to country context.**

National IPC guidelines are not publicly available in all AMS. There is inconsistency in IPC standards and definitions (e.g. definition of high-touch surfaces) across these documents. Some guidelines are outdated, with three AMS reporting that they do not review their national IPC guidelines at least once every five years to reflect the current evidence base (Annex 2), (Annex 4).[12] Despite having several IPC guidance, there is a lack of IPC guidelines that are culturally adapted and tailored to the country contexts, particularly where infrastructure and resources are limited and family caregivers are involved. Recurrent issues in availability of adapted IPC guidelines included ventilator-associated pneumonia (VAP) prevention, eye surgery surgical site infection (SSI) prevention guidelines, and IPC guidance for caregivers (Annex 4).[13]

**Certain IPC guidelines do not fully address components of occupational safety or the inclusion of robust evidence base.**

Absent or outdated specific OHS guidelines and SOPs for HWs, to prevent tuberculosis, improve HW awareness of vaccine-preventable diseases, such as Hepatitis, and to guide development of OHS policies and procedures for needle-stick

[11] Desk review references: 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58
[12] Desk review references: 39, 41, 47, 48, 50, 59–64
[13] Desk review references: 29, 30, 40, 41, 43, 47, 48, 59–63, 65, 70

injury (Annex 4).[14] Remaining methodology challenges remain in developing and implementing IPC guidelines, such as balancing ideal versus feasible practices, lack of robust evidence to provide strong IPC recommendations (e.g. cleaning frequency for high-touch surfaces), contextualizing interpretation of evidence, and adapting rapidly evolving information (e.g. in public health emergency contexts; Annex 4).[15] A weak safety culture is mentioned in some AMS, at the HCF level and across the Asia Pacific Region, which can undermine compliance with existing IPC guidelines and SOPs, such as preventing neonatal sepsis, worker safety, and routine IPC practices (Annex 4).[16]

## Core Component 3: IPC Education and Training

### *Strengths and Key Achievements*

**In-service IPC training curricula are aligned with national IPC guidelines or national standards, in some AMS.**

At the national level, three out of nine AMS meet all CC MR indicators for IPC education and training. Some AMS report having in-service IPC training curricula aligned with national IPC guidelines, and in one AMS, national legislation mandates hospitals to provide IPC training based on national standards (Annex 2). At tertiary level, HCFs from eight AMS have an average score of 92%, indicating a robust education and training system for IPC. Several hospitals have launched comprehensive IPC training programmes for HWs, clinical and non-clinical staff, covering Hand Hygiene (HH), Personal Protective Equipment (PPE), and HCWM. At secondary level, the average score for the seven AMS is 81%, with some fluctuation between AMS (range: 79-100%) *(Annex 3).*

Interactive training methodologies, for instance, simulation-based education, interprofessional learning, train-the-trainers models, and targeted video tools, have been demonstrated to be effective methodologies in improving IPC (Annex 4).[17]

Numerous studies show that IPC training programmes, especially focused on HH and COVID-19 prevention, are effective in improving HW knowledge, attitudes, and practices (KAP) and in preventing and reducing HAIs (Annex 4).[18]

### *Identified Gaps and Challenges*

**IPC education and training CC has the second lowest-score of the national IPC programmes, with a common lack of monitoring of IPC training.**

The nine reporting AMS have an average score of 67% with extreme variation across AMS (range: 25 – 100%) (Annex 2). At the HCF level, CC3 is the second lowest

[14] Desk review references: 25, 26, 44, 62, 68, 69
[15] Desk review references: 47, 64
[16] Desk review references: 46, 84
[17] Desk review references: 8, 47, 71, 75–77, 82, 83
[18] Desk review references: 10, 25, 39, 45, 47, 60, 70 -81; and 189, 204, 205, 212, 216, 217

in the primary HCF level (70%), with significant variations across the six AMS (range: 57%-100%) (Annex 3). Monitoring of IPC training needs improvement, as only three of the AMS respondents have a national system and schedule of monitoring and evaluation in place to verify the effectiveness of training and education, at least annually (Annex 2). Training methodologies needs to be enhanced with adult learning principles, targeted educational interventions, and evaluation mechanisms (Annex 4).[19] Also, limited financial resources impede the development and implementation of comprehensive IPC programmes and logistical barriers impact training opportunities and accessibility in all HWs (Annex 4).[20]

**There is a lack of accredited IPC training curricula, education pathways for IPC professionals, and limited evidence on the inclusion of IPC in pre-service training.**

Accredited and competency-based training, and refresher training, with the inclusion of an OHS module, are not universally available, particularly in private and small hospitals (Annex 4).[21] There is limited evidence on the inclusion of IPC in pre-service training. This is not assessed by existing tools such as the IPCAT-MR or IPCAF-MR. Most published literature focuses on in-service, refresher, or ongoing training for HWs (Annex 4).[22] However, documents indicate a lack of incorporation of IPC content in undergraduate and graduate training programmes in all relevant health disciplines, in two AMS (Annex 4).[23] In one AMS, IPC training has been integrated into Continuing Medical and Nursing Education (Annex 3), (Annex 4).[24] In two AMS, training approaches that are tailored to local contexts, considering cultural norms and the role of caregivers, are yet to be recognised (Annex 4).[25]

[19] Desk review references: 39, 71, 72, 77, 78, 85, 86
[20] Desk review references: 84, 85, 89
[21] Desk review references: 20, 63, 91, 92
[22] Desk review references: 25, 76, 77, 86
[23] Desk review references: 92, 242
[24] Desk review reference: 242
[25] Desk review references: 29, 47, 70

## Core Component 4: Healthcare-Associated Infection Surveillance

### *Strengths and Key Achievements*

**Efforts to implement HAI surveillance are underway across several AMS.**

At the national level, the average score across the nine AMS is 78%, with six AMS meeting all three CC MR indicators, which focus on having a multidisciplinary technical group for HAI surveillance, with a trained IPC focal point(s) or team in surveillance concept and methods and having a developed strategic plan for HAI surveillance. Eight AMS have trained IPC focal points in HAI surveillance methods, and six have national strategic surveillance plans developed by multidisciplinary teams. Availability of national HAI surveillance guidelines and reports showed systematic implementation in related countries (Annex 2).

**At the tertiary HCF level, five of the 10 AMS indicate a structured HAI surveillance system, with an average score of ≥ 94%.**

The IPCAF-MR data indicates a structure surveillance system at higher-level facilities, with three AMS complying with all MR indicators at tertiary levels and two having an average score of ≥ 94%. Tertiary facility level, in eight AMS report an overall average score of 85%, and secondary level report an overall average score of 83%, although coverage varies across AMS. Noting that HAI surveillance is not one of the IPC programmes CC at the Primary HCF level (see Annex 3).

One tertiary HCF reports initiating surveillance for SSI, VAP, Catheter-Associated Urinary Tract Infection (CAUTI), and Catheter-Associated Bloodstream Infection (CABSI), planning for annual surveillance and reporting to the Hospital IPC committee and to the respective departments recording high HAI rates. In addition, the hospital uses a reference laboratory for whole-genome sequencing (WGS), prioritizing outbreak investigations, SSI, and needle-stick injuries surveillance (Annex 3). At secondary level, one HCF reports conducting annual point prevalence surveys, covering SSI, CAUTI, and sharps injury registers, using digital platforms such as Google Drive, to submit data to the MOH (Annex 3). Further, evidence from the scoping review highlights the impact of HAI surveillance, documenting significant reductions in SSIs following IPC and antimicrobial stewardship measures (Annex 4).[26]

One AMS reports a 10-year decrease in sharps injuries with effective sharp injury surveillance, demonstrating the long-term value of consistent monitoring (Annex 4).[27]

**Routine HAI surveillance and studies have identified risk factors for HAI and associated mortality in the region, informing targeted prevention strategies.**

The main identified risk factors were: (i) Catheter-associated infection (e.g. Central Line-Associated Bloodstream Infection [CLABSI], VAP, CAUTI), central-line days, urine-catheter days, older age, female sex, and length of stay;

[26] Desk review reference: 106
[27] Desk review reference: 85

(ii) Mechanical ventilation utilisation ratio, upper-middle-income countries, surgical hospitalisation, pediatric oncology Intensive Care Unit (ICU), and adult oncology ICU were associated with the highest mortality risks; (iii) Length of stay with an increased mortality risk of 1% per bed day. It is acknowledged that some variables associated with an increased HAI and mortality risk are unlikely to change, such as age, sex, national economy, and hospitalisation type (Annex 4).[28]

### *Identified Gaps and Challenges*

**Despite progress, extensive variation in scores across AMS and persistent challenges undermine the effectiveness of HAI surveillance in the region.**

Among the nine respondents, one AMS has yet to establish a national HAI surveillance system (score of 0%) and two AMS have to strengthen their respective national HAI component (score of 34 and 67%) to oversee HAI surveillance in tertiary and secondary HCFs. Three AMS have yet to develop a national strategic plan, and two should establish a national multidisciplinary technical group, and one should train the national IPC focal point/team in HAI surveillance concepts and methods (Annex 2).

**Although most AMS (six out of nine) indicate having national strategic surveillance plans, the actual level of implementation remains uncertain.**

Feedback from IPC focal points at HCFs from the IPCAF-MR and findings from regional studies indicated inconsistencies and limitations in surveillance systems and monitoring of their operationalisation. In several cases, surveillance is restricted to laboratory data, limiting comprehensive assessments of HAIs. Some facilities rely solely on annual point-prevalence surveys or pilot initiatives that are not sustained as routine practice.

**Absence of standardised case definitions and consistent reporting practices affects HAI prevention and response.**

Furthermore, the absence of standardised case definitions and consistent reporting practices contributed to fragmented or under-reported data, ultimately affecting the timeliness of adequate response measures and the ability to obtain a regional overview of HAI trends (Annex 2, Annex 3), (Annex 4).[29]

**Persistent financial, human, and technical resource constraints remain major barriers to effective HAI surveillance across settings.**

Inadequate infrastructure and a lack of robust information systems further limit data utilisation. At the tertiary hospital level, IPC focal points noted in the IPCAF-MR that while surveillance activities have been initiated, challenges persist, particularly in staff training and data completeness. In some cases, reliance on untrained personnel for SSI surveillance leads to incomplete data and poor documentation.

[28] Desk review references: 9, 41, 97–99, 104, 108, 119, 171, 172
[29] Desk review references: 84, 174, 175

The absence of dedicated epidemiologists also undermines the accuracy and long-term sustainability of surveillance efforts (Annex 3), (Annex 4).[30]

**HAIs represent a major burden in the region, with a prevalence of 21.6% and leading to increased length of stay, mortality risk, and economic costs.**

The overall HAI prevalence in the region is 21.6% (95% CI: 15.5–29.1%), based on a systematic review covering the 10 AMS, over 30 years (1990–2022) (Annex 4).[31] The study reported that Indonesia had the highest prevalence rate of 30.4% whereas Singapore had the lowest prevalence rate at 8.4%, revealing that the overall prevalence rate of each country could be associated with socioeconomic status. Notably, the CC4 scores of IPCAT-MR and IPCAF-MR (tertiary HCF level) of those two AMS were similar, and no major conclusion could be drawn (Annex 4).[32] For example, ICU patients with VAP infected with *Acinetobacter baumannii* tend to have 1.4 times higher mortality risk than those infected with other species (Annex 4).[33] Similarly, a study related to peripheral venous catheters and associated infection showed that mortality in patients with CLABSI with peripheral venous was around three times higher than for those with peripheral venous and without CLABSI (12.21% vs 4.53%, respectively) (Annex 4).[34] In addition, fungal infections, particularly *Candida parapsilosis*, are associated with CLABSI, with risk factors including total parenteral nutrition, and respiratory syncytial virus caused frequent HAI in pediatric settings, with a prevalence of 26% and evidence of in-hospital transmission (Annex 4).[35] Further, the health and economic burden is significantly greater among patients with AMR infections (Annex 4).[36] For example, in one high-income AMS, CRE-associated HAIs are estimated to cost approximately US$ nine billion annually (Annex 4).[37] In a lower-middle-income AMS, another study reports that the cost of managing HAI cases is 2.5 times higher than for uninfected patients (Annex 4).[38] Meanwhile, the COVID-19 pandemic caused some disruption to IPC programmes, while some facilities improved IPC during the pandemic and observed HAI rate reduction (e.g. decrease in MRSA transmission), others experienced setbacks, linked to increased HAI rates and inappropriate antibiotic use (Annex 4).[39]

**HAI is further exacerbated by multidrug resistant organisms (MDRO).**

Pathogens such as *Acinetobacter baumannii*, *Klebsiella pneumoniae*, *Escherichia* coli (*E. coli)*, and *Staphylococcus aureus* are prevalent and often resistant to multiple antibiotics.

[30] Desk review references: 42, 59, 84, 89, 176
[31] Desk review references: 21,62,90
[32] Desk review reference: 94
[33] Desk review references: 119
[34] Desk review reference: 9
[35] Desk review references: 98, 137
[36] Desk review references: 42, 107, 110, 145, 150, 153
[37] Desk review reference: 150
[38] Desk review reference: 173
[39] Desk review references: 142, 165, 167-170

In addition, several AMS have identified a widespread of *Pseudomonas aeruginosa*, such as carbapenem resistance and dissemination of resistant clones in ICUs (Annex 4).[40] Meanwhile carbapenem-resistant organisms and MRSA pose major threats across AMS, affecting both high- and low-resource settings (Annex 4).[41] MRSA is frequently reported, with prevalence rates varying widely among AMS, reflecting the severity of the AMR challenge (Annex 4).[42] For example, one lower-middle income country tertiary HCF reports an MRSA prevalence rate of 53.8% between 2020 and 2022 (Annex 4),[43] whereas in an upper-middle-income AMS, the prevalence was notably lower at 7% in 2021 (Annex 4).[44] Additional details on HAI prevalence, incidence, and key HAI microorganism profiles in the ASEAN region are available in Annex 4.

## Core Component 5: Multimodal Strategies for Implementation of IPC Interventions

### *Strengths and Key Achievements*

**Multimodal Strategies (CC5) consistently achieved the highest scores among AMS, with strong performance at national and across the three HCF facility levels.**

At the national level, based on the national self-assessment, IPCAT-MR results, and the WHO IPC systems in the Western Pacific region report,[45] all AMS have multimodal strategies for IPC intervention implementation. CC5 has the highest average IPCAT-MR score (100%) across the nine AMS respondents meeting the three CC MR indicators. Despite only one AMS sharing a national IPC strategic plan, these results reflect a solid foundation for multimodal strategic approaches for implementation in IPC guidelines, IPC education and training programmes. Nine AMS reported at least one national IPC focal point with knowledge to coordinate and support local IPC implementation (Annex 2). The 10th AMS has established national, subnational, and hospital IPC committees (Annex 4).[46]

At the facility level, AMS have an average score of 90% for primary (six AMS), 88% for secondary level (seven AMS), and 93% for tertiary level (eight AMS). Additional information confirmed this high performance at all HCF levels. At the primary level, one HCF's multimodal strategy focuses on IPC education, audits, feedback, and promoting a safety culture.

[40] Desk review references: 9, 45, 46, 94, 95, 101, 104, 105, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 138, 139, 140, 145, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161
[41] Desk review references: 101, 133, 135, 146, 150, 151
[42] Desk review references: 101, 103, 107, 133, 145, 146, 147, 148
[43] Desk review reference: 133
[44] Desk review reference: 146
[45] Infection prevention and control systems in six priority countries in the Western Pacific Region: regional report 2023. 13 February 2025. WHO-WPRO. https://www.who.int/westernpacific/publications/i/item/9789290620686
[46] Desk review reference: 242

At the secondary level, another HCF mentioned the inclusion of system change, training, monitoring, communication, and culture change. Meanwhile at the tertiary level, multimodal approaches are used to manage outbreaks, including an OHS component for the HW needle-stick injury surveillance, reporting, care, and follow-up (Annex 3).

**The effectiveness of multimodal IPC strategies and interventions, along with integration with Antimicrobial Stewardship Programmes (ASP), has been demonstrated in several studies.**

These interventions, often involving HH campaigns, reduced length of stay, limited usage of catheters, environmental cleaning, patient cohorting, integration with the ASP show significant reductions of antibiotic use, in-hospital mortality, and HAI and AMR rates, such as MRSA rate decreased from 8% to 3% when using a multifaceted approach (Annex 4).[47]

### *Identified Gaps and Challenges*

**Despite robust CC5 implementation, challenges persist, including inconsistency across HCF levels, difficulty sustaining multimodal strategy effectiveness, and limited integration with the ASP.**

One HCF respondent recognises the lack of a multimodal strategic plan and reported their efforts to develop and implement multimodal strategies. Another one emphasises the need to improve safe climate and culture, for instance, to increase awareness of needlestick injuries, which remain an ongoing priority (Annex 3). One AMS report mentions having multimodal IPC strategies at the national level, though it is absent at the facility level (Annex 4).[48]

If not context-specific, there are challenges in sustaining multimodal strategy effectiveness, particularly in LMICs, such as addressing HAIs influenced by prolonged stays, catheter use, or poor antibiotic practices (Annex 4).[49]

Challenges persist in maintaining IPC improvements that require sustained investment such as HH compliance and post-pandemic IPC momentum (Annex 4).[50] Multiple studies stress the need for comprehensive ASP and strategies integrating antimicrobial stewardship, surveillance, and research (Annex 4).[51] However, few mention IPC, despite its crucial role in preventing AMR.

**Integrating key players and new technologies within multimodal strategies remains a gap.**

The role of caregivers in the IPC multimodal strategy remains ignored in most AMS, despite their importance in patient care in several AMS settings, mostly in LMICs

[47] Desk review references: 43, 60, 141, 171, 173, 174, 180, 181, 182, 201
[48] Desk review reference: 23
[49] Desk review references: 43, 60, 141, 173
[50] Desk review references: 87, 167, 191, 194
[51] Desk review references: 60, 99, 151, 171,173, 181, 183, 196, 197, 198, 199, 200

(Annex 4).[52] Limited incorporation of emerging technology such as WGS and telehealth into IPC multimodal strategies, despite their recognised role in enhancing IPC and surveillance. These innovations are valuable components of multimodal strategies (Annex 4).[53]

## Core Component 6: Monitoring/Audit of IPC Practices and Feedback

### *Strengths and Key Achievements*

**Monitoring/audit of IPC practices and feedback is making progress.**

Three of the nine AMS achieve all five CC 6 MR indicators at national level, with a score of 100%, and one achieves 80% of the MR. Seven AMS identify HH compliance monitoring and feedback as a key national indicator, especially for reference hospitals (Annex 2). CC 6 is also making progress at the tertiary and secondary facility level (average score of 96% and 90%, respectively). Some AMS in HCFs at the secondary level have monthly audits and triannual IPC committee discussions. Tertiary-level HCFs show that several HCFs are reporting using comprehensive monitoring systems, including regular audits, HH and MDRO surveillance, and detailed feedback mechanisms disseminated to all relevant departments. Surveillance of needle-stick injuries and adherence to IPC checklists have also been integrated as standard practices in some tertiary settings (Annex 3).

**Monitoring of IPC practices, such as HH compliance, plays a critical role in reducing the burden of HAI and AMR.**

Studies conducted in AMS consistently emphasise that IPC monitoring, particularly HH compliance audits, plays a critical role in reducing the burden of HAI and AMR, while also demonstrating cost savings. Identified factors enhancing IPC and HH compliance include, but are not limited to, regular audits, feedback mechanisms, in particular real-time feedback, culturally sensitive interventions, patient empowerment strategies, and innovative tools such as floor markings (Annex 4).[54]

### *Identified Gaps and Challenges*

**Monitoring/audit has the second-lowest average score, with 64%, at the national level across nine AMS.**

Despite some AMS have developed comprehensive national IPC monitoring systems with regular evaluation mechanisms, notable disparities persist. Four AMS score 40% or below, and one scoring 60%, reflecting significant gaps in systematic monitoring frameworks (Annex 2). These findings also emerge in the Joint External Evaluation of International Health Regulations (IHR) Core Capacities of four AMS,

[52] Desk review references: 30, 31, 32
[53] Desk review references: 183, 184, 195, 196
[54] Desk review references: 28, 37, 54, 121, 185, 189, 205, 211, 214, 217, 227, 228

where it is reported that a lack of standardised IPC indicators and feedback mechanisms limits programme effectiveness, particularly in LMICs, with few HCFs systematically analyzing audit results or applying findings to policy and practice (Annex 4).[55] Also, there is a need for longer-term engagement of multimodal interventions and IPC efforts in the region, for instance, during public health emergencies, to sustain HH compliance or reduce HAI rates (Annex 4).

**Gaps between recommended and actual IPC practices persist, as reflected in low HH compliance, especially after contact with patients, and in healthcare waste management.**

Primary level facilities have an average score of 79%, with some HCFs conducting internal and external audits and semi-annual HH compliance surveys. Audit of IPC compliance has yet to begin in some HCFs or is not a standardised practice, though for others, biannual monitoring/audit assessing IPC compliance, e.g. HH and cleanliness of the facilities, is reported (Annex 3). Studies show that HH compliance remains suboptimal globally, with major variability across departments and consistently low adherence after patient contact with surroundings, even following interventions (Annex 4). Further, weak compliance with safely managing healthcare waste, part of IPC standard precautions, continues across AMS, emphasizing the need for environmentally safe technologies, occupational safety, and effective waste segregation and minimisation (Annex 4).

**Positive leadership and adequate resource allocation are among the multiple factors impacting IPC compliance that need to be addressed**.

Influencing factors include positive leadership and adequate resource allocation to ensure prevention bundles (Annex 4).[56] Specific factors impacting IPC practices compliance identified in the literature include, (i) at the individual level: staff profession, experience, education, knowledge, attitude, and perceived practice (Annex 4);[57] (ii) at the organisational level: leadership, department support (Annex 4);[58] (iii) then in the environment: workload (refer to CC7), time constraints (refer to CC7), adequate resource allocation (refer to CC8) such as lack of disinfectant materials, are identified causes of poor compliance with environmental hygiene practices (Annex 4);[59] (iv) workforce shortages, which are particularly detrimental to IPC in neonatal care settings where, despite staff's strong knowledge of HH, compliance is low (Annex 4);[60] and (v) psychological: burnout, stress, job satisfaction (Annex 4).[61]

[55] Desk review references: 21, 22, 63, 90
[56] Desk review references: 54, 73, 121
[57] Desk review references: 73, 220, 226
[58] Desk review references: 54, 185, 227, 228
[59] Desk review references: 28, 211, 214, 218, 224, 225, 229, 238
[60] Desk review reference: 234
[61] Desk review references: 225, 228

## Core Component 7: Workload, Staffing and Bed Occupancy at the Facility Level

### *Strengths and Key Achievements*

**Across all levels, some HCFs reported adaptive capacity supported by strategies and contingency plans to manage emergencies, high workloads, and overcrowding.**

The secondary facility level reports an average score of 86% across seven AMS. A facility recognises that effective management of staffing levels is essential in aligning staffing levels to fluctuating workload, optimizing physical spaces, and ensuring quality care through strategic scheduling (Annex 3).

At the primary level, despite having the lowest average score, some HCFs implement strategies to manage emergency situations, heavy workload, and overcrowding. These include the use of triage systems, extended operating hours, and staggered appointment systems to distribute patient flow more evenly, and patient cohorting[62] for in-patients (Annex 3), (Annex 4).[63] To further optimise service delivery and resource use, one primary HCF offers virtual clinics with appointment-only systems for routine medical visits to reduce walk-in congestion, and drive-through pharmacy services to streamline medication pickup. A call system at the same facility is also in place to facilitate patient communication and coordination with district health offices, allowing for staff mobilisation between clinics to address staffing shortages (Annex 3). Similarly, at the tertiary level, one hospital in LMIC reports having a hospital contingency plan, a patient flow management system, such as triage, and prioritizing spacing for ICU beds (Annex 3).

### *Identified Gaps and Challenges*

**Workload, staffing, and bed occupancy is among the lowest-scoring CCs at primary and tertiary facilities, and remain inconsistent across AMS.**

The primary facility level reports an average score of 61% (six AMS), ranging from 0 to 92%, and four AMS scoring below 50%. At the tertiary facility level, the average CC 7 score is 74% (eight AMS), with scores ranging from 39% to 100% (Annex 3).

Staffing shortages are a recurrent issue across levels, with multiple AMS reporting gaps in the number of full-time IPC nurses and infectious disease specialists. These shortages lead to high workloads and HW multitasking, with risk to lower IPC compliance (Annex 4).[64] For instance, a lack of full-time IPC nurses is one of the most frequently reported challenges to implement IPC in one AMS (Annex 4).[65]

[62] Cohorting: Grouping of patients who are colonized or infected with the same resistant organism with the aim to confine their care to one area and prevent contact with other susceptible patients. World Health Organization. (2019). Minimum requirements for infection prevention and control programmes. World Health Organization. https://iris.who.int/handle/10665/330080. License: CC BY-NC-SA 3.0 IGO
[63] Desk review reference: 168
[64] Desk review references: 75, 224, 226, 234
[65] Desk review reference: 224

The COVID-19 pandemic exacerbated existing staff shortages, with increased burnout, reallocation of duties, and hospital reorganisation affecting IPC practice at all levels (Annex 4).[66] In some tertiary facilities, overcrowding in inpatient areas caused inadequate space between beds and bed-sharing practice, making it difficult to comply with the recommended IPC practice and increasing infection risks. In one primary HCF, they lack dedicated staff for decontamination and sterilisation services (Annex 3), (Annex 4).[67]

## Core Component 8: Built Environment, Material and Equipment at the Facility Level

### *Strengths and Key Achievements*

**CC8 scores were consistent with average scores of at least 90% across all three HCF levels.**

The secondary HCF level has the highest average score at 94% (seven AMS), followed by the tertiary level with 93% (eight AMS), then the primary level with 90% (six AMS), reflecting notable progress in infrastructure and resource availability to support IPC. At the primary level, several facilities inform of initiating renovations, installing additional HH stations, and improving water and electricity systems, to further enhance environmental standards.

One tertiary level facility describes their improvement to include alcohol-based handrub at every patient bed and equipping each HH station with necessary items such as single-use towels (Annex 3).

**The availability of essential infrastructure, equipment and materials, such as adequate sink-to-bed ratios, has an impact on compliance with IPC practices.**

Studies confirm that the availability of necessary infrastructure and supplies has a direct impact on improving IPC practices; for instance, the sink-to-bed ratio influences HH compliance. One AMS study demonstrated that HH compliance reached 76% in an ICU with a sink-to-bed ratio of 1:1, compared to only 51% compliance with a sink-to-bed ratio of 1:4 (Annex 4).[68]

### *Identified Gaps and Challenges*

**Facilities report ongoing deficiencies in built environment, materials, and equipment availability, despite CC 8 scores achieving at least 90%.**

Deficiencies in WASH infrastructure are frequently reported and commonly observed in resource-limited settings, significantly contributing to exacerbating HAI risks.

[66] Desk review references: 168, 185, 235
[67] Desk review reference: 237
[68] Desk review reference: 6

Many facilities continue to operate with poor sink-to-bed ratios, limited access to functional handwashing stations, unreliable water supply, and clean water, which directly impact compliance with IPC standard practices such as environmental hygiene and reprocessing patient care equipment and linen (Annex 3), (Annex 4).[69]

Obstructions to IPC compliance include inadequate hospital layout for efficient patient flow, the absence of distinct patient zones in overcrowded facilities, and inadequate ventilation. Studies emphasise that while ventilation type alone is not a major risk factor, air quality and hospital layout significantly impact HAI prevention efforts (Annex 4).[70] To date, only one document with IPC specifications for new healthcare buildings has been identified from one AMS to guide the development of an enabling built environment for IPC, although similar guidance may exist in other AMS.

Other commonly cited deficiencies include limited availability of essential materials, equipment, and consumables, such as PPE, operational sterilisation apparatus, medical waste and puncture-proof containers, disinfectant solutions, to name a few. One study stresses the recognised HAI risk linked to lack of adequate disinfectant for mobile phones, including before and after entering the operating theatre (Annex 4).[71]

In addition, the lack of safe HCWM systems, the shortage of isolation rooms, and the absence of up-to-standard decontamination areas and a sterilisation department are particular concerns.

In the IPCAF-MR, the CC8 MR indicator on dedicated decontamination areas and/or sterile supply departments at the primary level was among the weakest across AMS, with an average score of 68% (Annex 3), (Annex 4).[72]

## Future Considerations

Based on findings from national and HCF IPC programme assessments (IPCAT-MR and IPCAF-MR results), the regional scoping review, and feedback from respondents across the 10 AMS, several cross-cutting priorities emerge. These highlight the key considerations needed to strengthen IPC programmes at both national and facility levels.

[69] Desk review references: 4, 5, 95, 96, 97, 226, 231
[70] Desk review references: 237, 238
[71] Desk review reference: 238
[72] Desk review references: 4, 21, 85, 148, 226, 238, 239

**Future considerations: cross-cutting themes**

- **Leadership, policy and enabling environment**: Ensure strong national leadership and policy backing with dedicated and appropriate funding to secure provision of essential equipment and materials, alongside upgrading infrastructure with a focus on needs to allow IPC compliance.
- **Resources:** Ensure adequate and dedicated human resources and appropriate staffing at recommended staff-patient ratios, and IPC professional-hospital bed ratios.
- **Capacity building and workforce development:** Developing accredited IPC training curricula for healthcare workers and IPC professionals (pre-in-service training) and establishing professional career pathways to retain skilled IPC staff, epidemiologists and auditors.
- **Standardised guidance and contextualisation:** Regularly updating IPC guidelines, SOPs, and training curriculum and adapting to AMS needs by adapting international or national guidelines to local cultural, economic and resource limitations realities.
- **Monitoring and evaluation**: Strengthening or establishing national IPC monitoring/audit systems with standardised indicators and feedback loops to ensure all AMS have a system to support targeted interventions.
- **Networking/multisectoral collaboration and research:** Nurturing multisectoral collaboration and research among policymakers, researchers, and healthcare providers within and between countries.

The table below provides more detailed recommendations by Core Component, broken down by theme.

Table 1: Future Considerations and Potential Actions per Core Component, by Thematic Area

| **CC1: IPC Programmes (Annex 3), (Annex 4)[73]** | |
|---|---|
| **Leadership and policy** | ● Advocate for leadership engagement at national and facility levels.<br>● Promote national IPC policy, including trained IPC professionals in IPC structure, and a robust HAI surveillance system.<br>● Integrate IPC into national health and patient safety strategies.<br>● Invest in and promote occupational health policies to raise awareness of how to protect and empower HWs and caregivers. |

[73] Desk review references: 3 13, 25, 26, 27,37, 38

| | |
|---|---|
| **Resources** | • Secure sustainable funding and resources for national and HCF IPC programmes, with dedicated budgets for IPC teams and operations.<br>• Create clear IPC career pathways and staffing structures to support retention and sustainability. |
| **Networking, collaboration, research** | • Strengthen national IPC programmes through inter- and multisectoral collaboration.<br>• Encourage peer learning by leveraging lessons from AMS with strong IPC programmes.<br>• Establish IPC and patient safety research networks and promote a strong safety culture, prioritizing support to AMS lacking IPC-related research.<br>• Translate research into sustainable IPC interventions (e.g. cost-effectiveness studies). |
| **CC2: IPC Guidelines (Annex 4)[74]** | |
| **Standardise, contextualise guidance** | • Standardise and update IPC and OHS guidelines tailored to country contexts, including vaccine-preventable diseases (e.g. Hepatitis B) and exposure prevention, particularly in AMS with a high prevalence of chronic Hepatitis B and C among HWs.<br>• Developing guidelines, balancing ideal recommendations and feasibility, taking into account available resources and cultural contexts (e.g. IPC guidance for family/caregivers). |
| **Networking, collaboration, research** | • Foster cross-disciplinary collaboration to develop and adapt guidelines, involving local experts.<br>• Conduct studies and research to generate evidence-based guidance and optimal SOPs (e.g. cleaning frequency for high-touch surfaces). |
| **CC3: IPC Education and Training (Annex 4)[75]** | |
| **Leadership and policy** | • Promote a strong IPC safety culture through continuous education.<br>• Establish ASEAN-wide IPC professional competency frameworks.<br>• Integrate IPC education and an accredited training programme into all health workforce disciplines. |

[74] Desk review references: 25, 26, 29, 30, 39, 41, 47, 50, 51, 64, 66, 67, 69, 70
[75] Desk review references: 20, 29, 30, 43, 46, 47, 49, 53, 54, 61, 63, 70-72, 76, 77, 83, 85, 86, 88, 91, 92

| | |
|---|---|
| | • Implement national systems to monitor and evaluate IPC training effectiveness, with performance indicators and feedback to sustain and improve outcomes. |
| **Standardise, contextualise guidance** | • Institutionalise standardised, competency-based IPC education for pre- and in-service training, incorporating adult learning methods (e.g. simulation, interprofessional learning).<br>• Develop IPC professionals training curricula based on ASEAN-wide IPC professional competencies.<br>• Tailor training to AMS contexts, addressing cultural, linguistic, economic, and infrastructure challenges. Emphasise OHS modules focused on vaccine-preventable diseases (e.g. Hepatitis B), and staff protection. |
| **Networking, collaboration, research** | • Expand access through virtual platforms and e-learning systems, especially for remote and underserved areas.<br>• Establish systems to evaluate training effectiveness using performance indicators and feedback loops.<br>• Invest in national and institutional e-learning infrastructure and accreditation mechanisms. |
| **CC4: HAI Surveillance (Annex 4)[76]** | |
| **Leadership and Policy** | • Use surveillance data to guide IPC policy improvements. |
| **Standardise, contextualise guidance** | • Develop standardised national and regional HAI surveillance frameworks with harmonised definitions, procedures, and feedback mechanisms.<br>• Use surveillance data to guide evidence-based IPC interventions, guideline updates, and antimicrobial stewardship, adapted to AMS contexts. |
| **Resources** | • Build human resource capacity for surveillance (epidemiologists, data analysts, infection control teams).<br>• Strengthen laboratory capacity and digital data systems. |
| **Networking, collaboration, research** | • Adopt advanced technologies such as WGS, wastewater monitoring, and early-warning systems, to improve the detection and tracking of HAI and AMR outbreaks.<br>• Promote regional data-sharing and cross-country learning platforms. |

[76] Desk review references: 41, 42, 59, 64, 84, 89, 101, 108, 140, 162, 176, 179

| CC5: Multimodal Strategies (Annex 4)[77] | |
|---|---|
| **Leadership and Policy** | ● Institutionalise and/ or strengthen multimodal IPC approaches with diverse stakeholders.<br>● Integrate IPC multimodal strategies with antimicrobial stewardship and One Health initiatives.<br>● Empower IPC teams and facility leadership by promoting audit-feedback cycles and IPC champions to maintain motivation and compliance. |
| **Standardise, contextualise guidance** | ● Tailor multimodal strategies to local contexts and cultural norms (e.g. caregiver roles, staff constraints, infrastructure limitations).<br>● Include IPC multimodal strategies and interventions in outbreak and pandemic action plans and strategies. |
| **Networking, collaboration, research** | ● Conduct studies to assess the effectiveness and cost-effectiveness of multimodal strategies.<br>● Integrate and invest in new technologies (e.g. telehealth, WGS, digital monitoring tools) to sustain IPC adherence. |
| **CC6: Monitoring/Auditing and Feedback (Annex 4)[78]** | |
| **Leadership and Policy** | ● Institutionalise internal and external audits in HCFs, particularly at the primary level.<br>● Promote an audit system where monitoring results inform policy and practice adjustments. |
| **Standardise, contextualise guidance** | ● Strengthen or develop national IPC monitoring frameworks with standardised indicators and protocol (e.g. effective feedback loops). |
| **Resources** | ● Build capacity of auditors or IPC focal points for data collection, interpretation, and use.<br>● Develop digital systems for monitoring and reporting IPC data. |
| **Networking, collaboration, research** | ● Implement innovative solutions, tools such as real-time HH feedback cards, floor markings (to comply with patient placement, disinfection – sterilisation circuits), and safe HCWM technologies. |

[77] Desk review references: 14, 23, 26, 30, 31, 32, 60, 87, 99, 141, 142, 151, 167, 171, 173, 174, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201
[78] Desk review references: 8, 21, 22, 63, 77, 90, 180, 192, 205, 208, 213, 217, 218, 222, 224, 227, 232

| CC7: Workload, Staffing and Bed Occupancy (Annex 4)[79] | |
|---|---|
| **Leadership and Policy** | • Develop and enforce national bed occupancy and spacing, and staffing standards, including the trained IPC professional ratio per hospital bed.<br>• Integrate workforce planning into public health emergency preparedness frameworks. |
| **Standardise, contextualise guidance** | • Contextualise guidance for triage systems, appointment scheduling, and virtual clinics to manage workload and reduce overcrowding, and support implementation. |
| **Resources** | • Reinforce staffing standards to reduce informal caregiving.<br>• Build workforce resilience and wellbeing through effective planning and supervision.<br>• Upgrade infrastructure to meet occupancy and spacing standards. |
| **Networking, collaboration, research** | • Evaluate the impact of workload management and staffing policies on IPC performance and outcomes. |
| **CC8: Built Environment, Materials and Equipment (Annex 4)[80]** | |
| **Leadership and Policy** | • Develop or revise national HCF building standards based on IPC principles (e.g. HH station, patient placement, zoning, ventilation). |
| **Standardise, contextualise guidance** | • Tailor national HCF building standards to local contexts (e.g. source and reserve of water, wastewater management system, informal caregivers, kitchen and patient alimentation). |
| **Resources** | • Reorganise unit and facility layouts to meet HCF building standards.<br>• Invest in WASH infrastructure (adequate ratio of HH stations, safe water supply, and reliable sanitation systems).<br>• Ensure reliable supply chains for IPC equipment, materials, and consumables.<br>• Reorganise facility layouts to optimise IPC workflows and patient flow. |

[79] Desk review references: 86, 168, 185, 224, 234, 237

[80] Desk review references: 4, 5, 8, 51, 85, 95-97, 148, 222, 231, 237-240

| | |
|---|---|
| | • Strengthen technical capacity in facility design, maintenance, and IPC-related engineering. |

## Conclusion

The assessment reveals that while all AMS have established IPC programmes, their implementation varies significantly across different healthcare facility levels. Key strengths include the development of national IPC guidelines, multimodal strategies, and improvements in built environments that support IPC practices. However, substantial gaps remain, particularly in IPC programme implementation, education and training, and monitoring/audit systems.

To sustain and build upon existing progress, such as the establishment of national IPC programmes and HAI surveillance systems, it is essential to address persistent identified challenges, including shortages in human and financial resources, limited enabling environments, a deficiency of trained IPC professionals and career pathways, and a lack of strong safety culture.

Targeted efforts to strengthen the weakest-performing CC MR are needed. These should include IPC education and training (CC3) and monitoring/audit of IPC practices and feedback (CC6) at both levels, and HAI surveillance implementation (CC4), workload, staffing, and bed occupancy (CC7) including the availability of trained IPC professionals, and built environment, materials and equipment (CC8) at facility level, are essential to ensuring patient safety and quality care, providing a safer environment for HWs, patients, and caregivers, and preventing future public health emergencies, including outbreaks of HAIs and AMR.

# ANNEXES

## Annex 1: Detailed Methodology

Under the leadership of Cambodia, Core Group members guided the ASEAN Infection Prevention and Control (IPC) landscape assessment based on the endorsed concept note for Activity 5 of the 2023–2025 ASEAN-US IPC Task Force Work Plan: *Landscape Assessment of National IPC Programmes in ASEAN Member States* (AMS). The activity was conducted from January 2024 to June 2025.

The Core Group members agreed upon the following steps to conduct the IPC landscape assessment:

- Assessment of national IPC programmes using the self-administered WHO IPC Assessment Tool – Minimum Requirements (IPCAT-MR) tool;
- Assessment of HCF IPC programmes using the self-administered WHO IPC Assessment Framework – Minimum Requirements (IPCAF-MR) tool;
- Desk review of relevant articles, reports, and documents related to IPC;
- Compilation and organisation of IPC-related documents submitted by national and HCF assessors and from the scoping review;
- Sharing of the draft report with Task Force members for review and content validation;
- Report dissemination to relevant stakeholders.

**Self-Administered National and HCF IPC Programmes Assessments**

The Core Group members selected the following WHO tools for the self-assessment process:

- IPCAT-MR[81] tool for national-level IPC programmes assessments;
- IPCAF-MR tools for HCF-level assessments, covering primary,[82] secondary,[83] and tertiary[84] facility levels.

All tools were integrated into a REDCap platform in English to support data collection, analysis, and document submission. The IPCAF-MR tool was translated into Khmer and Bahasa Indonesia with validation of translation by Task Force members to facilitate the participation of HCF IPC focal points.

[81] Assessment tool of the minimum requirements for infection prevention and control programmes at the national level. Geneva: World Health Organization; 2021. https://www.who.int/publications/m/item/assessment-tool-of-the-minimum-requirements-for-infection-prevention-and-control-programmes-at-the-national-level

[82] Assessment tool on infection prevention and control minimum requirements for primary health care facilities. Geneva: World Health Organization; 2023. https://iris.who.int/bitstream/handle/10665/367505/WHO-UHL-IHS-IPC-2023.2-eng.pdf?sequence=1

[83] Assessment tool on infection prevention and control minimum requirements for secondary health care facilities. Geneva: World Health Organization; 2023. https://iris.who.int/bitstream/handle/10665/374518/WHO-UHL-IHS-IPC-2023.4-eng.pdf?sequence=1

[84] Assessment tool on infection prevention and control minimum requirements for tertiary health care facilities. Geneva: World Health Organization; 2023. https://iris.who.int/bitstream/handle/10665/374519/WHO-UHL-IHS-IPC-2023.5-eng.pdf?sequence=1

Below are the links to the REDCap surveys and translated tool:

1. National IPC programmes assessment
    a. IPCAT-MR tool (PDF format): https://drive.google.com/file/d/1R4PHqX8uQXfKcd65bkI0xt2Jtct-RHyK/view?usp=drive_link
    b. IPCAT-MR tool (REDCap platform): https://redcap.link/TaskForceIPCATMR
2. HCF IPC programmes assessment
    a. IPCAF-MR tool (PDF format) https://drive.google.com/drive/u/1/folders/12zhtctvWoteOLjGH8QX3bqvS3G57M0Ko
    b. IPCAF-MR tools (REDCap platform)
        i. Primary HCF level: https://redcap.vumc.org/surveys/?s=PLPYWLH4Y8EN4F37
        ii. Secondary HCF level: https://redcap.vumc.org/surveys/?s=P3M9AWDYR7XD9FTJ
        iii. Tertiary HCF level: https://redcap.vumc.org/surveys/?s=3H7RK9JJ9CDEAW88

To support accurate completion of the assessments, tutorials were developed for both tools via webinars and Canva. These included assessment objectives, step-by-step guidance, and contact information for technical support:

- The IPCAT-MR tutorial was delivered via webinar in July 2024, available at:

  https://docs.google.com/presentation/d/1kHzVzj_db-C_G6WpF7nWExiPbBipLUXA/edit?slide=id.p1#slide=id.p1

- The IPCAF-MR tutorials, one per HCF level and one specific for the REDCap platform use, were developed using the Canva application. Tutorials for all HCF levels were also translated into Khmer and Bahasa Indonesia, available at:
    - IPCAF-MR Tutorial – English version (CANVAS platform): https://healthsecuritypartners.instructure.com/courses/306/modules
    - IPCAF-MR Tutorials – Khmer version: https://drive.google.com/drive/folders/1NQR3E-SkoM2YbYZ3mggeTzvfe8JOBFup?usp=drive_link
    - IPCAF-MR Tutorials – Bahasa Indonesia version: https://docs.google.com/presentation/d/1rdGc3yL0VE6tw874UcYtu6DHWv5CZ0sN/edit?usp=drive_link&ouid=117573523005343947039&rtpof=true&sd=true

*Data Analysis and Reporting*

National IPC Assessment (IPCAT-MR tool): Data entry and data management activities were carried out via the REDCap platform, while data analysis was carried out using pivot table feature on Excel and Looker Studio was utilised in data visualisation. Nine of 10 AMS submitted data. Lao PDR did not submit data. IPCAT-MR scores for each CC and overall were calculated for each country and averaged across the nine AMS. National documents and additional information (e.g. policies, guidelines, protocols) uploaded by self-assessors were summarised.

HCF IPC Assessment (IPCAF-MR tool): REDCap platform was used to enter and analyze raw data from three HCF levels of six, seven, and eight AMS for primary, secondary, and tertiary HCF levels, respectively. An option to upload additional relevant IPC documents (e.g. IPC action plans, multimodal strategies) was included.

Average score for each CC of IPCAF-MR calculated by country and hospital level. Where CC scores were averaged across countries, a weighted average was calculated to account for the different number of hospitals submitting data in each AMS. Additional documents uploaded were summarised and listed per country and CC to create a regional document library for TF members.

Supporting documents submitted by AMS and HCFs (e.g. policies, guidelines, SOPs, and responses to open-ended questions) were reviewed, with relevant findings incorporated into the landscape report to support and validate the IPC programme self-assessments. Documents related to IPC were ordered and classified (Annex 5). The findings were first analysed per tool and HCF level, then synthesised into the overall ASEAN IPC landscape assessment, combining with the findings from the scoping review (Annex 2, Annex 3).

**Desk Scoping Review**

In parallel to the IPC programme self-assessment, a desk scoping review was carried out to gather information related to IPC programmes, HAI and pathogen surveillance, the health and economic burden of HAIs, and health data infrastructure.

*Data Sources*

Relevant information was collected using the following criteria:

- Publication timeframe: 2014–2024.
- Websites reviewed: Official Ministry of Health websites of AMS and partner organisations (e.g. Asian Development Bank, CDC, WHO, and Non-Governmental Organisations).
- Search platforms and databases: PubMed, Google Scholar, ScienceDirect, US-CDC.

Search Keywords included:

- Healthcare-associated infection, HAI, HCAI, nosocomial infection, antimicrobial resistance, AMR;
- Infection prevention and control, IPC, infection control;
- IPC-related terms: programme, policy, strategy, cost-effectiveness, monitoring, evaluation, audit;
- IPC-specific measures: hand hygiene (HH), personal protective equipment (PPE), guidelines, training, healthcare waste management (HCWM), environmental hygiene, environmental cleaning, quality improvement.

Inclusion and Exclusion Criteria

- Inclusion Criteria:
    - Articles in English (full text or abstracts);
    - Content addressing at least one IPC CC.
- Exclusion Criteria:
    - Future IPC projects without available data;
    - Articles unrelated to at least one AMS or IPC CC.

Studies solely focused on pathogen surveillance in animal, environmental, or community contexts.

*Summary of Search Results and Eligible Articles*

- Total articles retrieved: 1,674
- Articles excluded: 1,393
- Articles included in the final review: 281

Eligible articles were screened, and data were extracted, analysed, and summarised according to the WHO IPC CC. Among those 281 eligible articles, AMS with the fewest IPC-related articles were Brunei Darussalam, Lao PDR, and Myanmar (respectively, 1.4%, 1.1%, and 2.1%). AMS with the highest number of IPC-related articles were Viet Nam (16.17%), Indonesia (14.9%), Thailand (14.6%), and Malaysia and Singapore (13.5%).

***Findings Analysis and Reporting***

Key findings from the included articles were synthesised according to the WHO IPC CCs, highlighting common thematic areas (Annex 4).

## Annex 2: Report on national IPC programmes assessment

The self-assessment of the national infection prevention and control (IPC) programme included six Core Components (CC), as per the WHO IPC Assessment Tool-Minimum Requirements (IPCAT-MR):

- CC1: IPC programmes
- CC2: IPC guidelines
- CC3: IPC education and training
- CC4: Healthcare-Associated Infections (HAI) surveillance
- CC5: Multimodal strategies for implementation of IPC interventions
- CC6: Monitoring/audit of IPC practices and feedback

**Summary of Data Results and Findings**

### *National IPC Programmes — Overall Findings*

**Nine of 10 ASEAN Member States (all except Lao PDR) completed the national IPC programme survey using the REDCap platform.** All respondents voluntarily participated in this survey and answered all questions to the best of their knowledge and capacity. Respondents are all affiliated with their Ministry of Health (MOH) and/or national IPC structure, such as IPC or Antimicrobial Resistance (AMR) committee chairs, national IPC focal persons, Heads of IPC units.

**On average, the nine AMS respondents have achieved 80% of the national IPC programmes CC MR.** The overall score range varies between 44% and 100%. Three of six CCs had average MR scores above 85% (CC5—Multimodal strategies, CC2—IPC guidelines, CC1—IPC programmes), while two scored below 70% (CC3—IPC education and training, 67%; CC6—Monitoring/audit of IPC practices and feedback, 64%). CC4—HAI surveillance had an average score of 78%. Figure 11 presents average CC scores and the overall average for the nine national IPC programmes.

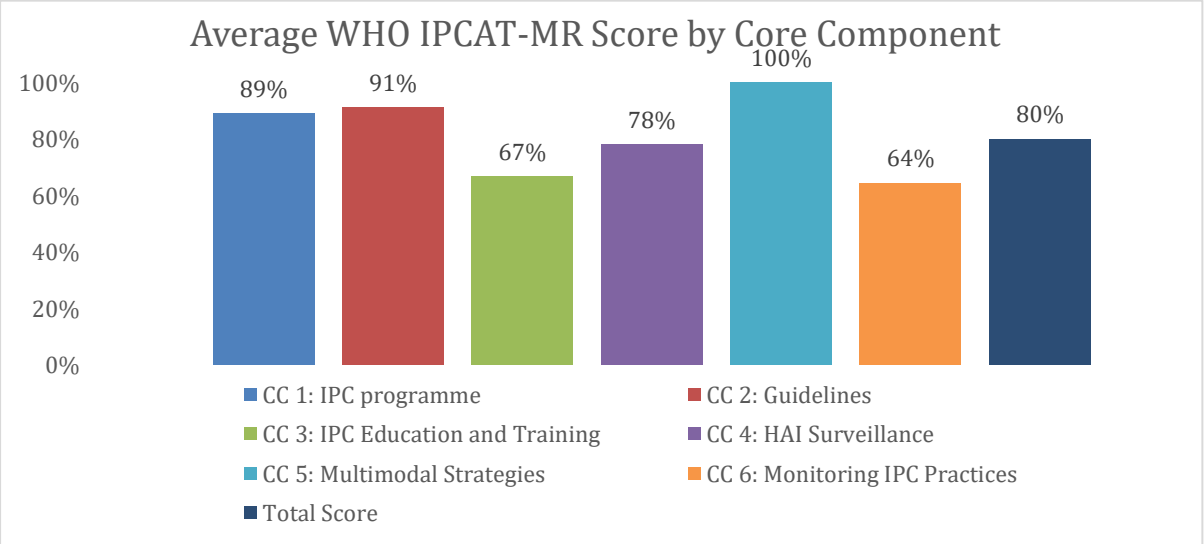


*Figure 11. Average Score of the National IPC Programmes per Core Component (n=9)*

## *National IPC Programmes — Detailed analysis*

### *CC1: IPC programmes*

**Most respondents confirm that their respective country has an active national IPC programme**. The average score is 89% for the nine AMS respondents. An active IPC programme is defined as a functioning programme with annual work plans and a budget. Six out of nine respondents answered “yes” for all the CC MR indicators under CC1. Only one AMS recognised that while having a national IPC programme and an activity plan for any given year, they are working on strengthening their programmes to develop a formal endorsed plan at the national level and ensuring a dedicated budget according to planned activities with at least one full-time equivalent appointed IPC focal point(s) to implement their IPC programmes.

**All AMS respondents have confirmed that an appointed IPC focal point is in charge of the national IPC programme**. Only one AMS mentioned that their appointed IPC focal point has not undergone training in the prevention of HAI. Most appointed IPC focal points have a dedicated full-time (or equivalent) person to implement the IPC tasks, except for two AMS. In addition, one of the AMS mentions that the composition, roles, and responsibilities of their national IPC focal point were established in 2021, under the Patient Safety Central Committee. Another AMS shares that their national IPC committee is a multidisciplinary working group that includes physicians, nurses, pharmacists, medical technologists, experts from the government, universities, and private sector. Their IPC plan includes at least HAI surveillance, annual seminars, and HCF monitoring and evaluation, funded by government and partners.

Figure 12 summarises the MR scores for CC1 from the nine AMS respondents.

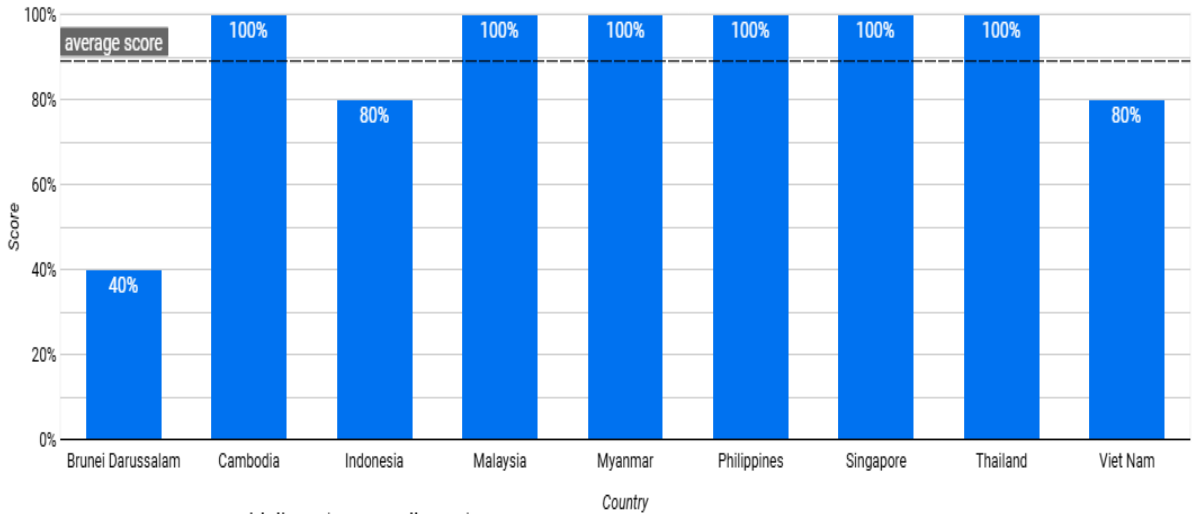


*Figure 12. IPCAT-MR CC1 scores by AMS*

### *CC2: IPC guidelines*

**This component has the highest overall score, 91% on average, for the nine respondent AMS.** Five out of nine AMS fulfill all CC MR indicators for CC2, and the four remaining AMS have a score of 80%. One AMS mentions that their national IPC programme is not mandated to produce guidelines for preventing and controlling HAI. Out of nine AMS, seven AMS have shared their national guidelines, such as IPC guidelines, isolation, HAI, and national IPC standards.[85] Three AMS have specified that they do not review their IPC guidelines at least once every five years to reflect the current evidence base. All respondents answered "Yes" for these MR indicators:

- The development of guidelines involves the use of evidence-based scientific knowledge and international/national standards.
- The guidelines are for national coverage, including all acute health care facilities (both public and private).
- The IPC programme actively addresses guideline adaptation and standardisation of effective preventive practices (e.g. SOPs) and their implementation to reflect local conditions.

Figure 13 summarises the MR scores for CC2 from the nine AMS respondents.

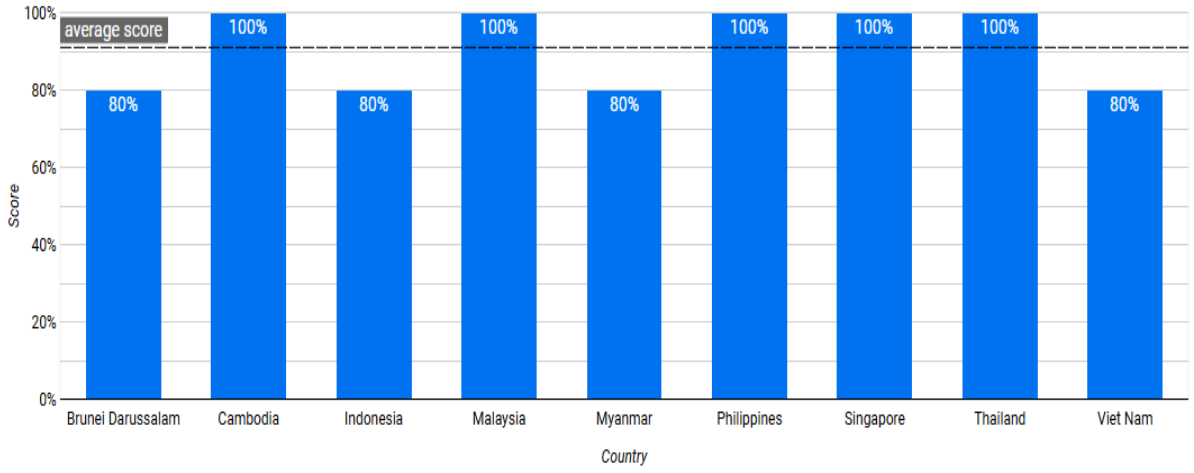


*Figure 13. IPCAT-MR CC2 scores by AMS*

### *CC3: IPC education and training (CC3)*

**IPC education and training CC has the second-lowest score, 67% on average, among the nine respondent AMS.** More specifically, three out of nine AMS (33%) responses indicated that all minimum requirements for CC3 are met, with 33% of respondents having a national system and schedule of monitoring and evaluation in place to verify the effectiveness of training and education at least annually.

[85] https://www.moh.gov.sg/hpp/all-healthcare-professionals/guidelines/GuidelineDetails/infection-prevention-and-control-guidelines-and-standards

However, three AMS did not meet the MR indicator of having a developed national IPC curriculum for in-service training of HWs, aligned with national IPC guidelines and approved and endorsed by the appropriate national body.

**In terms of IPC education at the facility level, results are also mixed.** For the CC MR indicators associated with providing guidance and recommendations for the in-service IPC training at the facility level, one AMS did not reach the CC MR indicators. In addition, two AMS have mentioned that they have an in-service IPC training and education programme or curriculum organised at the HCF level based on the national IPC guidelines. One AMS has legislation that states that the hospital IPC committee has the task to train its staff on IPC matters by national IPC standards. Figure 14 summarises the MR scores for CC3 from the nine AMS respondents.

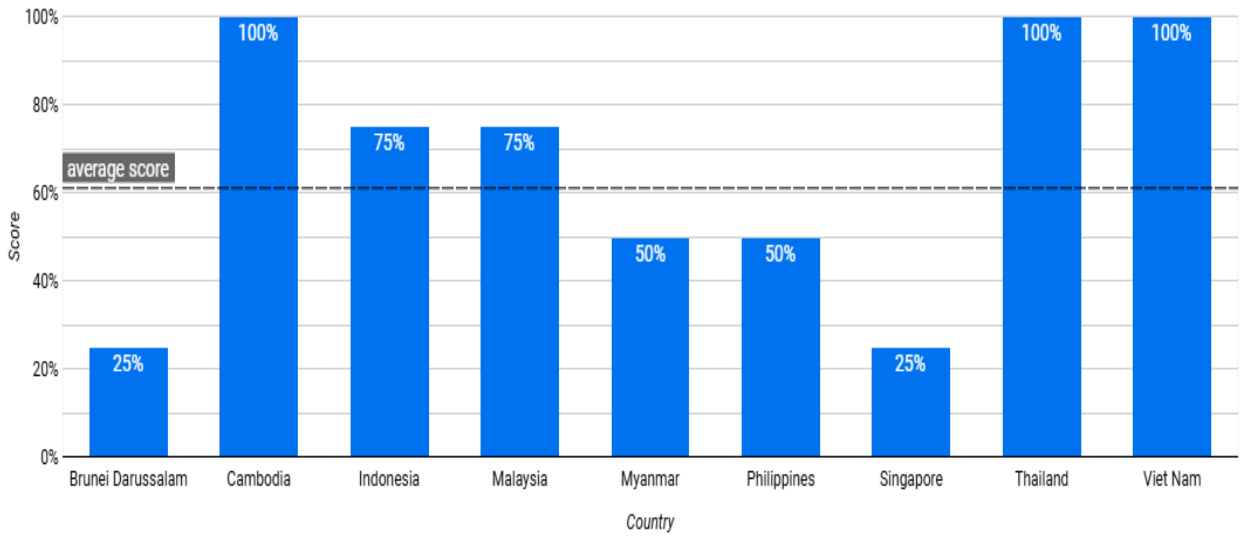


*Figure 14. IPCAT-MR CC3 scores by AMS*

### *CC4: HAI surveillance*

**With an average score of 78% for the nine AMS respondents, most respondents (except two) have a national multidisciplinary technical group for HAI surveillance.** Six out of nine AMS have a national strategic HAI surveillance plan (focusing on priority infections based on the local context) developed by the multidisciplinary technical group. Nearly all national IPC focal points/team (eight out of nine AMS) are trained in HAI surveillance concepts and methods. Overall, six AMS complied with the three MR indicators for the national level of HAI surveillance, however one AMS has yet to establish a national HAI surveillance system. Note that several AMS shared their national HAI guidelines or HAI reports. Figure 15 summarises the MR scores for CC4 from the nine AMS respondents.

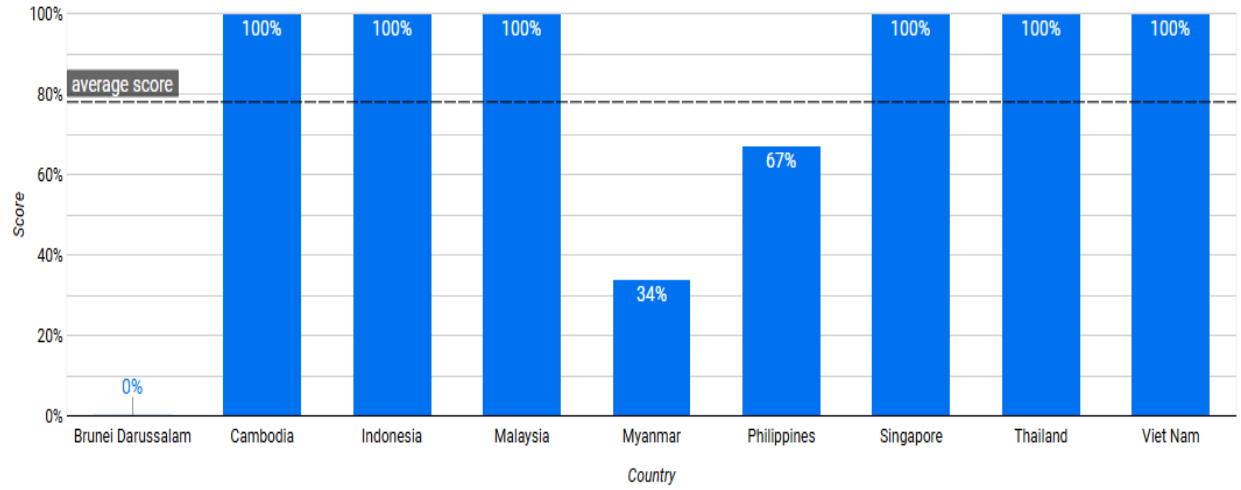


*Figure 15. IPCAT-MR CC4 scores by AMS*

### *CC5: Multimodal strategies for implementation of IPC interventions*

**The average score across the nine AMS for multimodal strategies is the highest, at 100%.** All AMS respondents have achieved the three CC MR indicators:

(i) There is a trained national IPC focal point with knowledge of implementation science and multimodal improvement strategies and their application to IPC;

(ii) The national IPC focal point coordinates/supports local implementation of IPC improvement interventions; and

(iii) Multimodal strategies are included as the best approach for implementation in IPC guidelines and IPC education and training programmes. One AMS shared their national strategic plan (2023–2027).

Figure 16 summarises the MR scores for CC5 from the nine AMS respondents.

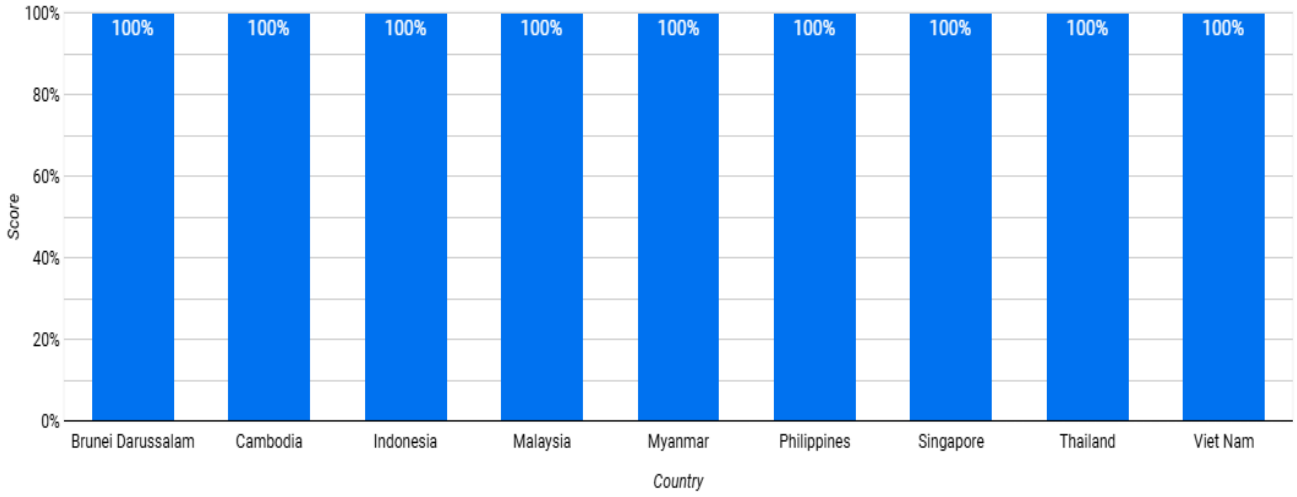


*Figure 16. IPCAT-MR CC5 scores by AMS*

### *CC6: Monitoring/audit of IPC practices and feedback*

**The average score for CC6 is 64%, making monitoring and audit the lowest average score across the nine AMS**. Three AMS have achieved the five CC MR indicators. Four AMS have a score of 40% or lower, and two AMS a score of 60% and 80%. Seven out of nine AMS have identified HH compliance monitoring and feedback as a key national indicator, at the very least for reference hospitals.

Figure 17 summarises the MR scores for CC6 from the nine AMS respondents.

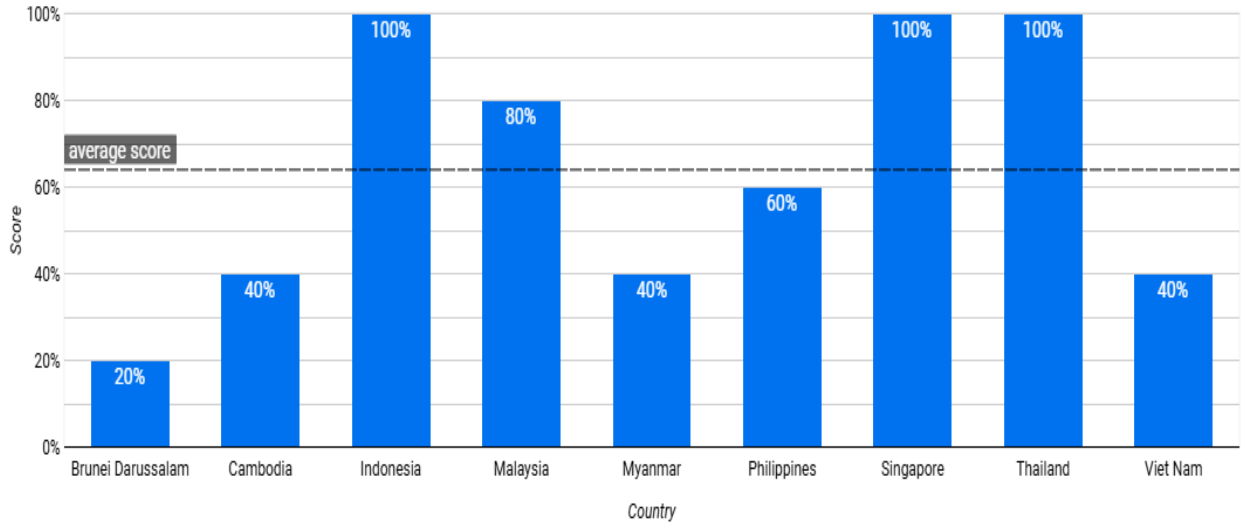


*Figure 17. IPCAT-MR CC6 scores by AMS*

## *Conclusion and Future Considerations*

**While the overall score of the six CCs across nine AMS for the national IPC programmes reached 80%, there is room for improvement for each CC.** Compliance with IPC education and training (CC3) and monitoring and audit of IPC practices and feedback (CC6) should be prioritised, as they have the lowest average scores, respectively 67% for CC3 and 64% for CC6. Under CC3, only three AMS have a national system and a schedule of monitoring and evaluation in place to verify the effectiveness of training and education, at least annually. This should be taken into account and prioritised.

## Annex 3: Report on HCF IPC programmes assessment

The self-assessment of the Healthcare Facility (HCF) infection prevention and control (IPC) programmes included eight Core Components (CC), as per the WHO IPC Assessment Framework-Minimum Requirements (IPCAF–MR). Those are:

- CC1: IPC programmes
- CC2: IPC guidelines
- CC3: IPC education and training
- CC4: HAI surveillance
- CC5: Multimodal strategies for implementation of IPC interventions
- CC6: Monitoring/audit of IPC practices and feedback
- CC7: Workload, staffing and bed occupancy
- CC8: Built environment, materials and equipment for IPC at the facility level

**Summary of Data Results and Findings**

***Primary HCF Level — Overall Summary***

**The weighted average score of all CC MRs in primary HCFs is 81%.**

This is based on 482 self-administered records of WHO IPCAF–MR from primary HCF from six AMS (Brunei Darussalam, Cambodia, Malaysia, Myanmar, Philippines, and Thailand). As presented in Figure 18 below, IPC guidelines (CC2) has the highest average score (93%), followed by multimodal strategies (CC5) and built environment, materials and equipment for IPC (CC8) (both 90%). HAI surveillance (CC4) is not assessed at the primary HCF level with IPCAF–MR tool and therefore CC4 has no data. The CC with the lowest average score is workload, staffing and bed occupancy (CC7) (58%; range 0–92%). IPC education and training (CC3) (70%; range 57–100%) and IPC programmes (CC1) (71%; range 59–98%) have the second- and third-lowest average score, respectively.

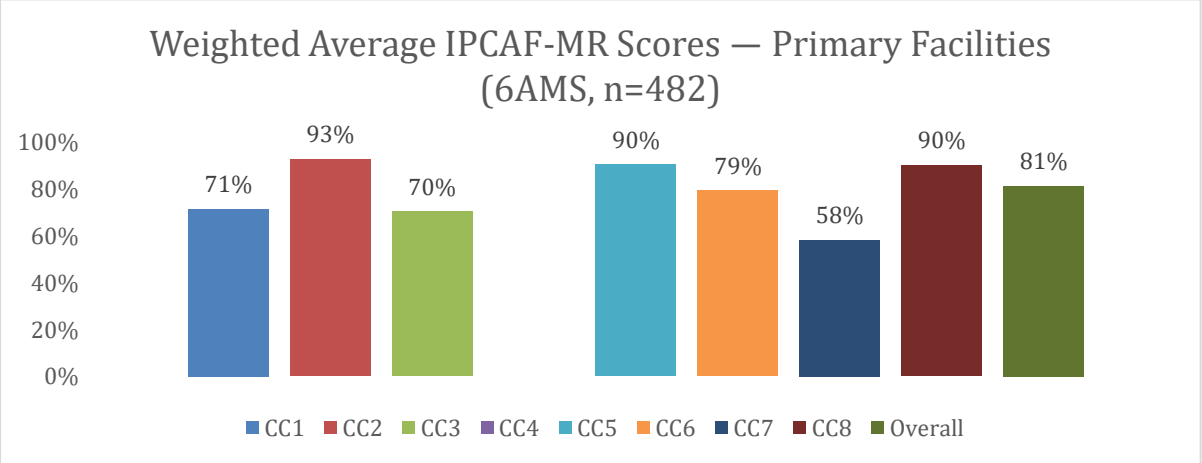


*Figure 18. Average IPCAF-MR Primary Level scores across six AMS by CC*

### *Primary HCF Level — Results by Country and Core Components*

*Table 2. WHO IPCAF-MR Primary Level Scores by Country*

| Country | Count | CC1 | CC2 | CC3 | CC5 | CC6 | CC7 | CC8 | Overall |
|---|---|---|---|---|---|---|---|---|---|
| Brunei Darussalam | 2 | 0.75 | 0.83 | 1 | 1 | 0.75 | 0 | 0.91 | 0.79 |
| Cambodia | 42 | 0.64 | 0.85 | 0.76 | 0.88 | 0.68 | 0.25 | 0.9 | 0.76 |
| Malaysia | 88 | 0.98 | 1 | 0.93 | 0.95 | 0.96 | 0.4 | 0.92 | 0.88 |
| Myanmar | 59 | 0.86 | 0.98 | 0.82 | 0.92 | 0.94 | 0.48 | 0.98 | 0.88 |
| Philippines | 267 | 0.59 | 0.9 | 0.57 | 0.88 | 0.71 | 0.69 | 0.87 | 0.77 |
| Thailand | 24 | 0.88 | 0.97 | 0.95 | 1 | 0.96 | 0.92 | 0.99 | 0.96 |

**Several notable country level results are observed at the primary level.** Thailand reports the highest overall score of 96%, while Cambodia reports the lowest overall score of 76%. Indeed, Thailand consistently reports high scores across CC where other AMS tended to score lower on average. Notably, Thailand achieved a score of 92% for CC7 (average of 58% across AMS) and 95% for CC3 (average of 70% across AMS). Finally, the low number of HCF reporting from Brunei Darussalam (2) made it challenging to compare results to other countries.

**Despite average scores across the CC MRs of 76% and over, inconsistencies are identified in some of the indicators.** For example, under CC8, although the overall average score is 90% across AMS, the MR indicator related to the provision of a dedicated decontamination area and/or sterile supply department, either on-site or off-site and operated by a licensed provider, remained unmet, with a lower average score of 68%.

Primary HCF respondents provided additional insights into their experiences and the challenges they met in implementing their IPC programmes:

- **IPC programmes:** In one AMS, IPC activities at the primary care level are led by IPC-trained Township Medical Officers and coordinated by the Regional Health Department. Their IPC programmes include various activities, supported by an annual budget to promote IPC, such as Hand Hygiene (HH) awareness campaigns, training, audits, and the purchase of equipment.
- **IPC guidelines:** One HCF reports following national IPC guidelines, including Standard Operating Procedures (SOPs) for HH, Personal Protective Equipment (PPE) use, decontamination, waste, and spill management, periodically updated and implemented through audits and training.

- **IPC education and training:** IPC education is delivered through Continuous Medical Education (CME) programmes and annual training, including orientation for new staff, and training is conducted at least annually. Healthcare workers (HWs), link nurses, and auditors are trained using national IPC modules, which are organised by district health departments. The district health office has proposed specialised IPC courses to IPC officers and link persons. IPC education is reinforced during outbreaks and supported by internal audits and HH monitoring.
- **HAI surveillance:** One AMS specifies that HAI surveillance is not implemented at the primary care level. Surveillance of sharp injuries and other infectious diseases, such as vaccine-preventable diseases, tuberculosis, measles, HIV, and hepatitis, among others, vary across HCFs, and where implemented, it follows national guidance. However, the lack of HAI surveillance at the primary HCF level is recognised as a gap in monitoring and managing infection risks in these settings.
- **Multimodal strategies:** One HCF mentions that their multimodal IPC strategy elements are training and education, audit, and a system with dedicated link personnel in clinics to facilitate communication and reminders. However, there are limitations in infrastructure and human resources for IPC implementation. These constraints affect their ability to fully apply certain strategic elements in primary health care, such as system changes to enable IPC practices. Despite these challenges, they emphasise culture safety and hold regular meetings to address IPC issues.
- **Monitoring/audit of IPC practices and feedback:** Monitoring checklists are part of IPC guidelines. Regular audits, both internal and external, are conducted to monitor and enhance IPC measures, assessing HH compliance, the cleanliness of the facilities, and reported needle-sharp injuries. Staff are encouraged to report any errors or difficulties in maintaining IPC procedures, particularly during clinic meetings. However, it is also mentioned that primary care lacks IPC practice audit.
- **Workload, staffing and bed occupancy:** To manage patient flow during emergencies and overcrowding, several measures are implemented, including triage systems, spaced-out appointment scheduling, appointment-only consultations, virtual clinics, and drive-through pharmacy services. One facility addresses staff shortages through coordination with district health offices. Overwhelmed staff with multiple tasks and responsibilities, and a lack of human resources (e.g. lack of staff for decontamination and/ or sterilisation services) are recognised as limiting IPC implementation. For instance, a senior nurse works in several primary facilities, within different districts, also holding responsibilities as the Township Medical Officer in the IPC Programmes, indicating a high workload.

- **Built environment, materials and equipment for IPC:** Limitations in infrastructure for IPC implementation are recognised; for instance, some facilities lack proper HH stations, sinks, dedicated areas for decontamination or sterilisation services, and these are identified as areas for improvement. PPE and waste management supplies are coordinated through the pharmacy and district IPC units. Basic infrastructure (electricity, sewage) is in place, but further improvements in facility layout/infrastructure are needed. One HCF stresses that despite having IPC SOPs, there is no triage system or isolation room for infectious patients (allowing IPC compliance with SOPs).

***Secondary HCF Level — Overall Summary***

**The weighted average score of all secondary healthcare facilities across seven AMS is 89%.** A total of 274 self-administered records of WHO IPCAF-MR for secondary level HCF were received across seven AMS and indicate a good overall performance of all Core Components based on self-assessment. Notable average scores over 90% include IPC guidelines (CC2) (95%), and Built Environment, Materials and Equipment (CC8) (94%). Multimodal strategies (CC5) reach 88%, suggesting good regional performance in these areas. IPC programmes (CC1) average score is the lowest with 75%. Results show there is space for improvement to reach all MR indicators, by all AMS.

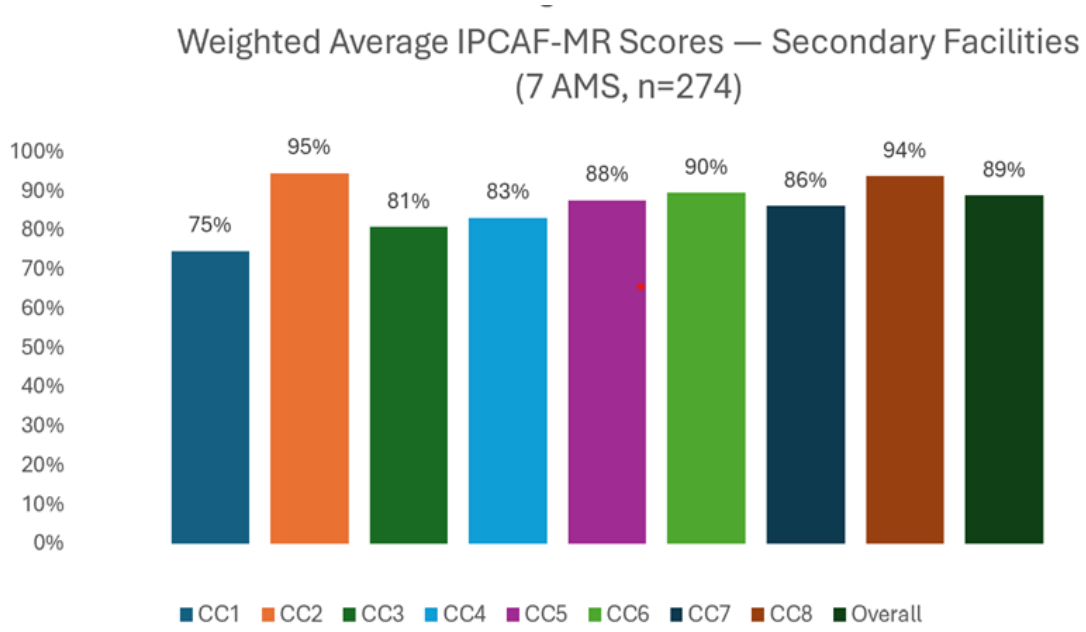


*Figure 19. Average IPCAF-MR Secondary Level CC scores across seven AMS*

### *Secondary HCF Level — Results by Country and Core Components*

*Table 3. WHO IPCAF-MR Secondary Level Scores by Country*

| Country | Count | CC1 | CC2 | CC3 | CC4 | CC5 | CC6 | CC7 | CC8 | Overall |
|---|---|---|---|---|---|---|---|---|---|---|
| Brunei Darussalam | 1 | 0.33 | 1 | 1 | 1 | 1 | 0.75 | 0.43 | 0.86 | 0.76 |
| Cambodia | 17 | 0.55 | 0.79 | 0.8 | 0.47 | 0.76 | 0.94 | 0.51 | 0.9 | 0.77 |
| Indonesia | 20 | 0.77 | 0.94 | 0.87 | 0.85 | 0.6 | 0.91 | 0.74 | 0.91 | 0.86 |
| Malaysia | 6 | 0.94 | 0.92 | 0.94 | 1 | 1 | 1 | 0.9 | 0.98 | 0.95 |
| Myanmar | 15 | 0.64 | 0.93 | 0.91 | 0.8 | 0.67 | 0.83 | 0.76 | 0.97 | 0.87 |
| Philippines | 205 | 0.76 | 0.96 | 0.79 | 0.85 | 0.92 | 0.89 | 0.91 | 0.94 | 0.9 |
| Thailand | 10 | 0.87 | 0.98 | 0.87 | 1 | 1 | 0.98 | 0.91 | 0.99 | 0.95 |

**There are several notable country-level results at the secondary level.** Malaysia (95%) and Thailand (95%) report the highest overall score from the secondary level, meanwhile Brunei Darussalam recorded only one HCF response and Malaysia recorded six HCF responses. Myanmar scored 87% overall. However, it scored lower than average in several components, mainly IPC programmes (CC1) (64%) and Multimodal strategies (CC5) (67%).

Secondary HCF respondents shared additional insights related to their experiences and the challenges they met in implementing their IPC programmes including:

- **IPC programmes:** Facilities in one AMS report a multidisciplinary IPC operational structure that integrates both clinical and administrative roles, including medical doctors, consultant pathologists, medical superintendents, deputy superintendents, IPC nurses, and nursing officers. Examples include two infection control nurses assigned to 103 hospital beds and nine IPC teams established to coordinate IPC activities in line with national IPC and AMR programmes, to ensure adherence to IPC practices.
- **IPC guidelines:** One hospital reports integrating comprehensive IPC guidelines, aligned with national IPC standards, policies, and WHO recommendations, into its operational practices to ensure high standards of hygiene and infection prevention. HH promotion is reinforced through the display of educational posters throughout the facility.
- **IPC education and training:** One facility report organising several training programmes related to IPC. These include an orientation programme for new healthcare and cleaning staff focusing on IPC Standard Precautions and

facility protocols; regular Continuing Medical Education sessions; and mandatory annual IPC training for all personnel. On-the-job training is emphasised as a key approach to ensure practical skill development, and the facility ensures that all IPC nurses undergo post-basic training to enhance their expertise.

- **HAI surveillance:** One HCF reports conducting HAI and Multidrug Resistant Organisms (MDRO) surveillance, with data submitted to the MOH via Google Drive. An annual Point Prevalence Survey (PPS) is carried out to assess rates of various HAIs, including Surgical Site Infections (SSI), Catheter-Associated Urinary Tract Infections (CAUTI), wound sepsis, and sharps injuries.
- **Multimodal strategies:** One AMS HCF reports that its IPC Committee convenes biannually, during which all IPC activities are reviewed and reported to the respective Health Department. The multimodal IPC strategy encompasses five key elements: system change, training and education, monitoring and feedback, reminders and communication, and safety culture. This comprehensive approach is aimed at maintaining high hygiene standards and robust IPC practices across the facility.
- **Monitoring/audit of IPC practices and feedback:** One respondent specifies that its HCF performs monthly IPC assessments, with findings reviewed during triannual IPC Committee meetings, as part of the national IPC and AMR containment programme. Monitoring activities cover cleanliness, hygiene compliance, and adherence to IPC protocols, with regular feedback provided to the IPC Committee based on collected data. Another facility highlights the importance of technical leadership in maintaining a safe environment and ensuring consistent compliance with updated IPC practices by HWs.
- **Workload, staffing and bed occupancy:** One HCF recognises that effective management of staffing levels is essential to align fluctuating workloads, as well as proper HCF space utilisation to ensure the facility's operational efficiency. This requires strategic scheduling and responsive deployment of staff based on medical service demands and optimisation of hospital spaces through careful planning and utilisation of all areas, from patient rooms and operating theatres to waiting areas and staff offices.
- **Built environment, materials and equipment for IPC:** HCF respondents acknowledge the need to increase the number of HH stations, and ensure the availability of essential items, such as for HH, cleaning and disinfection surface supplies, and healthcare waste management (HCWM) (e.g. waste containers, bags). One facility further emphasises the need to establish protected areas for high-risk patients (e.g. those with tuberculosis or cholera), to minimise infection risks and promote a sanitary environment.

### *Tertiary HCF Level — Overall Summary*

**The average score of all healthcare facilities is 88%.** A total of 134 self-administered records of WHO IPCAF-MR for tertiary HCF level were analysed across eight AMS (Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore, and Thailand). CC6 (96%), CC2 (95%), CC8 (93%) and CC3 (92%) has the highest average score, while CC7 (75%) is the lowest.

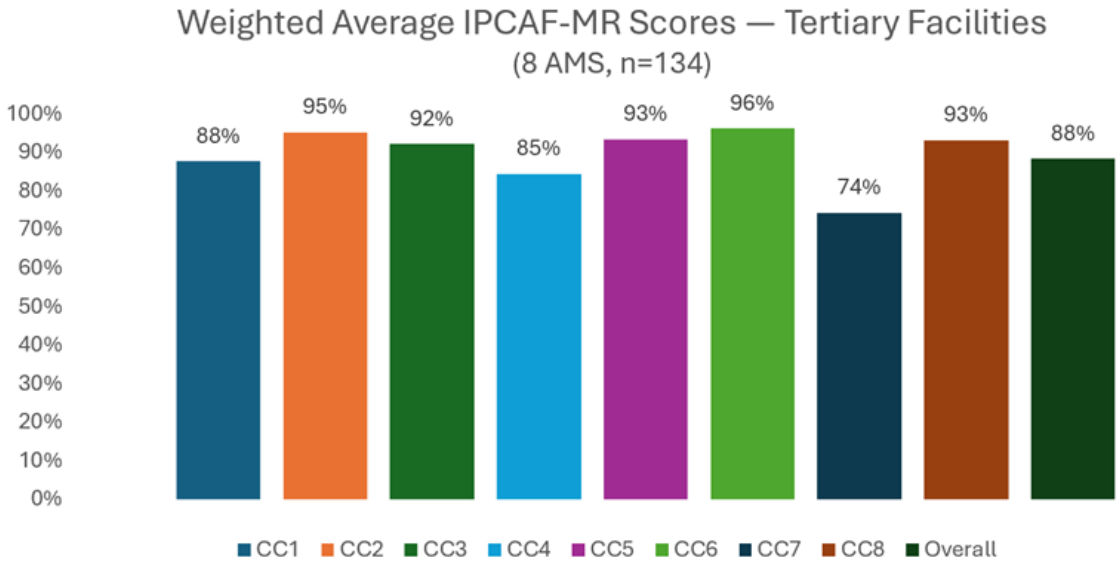


*Figure 20. Average IPCAF-MR Tertiary Level CC scores across eight AMS*

### *Tertiary HCF Level — Results by Country and Core Components*

*Table 4. WHO IPCAF-MR Tertiary Level Scores by Country*

| Country | Count | CC1 | CC2 | CC3 | CC4 | CC5 | CC6 | CC7 | CC8 | Overall |
|---|---|---|---|---|---|---|---|---|---|---|
| Brunei Darussalam | 2 | 0.5 | 0.63 | 1 | 0.36 | 1 | 0.75 | 0.71 | 0.93 | 0.71 |
| Cambodia | 20 | 0.69 | 0.85 | 0.88 | 0.39 | 1 | 0.95 | 0.39 | 0.9 | 0.71 |
| Indonesia | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Malaysia | 20 | 0.94 | 0.91 | 0.82 | 0.97 | 0.85 | 1 | 0.74 | 0.94 | 0.91 |
| Myanmar | 5 | 0.72 | 1 | 0.93 | 0.63 | 0.8 | 0.8 | 0.66 | 0.96 | 0.82 |
| Philippines | 79 | 0.92 | 0.99 | 0.95 | 0.94 | 0.94 | 0.97 | 0.82 | 0.93 | 0.92 |
| Singapore | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 0.95 | 1 | 0.99 |
| Thailand | 4 | 0.95 | 1 | 1 | 1 | 1 | 1 | 0.93 | 1 | 0.98 |

**There are several notable country level results at the tertiary level.** Five AMS have recorded no more than five HCF responses (i.e. Brunei Darussalam, Indonesia, Myanmar, Singapore, and Thailand) in comparison with the Philippines (n=79), Cambodia (n=20), and Malaysia (n=20). Indonesia reports a high overall score of 100% for one HCF, followed closely by Singapore (99%), Thailand (98%), the Philippines (93%) and Malaysia (93%). Brunei Darussalam and Cambodia (71%) and Myanmar (82%) overall average scores are relatively low compared to the other AMS. Brunei Darussalam and Cambodia report the lowest average scores for CC4, respectively 36%, 39%; and Myanmar has the third lowest average score of 63% for CC4. Brunei Darussalam and Cambodia report an average CC1 score lower than 70% score on (50% and 69% respectively, and Cambodia reports the lowest average score on CC7 (39%).

Respondents from the tertiary HCFs shared further insights into their experiences and the challenges of implementing IPC programmes including the following:

- **IPC programmes:** One AMS reports that the HCF IPC programme is guided and overseen by the MOH, including regular audits of HH, IPC practices, and HAIs. IPC activities are funded through a dedicated government budget line, excluding salaries.

  The MOH also recommends the recruitment of dedicated, trained IPC personnel in accordance with the national IPC policy and health accreditation standards, following a recommended IPC personnel-to-bed ratio of 1:110.

  One Hospital Multidisciplinary Infection and Antibiotic Control Committee oversees the prevention and control of HAIs, promotes responsible use of antimicrobials, and helps control AMR. HCF holds a monthly IPC Team meeting to address IPC challenges and report issues to the multidisciplinary IPC Committee.

- **IPC guidelines:** Facilities follow the national IPC guidelines (2019), which remain the most widely referenced. However, locally adapted hospital IPC guidelines are largely lacking. Some SOPs exist at HCF level, such as those for decontamination and disinfection of laryngoscopes, and environmental cleaning protocols, including germicide dilution and terminal cleaning procedures. SOPs for HW protection, including prevention of needlestick injuries, are in place, although may be outdated in some facilities and requires revision.

- **IPC education and training:** Comprehensive IPC training for healthcare providers is implemented, focusing on PPE, HH, and HCWM. Continuing Medical Education and Continuing Nursing Education programmes, along with special event activities, such as IPC orientation sessions for support teams (e.g. cleaning and hospital security staff), with attendance now being recorded digitally, as part of this new initiative. However, gaps remain, particularly in IPC

training for concessioner workers and some HCF personnel. While newly appointed medical officers, house officers, nurses, and assistant medical officers typically receive training, assistant medical personnel are often excluded due to logistical constraints.

- **HAI surveillance:** In one of the ASEAN LMICs, a tertiary hospital has begun annual HAI surveillance with data collection and analysis ongoing for SSI, Ventilator-Associated Pneumonia (VAP), CAUTI, and Catheter-Associated Bloodstream Infections (CABSI), since August 2024, with annual data reporting. Most of the HAI surveillance tasks are handled by IPC-trained workers, while SSI surveillance is performed by untrained staff, leading to incomplete hospital data and poor documentation. The hospital has a reference laboratory for whole-genome sequencing (WGS) during outbreak investigations and prioritises surveillance of SSI and needle stick injuries. Annual alerts on AMR organisms are communicated to the hospital administrator. To improve surveillance efficacy, there is a suggestion to appoint a dedicated epidemiologist.
- **Multimodal strategies:** One HCF respondent reports developing and implementing multimodal strategies, recognizing the lack of a strategic plan, initiated by a clinical audit, addressing hospital outbreaks.

  Current initiatives include guideline implementation, checklist development, and establishing a system for cross-checking, reporting, and providing feedback to the appropriate authorities. The HCF recognises that efforts to change the safety climate/culture are still needed. Therefore, cultural change and improved needlestick injury awareness remain ongoing priorities.
- **Monitoring/audit of IPC practices and feedback:** One hospital reports that its IPC team actively cross-checks IPC practices across wards to strengthen monitoring, auditing, and feedback mechanisms. Key IPC indicators, such as rates of HAI (e.g. CABSI), MDRO bacteria, IPC and HH compliance, guided by the checklist scores, are routinely monitored. The hospital also emphasises the reporting of needlestick injuries and promoting a safe working environment. Key IPC indicators and monitoring results are presented biannually during Hospital Infection and Antibiotic Control Committee meetings, shared with relevant wards and departments, and reported to hospital administrators.
- **Workload, staffing and bed occupancy:** One hospital in a LMIC country reports persistent challenges with overcrowding and staffing shortages, particularly in general wards, while intensive care units maintained better patient spacing. Staffing constraints affect the staff-to-patient ratio, and while contingency plans are in place, some areas do not meet the one-meter spacing standard. Efforts to manage patient flow include the use of a triage system; however, the doctor-to-patient ratio remains suboptimal.

- **Built environment, materials and equipment for IPC:** Respondents informed that while HH stations are generally well distributed, such as alcohol-based handrubs at bedsides and sinks in patient cubicles, and functional electricity backup systems are in place, several tertiary hospitals continue to face infrastructure and supply challenges. These include the lack of isolation rooms, waste disposal equipment, and menstrual disposal bins in public and ward toilets. Essential IPC supplies and equipment, such as autoclaves, safety boxes, and waste disposal units, are insufficient. Additionally, water quality for equipment reprocessing requires improvement.

## Annex 4: Key findings of the IPC scoping review

### Introduction

In 2024, a comprehensive desk-based scoping review of documents, articles, and literature related to infection prevention and control (IPC) programmes across the 10 Association of Southeast Asian Nations (ASEAN) Member States (AMS) was undertaken. This review, a crucial part of the 2023–2025 work plan of the ASEAN–United States IPC Task Force, aimed to provide a comprehensive landscape assessment of IPC programmes within AMS, complementing the findings from national and healthcare facility (HCF) programme surveys.

### Methodology

The review process from January to December 2024 was guided by the framework outlined in the endorsed concept note for Activity 5: *Landscape Assessment of national infection prevention and control programmes in ASEAN Member States*. This thorough review focused on gathering information related to IPC programmes, surveillance of Healthcare-Associated Infections (HAIs) and pathogens, the health and economic burden of HAIs, and the status of health data infrastructure.

### Data Sources

Relevant materials were identified with the following approach:

- Publication period: Articles published during 2014-2024.
- Review of official websites: Ministry of Health (MOH), Ministry of Public Health of AMS and relevant partner organisations such as WHO (e.g. Joint External Evaluation [JEE] (1) and Non-Governmental Organisations).
- Online search engines and database searches in PubMed, Google Scholar, ScienceDirect, and US-CDC search platforms, using the following keywords:
    - Healthcare-associated infection, HAI, Health care-associated infections (HCAI), nosocomial infection, NI, antimicrobial resistance, AMR;
    - Infection prevention and control, IPC, infection control;
    - Related terms such as programme, policy, strategy, cost-effectiveness, monitoring, evaluation, and audit;
    - IPC measures, hand hygiene, HH, personal protective equipment, PPE, guidelines, training, healthcare waste management, HCWM, environmental hygiene, cleaning and quality improvement.

## Inclusion and Exclusion Criteria

- *Inclusion Criteria*
  - Full-length articles and abstracts written in English
  - Content related to at least one Core Component (CC) of an IPC programme
- *Exclusion Criteria*
  - Future IPC projects without available data
  - Content not related to any AMS or IPC CC
  - Articles focused solely on HAI and pathogen surveillance in animal health, environment, or community contexts

Included articles were screened, and data were retrieved, analysed, and summarised guided by the structure of the WHO IPC programmes CC.[86]

## Summary of the searches

- Total number of articles found: 1,674
- Number of excluded articles: 1,393
- Number of eligible articles included in the final review: 281

Among those 281 eligible articles, Brunei Darussalam, Lao PDR, and Myanmar had the lowest number of publications related to IPC, respectively, 1.4%, 1.1%, and 2.1%. AMS with the highest number of articles pertaining to IPC were, in decreasing order, Viet Nam (16.2%), Indonesia (14.9%), Thailand (14.6%), and Malaysia and Singapore (13.5%). Figure 21 illustrates the percentage of eligible articles included in the final review per AMS and those for the ASEAN, Asia region, or global studies.

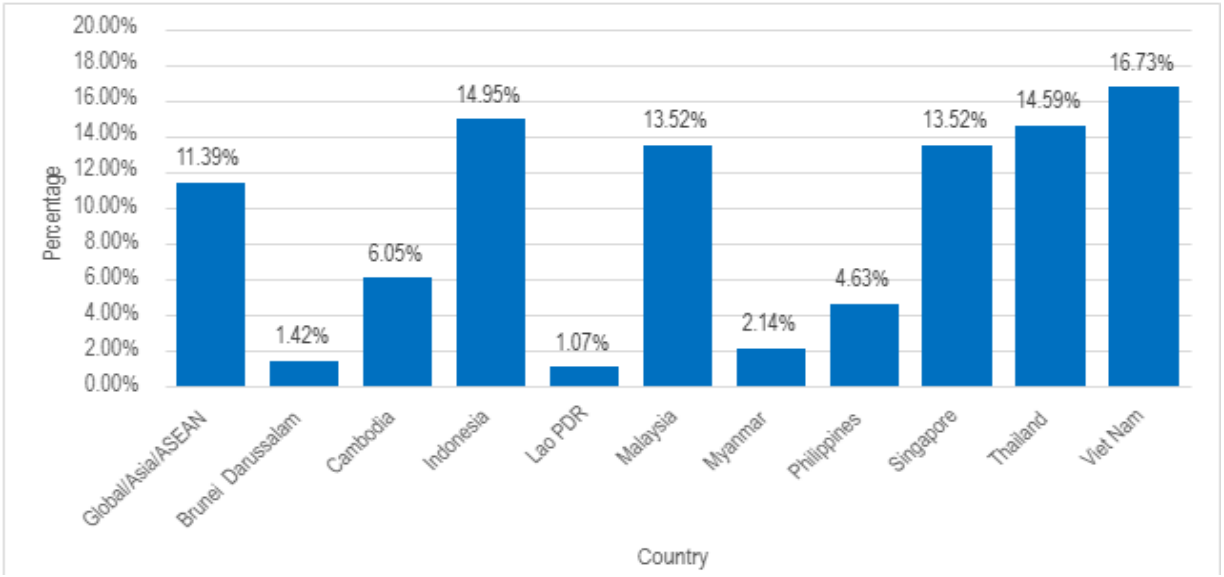


*Figure 21. Percentage of eligible articles included in the final scoping review per AMS*

[86] Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. WHO. 2016. https://www.who.int/publications/i/item/9789241549929.

Studies related to all CC were found for most AMS, except Brunei Darussalam (CC5-CC8), Lao PDR (CC6-CC8), and Myanmar (CC5 and CC7). Key findings were summarised using CC and key search terms. Table 5 below presents the number of eligible articles per CC. Since many articles contained relevant information across multiple CC, some may be counted more than once in the table.

*Table 5. Summary of the number of eligible articles per Core Component*

| **Summary** (out of 281 eligible articles) | | |
|---|---|---|
| **IPC programme CC** | **# Articles** | **# AMS** |
| 1. IPC programmes | 45 | 10 AMS |
| 2. IPC guidelines | 38 | 10 AMS |
| 3. IPC education and training | 54 | 10 AMS |
| 4. HAI surveillance | 132 | 10 AMS |
| 5. Multimodal strategies for implementation of IPC interventions | 51 | 8 AMS (Except: Brunei Darussalam, Myanmar) |
| 6. Monitoring/audit of IPC practices and feedback | 90 | 8 AMS (Except: Brunei Darussalam, Lao PDR) |
| 7. Workload, staffing and bed occupancy | 11 | 7 AMS (Except: Brunei Darussalam, Lao PDR, Myanmar) |
| 8. Built environment, material and equipment for IPC | 22 | 8 AMS (Except: Brunei Darussalam, Lao PDR) |

A summary of the key findings per CC and main topics, extracted from the eligible articles and documents related to IPC, is presented below.

## Core Component 1: IPC Programmes

Of the 281 eligible articles, 45 were related to Core Component 1 (CC1): IPC programmes. Six studies were conducted at the global or regional level, including one article covering all AMS. Most articles included information on IPC programmes policies, healthcare worker (HW) safety and protection regulations, cross-sectoral coordination mechanisms, action plans, financing, and IPC organisational or operational structures. Additional topics addressed caregiver roles, programme funding, cost-effectiveness, and evaluation of IPC programmes.

*Table 6. Distribution of articles by main topic under IPC programmes (CC1)*

| **CC1: IPC Programmes** | **# Articles** |
|---|---|
| IPC policy, regulations, funding**:** IPC, HCWM, programmes assessment, income-country level, coordination, health sector, action plan (AMR, antimicrobial stewardship, COVID-19 related to IPC) | 28 |
| IPC organisational or operational structure: composition and role of IPC structure (IPC nurse, IPC link nurse role, microbiologists, infectious disease specialists, administrator, accountability, salary, leadership, infection prevention specialist) | 8 |
| Exploring the role of caregivers and the IPC programmes | 6 |
| Cost-effectiveness of IPC interventions: COVID-19, AMR, economic evaluation | 6 |
| Occupational Health and Safety (OHS) of HWs: vaccination | 4 |
| Quality of care and patient safety | 3 |

## Main Findings

*IPC Policy, Regulations, Funding*

The interconnectedness of policy, infrastructure, and practice in achieving effective IPC and HCWM is highlighted in numerous studies (2–7).

**Several studies use the WHO Infection Prevention and Control Assessment Framework (IPCAF) tool to evaluate IPC practices across HCFs.** Low-income countries (LICs) consistently score lower on IPCAF than middle- (MIC) and high-income countries (HIC), indicating a need for targeted IPC capacity strengthening in LIC healthcare settings (8).

**Allocating a dedicated budget to sustain IPC programmes, especially in rural areas, remains a significant challenge in the region**. The WHO South-East Asia Region AMR report (2023) shows that only three of 11 member states had an IPC programme plan and a 50% dedicated budget. Similarly, studies identify limited resources, including funding, infrastructure, and trained personnel, as major barriers to implementing effective IPC and HCWM programmes. For instance, most provincial hospitals in one AMS classified as a lower-middle-income country (LMIC) spent about US$0.2–0.4 per bed per year on HCWM (13). Sustained financial support is essential for long-term implementation, particularly in rural areas (9–12).

**Effective coordination between AMR and IPC programmes is essential to address regional healthcare challenges**. Multisectoral coordination and governance are essential to address AMR and IPC challenges through cross-sectoral collaboration and evidence-based policies, including management of outbreaks and pandemics. Effective leadership and collaboration among government agencies, healthcare institutions, and stakeholders are critical to create resilient IPC programmes and structures (11, 14–16).

**Regarding HCWM, part of the IPC programme, one AMS evaluated their HCWM status and examined post-pandemic measures to identify challenges.** While the AMS has HCWM policies and regulations, there is a pressing need to enhance implementation through local collaboration and public information campaigns (17). Other studies in LMIC highlight the necessity to develop specific laws and regulations for medical waste management to advance HCWM practices (3, 12).

*IPC Organisational or Operational Structure*

**Various AMS studies describe the IPC organisational structure, including multidisciplinary IPC committees or teams and their roles and responsibilities**. IPC committees tend to comprise management staff, physicians, infectious disease specialists, HWs from clinical microbiology, epidemiologists, pharmacists, sterilizing, housekeeping, and training services. IPC committees are responsible for developing and updating IPC policies, guidelines, procedures, and training. Related indicators are included in hospital licensing requirements (18). IPC nurses and link nurses play a key role in supervising IPC implementation. Strong leadership and adequate resources are required to overcome challenges and achieve quality care and patient safety, while competency-based career development supports job satisfaction (2, 16). Another AMS study found that the presence of hospital epidemiologists and administrative support improved adherence to environmental cleaning protocols (19).

*Exploring the Role of Caregivers and IPC Programmes*

**One study emphasised the family's role in reminding HWs to perform HH.** Although both family members and HWs recognise the importance of HH in preventing HAI; family members often feel shy about reminding HWs, who may feel embarrassed but value these reminders as effective prompts (2).

*Cost-Effectiveness of IPC Interventions*

**Several studies have assessed cost-effectiveness of IPC interventions, demonstrating cost savings through reductions in HAIs and AMR.** Cost-effectiveness models show that IPC measures such as temporary isolation practice can lower healthcare costs while improving patient outcomes (33–35). One HIC AMS reported that carbapenem-resistant Enterobacterales (CRE) HAIs are associated with significantly higher hospital costs. Cost estimates of CRE-HAIs inform future economic evaluations of CRE prevention and treatment programmes in hospitals (36).

*Occupational Health and Safety of Healthcare Workers*

**Studies revealed that low vaccination rates among HWs could be addressed by culturally sensitive approaches.** Studies show that cultural and economic barriers to influenza vaccine uptake among HWs necessitate culturally sensitive approaches to comply with OHS policies. Suggested options included making annual flu vaccination free and compulsory for all HWs (66, 67).

*Quality of Care and Patient Safety*

**Hospital managers and leaders play a key role in promoting patient safety.** IPC is part of the Quality of Care and Patient Safety programme component, per WHO and the US-CDC. Several studies state the importance of the hospital management role and the leader commitment, as one of the factors that can create 'a safety culture' as the foundation of patient safety programmes and to improve patient safety, quality of care and hospital services (3, 13, 24).

### Identified Challenges

*IPC Policy, Regulations, Funding*

**Multiple factors affect IPC policy, regulations and funding.** There is a lack of effective multisectoral coordination and collaboration across AMR and IPC programmes (11, 14–16), limited economic data on the cost-effectiveness of IPC interventions (33–35), and insufficient resources, including organisational structures, funding, and trained personnel for IPC and HCWM, particularly in LICs (8–12). HCWM implementation remains weak despite existing policies, local collaboration and education campaigns (17). Some AMS still lack specific HCWM laws (3, 12).

*IPC Organisational/Operational Structure*

**IPC nurses and professionals lack support, training, career pathways and appropriate incentives.** Studies point to challenges in supporting IPC nurses, including a lack of management support and a need for competency-based development (16), insufficiently trained IPC professionals, including a lack of dedicated time, incentives, or salaries for IPC and AMS roles (20) and a lack of policies supporting retention and career pathways for IPC professionals (21–23).

*Exploring the Role of Caregivers and IPC Programme*

**Family members' clinical and cultural role in providing direct patient care in LMICs presents a unique challenge for IPC efforts.** Several studies show that family involvement in inpatient care is common in Asian healthcare settings and that caregivers, including family members, often lack adequate IPC knowledge and are not consistently included in IPC programmes. This may increase HAI risk for both patients and caregivers. These findings highlight the need to integrate families into IPC strategies through targeted communication, education, and empowerment programmes (29–32).

*OHS of Healthcare Workers*

**Limited infection risk awareness and vaccination access highlight the need for robust occupational health and vaccination policies.** Low awareness and access to service may contribute to low vaccination coverage among HWs for preventable diseases (Hep B, measles, rubella) (25–27), and there is a lack of enforcement of policies despite availability (e.g. influenza vaccination) (28). Cultural and economic barriers may influence influenza vaccine uptake among HWs and necessitate culturally sensitive strategies to implement OHS policies (e.g. consider making annual flu vaccination free and compulsory for all healthcare workers) (66, 67).

*Quality of Care and Patient Safety*

**Safety culture is weak.** Weak safety culture is linked to hospital management commitment and leadership in IPC (3, 13, 24).

### Future Considerations

- **Strengthen national IPC programmes** to promote intersectoral and multisectoral coordination and collaboration between researchers, healthcare providers, and policymakers to translate research findings into effective and sustainable IPC interventions.
- **Advocate for increased funding and resource allocation** to generate support to implement effective AMR and IPC strategies, address the lack of resources, improve training for HWs, monitoring and evaluation (M&E), and implement robust surveillance systems, etc.
- **Expand cost-effectiveness analyses to a broader range of IPC interventions and settings** to provide evidence-based information for policy decisions.
- **Invest in OHS** to drive identification of innovative approaches to increase HW vaccination coverage, addressing barriers such as access, costs, and misinformation. All AMS should pursue further study and surveillance of HWs' needle-stick and sharps injuries to develop evidence-based OHS policies for HWs. Additionally, mandatory vaccination policies for HWs are recommended to mitigate infection risks in clinical settings, alongside education and awareness campaigns (25–27). It is also recommended to study the enablers and barriers to strengthening IPC measures and implementing the hospital IPC programme that are faced by IPC focal points (IPC professional, dedicated IPC focal point, link person, etc.).
- **Focus on caregivers** by considering patient and family empowerment strategies, especially in resource-limited settings, where cultural and contextual factors are at play (37).

- **Establish a healthcare research network for quality improvement** by incorporating IPC and patient safety issues when establishing healthcare research network projects (38).
- **Support the creation of a Safety Culture** as the foundation for patient safety programmes, embracing IPC, and address cultural attitudes with the support of hospital management and leadership commitment (3, 13).

## Core Component 2: IPC guidelines

Of 281 eligible articles, 38 were related to IPC practices and guidelines, including information related to all 10 AMS. Twelve studies were conducted worldwide or in Asia, including at least one AMS, and the rest were specific to one AMS. These articles focus on different topics and healthcare contexts, such as specific IPC guidelines and standard operating procedures (SOPs), methodology, OHS of HWs, and guidance for caregivers.

*Table 7. Distribution of articles by main topic under IPC guidelines (CC2)*

| ***CC2: IPC guidelines*** | **# Articles** |
|---|---|
| Specific IPC guidelines and SOPs: HAI and AMR prevention bundles (e.g. Catheter-Associated Urinary Tract Infection [CAUTI], Central Line-Associated Bloodstream Infection [CLABSI], Ventilator-Associated Pneumonia [VAP], Surgical Site Infection [SSI], antibiotics (e.g. prophylaxis, routine antiseptic baths, Methicillin-resistant *Staphylococcus aureus* [MRSA] decolonisation, chlorhexidine wipes), clostridium difficile guide, SOPs for tracheostomy, environmental cleaning, phone disinfection, protocol featuring Pulsed-Xenon Ultraviolet [PX-UV], sepsis, resuscitation protocol, HCWM, pandemic/ public health emergency/COVID-19 preparation, prevention and response, country income level) | 28 |
| OHS of HWs: guidance, tuberculosis, vaccination-preventable diseases | 10 |
| Caregivers | 3 |
| Methodology for developing and implementing IPC guidelines: enablers, challenges | 1 |

## Main Findings

*Specific IPC guidelines and SOPs*

**Although multiple IPC guidelines and SOPs exist, protocols vary significantly across institutions and regions, especially between HICs and LMICs.** Numerous studies assess the adequacy of IPC guidelines and training in Asia, exploring various specific and broad IPC guidance and SOPs, providing recommendations to prevent HAI and improve IPC practices for several IPC practices such as MRSA decolonisation and patient bathing, public health emergency, COVID-19 guidelines, COVID-19 resuscitation protocol, environmental cleaning protocol with PX-UV light, HCWM procedure, to name some (39–58). One study emphasises the importance of a collaborative, interdisciplinary approach, involving flexible leadership, shared responsibility, and collaboration with local experts (47). Several articles highlight the lack of IPC guidelines and SOPs tailored to LMIC needs, recommending adaptation to ensure effectiveness in resource-limited settings (41, 43, 47, 48, 59–63). For example, a study covering four AMS suggests developing guidelines to prevent VAP and address risk factors, such as tracheostomies, adapted to LMIC conditions (41).

A study across six AMS (40) identifies the need for specific IPC guidelines to prevent SSIs in eye surgery and adequate procedures for SSI mitigation (65). Further, various practices are found to prevent MRSA in several HCFs. Standardised or harmonised guidelines for MRSA decolonisation are suggested, including SOPs for routine antiseptic bathing and discharge procedures for patients with MDRO (50).

*Occupational Health and Safety of HWs*

**Guidance is needed on the development of OHS policies to protect HWs (44) and for implementing HW protection** (62). A study on latent tuberculosis infections among HWs showed that education level, age, work experience, and exposure levels significantly correlate with latent HW tuberculosis infections, underlining the need for occupational tuberculosis infection SOPs (68), meanwhile in one AMS, studies emphasise the high rates of chronic hepatitis B and C infections among HWs and a lack of guidance and policies for HW vaccination and awareness (25, 26, 69).

## Identified Challenges

### *Specific IPC guidelines and SOPs*

**There are variation and inconsistency in IPC guidance, SOPs, and definitions.** Numerous studies report variation in SOPs, inconsistent definitions (e.g. "high-touch surfaces") and differences in OHS recommendations (39, 41, 43, 47, 48, 50, 59–64). Guideline development and implementation challenges include contextual interpretation, balancing ideal and feasible practices, and adapting to evolving information (47). Limited evidence for some IPC practices (64) and weak safety culture can lead to non-compliance and increase HAI risk (46, 84).

*Occupational Health and Safety of HWs*

**There is a lack of comprehensive OHS Policy and HW protection and strategy to enforce them.** Indeed, in one AMS, studies emphasise the high rates of chronic hepatitis B and C infections among HWs and a lack of guidance and policies for HW vaccination and awareness (25, 26, 69).

*Caregivers' Role in IPC*

**The lack of recognition and guidance for family caregivers despite their direct involvement in patient care**. Studies mention how a lack of recognition and guidance for family caregivers leaves them vulnerable to HAIs and occupational risks. Recommendations include addressing cultural factors and recognizing the impact of cultural values and social norms on caregivers by developing guidance to support and educate family caregivers on IPC measures (29, 30, 70).

## Future Considerations

This review highlights the immediate need to improve IPC practices in ASEAN healthcare settings through the following:

- **Targeted Interventions** through standardised guidelines and SOPs to address specific HAI challenges, such as SSI, VAP, and MRSA prevention (e.g. harmonise guidelines for MRSA decolonisation), adapted for LMIC contexts (41, 50, 51).
- **Standardised national OHS Guidelines** should integrate best practices for occupational IPC and include mechanisms for programme evaluation (39).
- **Implementation of OHS guidelines and policies** by developing strategies that consider cultural and economic barriers to implementation OHS guidance (66, 67) and ensuring that policies and awareness programmes are in place for vaccine-preventable diseases (e.g. Hepatitis B and C), where there is high prevalence among HWs (25, 26, 69).
- **Address cultural influences** by recognizing the role and the impact of cultural values and social norms on caregivers and developing guidance to support and educate caregivers on IPC measures (29, 30, 70).
- **The methodology for developing new guidelines** should consider key enablers, opting for a collaborative approach that brings together diverse expertise and local knowledge, contextualizing IPC guidelines to local settings and cultural influences, and balancing ideal recommendations with feasible practices (30, 47).
- **Take a multimodal approach** through a combination of targeted interventions, standardised guidelines, and a strong safety culture (84).
- **Undertake further research** to inform the preparation of optimal cleaning protocols (e.g. high-touch surface cleaning frequency) (64).

## Core Component 3: IPC education and training

Of 281 eligible articles, 54 were related to IPC Education and Training, covering the 10 AMS. Nine studies were conducted globally or in Asia, including at least one AMS. Others are specific to one AMS. The topics of these articles varied widely, ranging from specific IPC training related to the COVID-19 pandemic, methodologies, and LMIC settings, to studies on Knowledge, Attitude, and Practice (KAP), among the main focus areas.

Most eligible articles on IPC education and training focus on in-service training for HWs, with only a few addressing pre-service education for students or training for caregivers. Education or training for dedicated IPC professionals is largely absent, except for one article discussing a train-the-trainers approach.

*Table 8. Distribution of articles by main topic under IPC education and training (CC3)*

| ***CC3: IPC education and training*** | **# Articles** |
|---|---|
| Training programme and effectiveness<br>- Specific IPC training: prevent HAI (e.g. SSI, neonatal, CAUTI), HH, resuscitation, respirator fit testing, sterilisation processes, AMR, antimicrobial stewardship, pandemic and public health emergency (e.g. COVID-19), IPC and health professional education, HW, patient safety and quality of care<br>- OHS, prevent occupational exposure, prevent HW sharp injuries, and splash exposure<br>- Factors impacting the implementation of the IPC training programme: limited resources, cultural context, family and caregiver, commitment | 45 |
| Effective teaching methodology: interprofessional learning, innovative training approach, training-the-trainer standardised approach, simulation, continuous/refresher training, KAP | 15 |
| Type of training programme and M&E | 6 |
| Multimodal approach | 3 |

## Main findings

*Training programme and effectiveness*

**Numerous studies cover the use of diverse methodologies.** Methodologies applied include questionnaires, observations, interviews, focus groups, and quantitative surveys and highlight the effectiveness of training programmes, such as HH training and COVID-19 prevention, in enhancing IPC knowledge, skills, and practices among HWs and preventing healthcare-associated infections (HAIs) (10, 25, 39, 45, 47, 60, 70–81; and 189, 204, 205, 212, 216, 217).

*Effective Teaching Methodology*

**Teaching methods outlined include interprofessional and simulation-based training, train-the-trainer, and use of video.** Studies refer to the effectiveness of training in improving IPC through simulation-based training during the COVID-19 pandemic, which effectively identified communication and workflow gaps and addressed technical and behavioural factors (47, 71, 75, 76, 77, 82, 83). Interprofessional simulation-based learning improves knowledge, attitudes, and practices (KAP) related to HAIs among health professionals. The “train-the-trainers” model is used in several countries to enhance HH knowledge (71), while targeted educational videos address HH gaps and improve handwashing practices (8). One study reminds that trainer attitude is key to promoting positive attitudes among HWs, beyond knowledge of HAI prevention (73).

*Type of Training Programme and Monitoring and Evaluation*

**Studies related to IPC training cover pre- and in-service, refresher, and ongoing training.** Research shows that ongoing training and monitoring are essential for maintaining knowledge and skills and adapting to evolving situations. (74, 77, 79, 83). Several studies are associated with the pre-service training of health professionals (pre-graduate studies) and IPC (medical student nursing education) (25, 76, 77, 86).

*Multimodal Approach*

A combination of targeted training programmes, standardised guidelines, and a strong safety culture is necessary for effective IPC implementation (77, 84, 85).

## Identified Challenges

**Despite efforts to improve training, challenges persist, particularly in LMICs, including, limited resources, variation in curricula and delivery methods, and inadequate evaluation of training programmes (39, 72, 75, 85).** IPC training programme availability, quality, and content vary widely. Many programmes lack a focus on adult learning principles, targeted educational interventions, and evaluation mechanisms (39, 71, 72, 77, 78, 85, 86), and adequately assessing the effectiveness of IPC training is often neglected and challenging in low-resource settings (88).

Limited financial resources impede the development and implementation of comprehensive IPC training programmes, reducing training opportunities and access to essential equipment (84, 85, 89). Lack of consistent methodologies and frameworks are also reported (84, 89).

There is a need to tailor to the local context, and to consider available resources (47) and culture, such as healthcare provided by caregivers (29, 70). Studies identify the absence of officially recognised pre-service or in-service training curricula to train IPC professionals at tertiary, secondary, and primary hospital levels (21, 62, 90), and *a* lack of competency-based training and refresher IPC training curricula for all HCF staff (HWs and support staff), particularly in private and "small" hospitals (20, 63, 91, 92). In some AMS, IPC content is not yet incorporated in undergraduate and graduate training programmes in all relevant disciplines (92).

### Future Considerations

- **Enhance training programmes.** Develop competency-based in-service and refresher IPC training curricula for all HCF staff, focusing on adult learning and proven methodologies, such as interprofessional learning, standardised approaches, train-the-trainer, and adequate assessment of education and training effectiveness (20, 47, 63, 71, 76, 77, 91, 92). IPC content should be incorporated into undergraduate and graduate curricula across all relevant professional health disciplines (92).
- **Engage administrators in understanding the rationale for improvement,** ensure funding for implementation, and for governments to hold administrators accountable for IPC improvements (86).
- **Establish national systems for M&E of IPC training effectiveness**, with clear performance indicators and feedback mechanisms, to sustain training outcomes and improve IPC practices (88).
- **Occupational IPC training** should reflect comprehensive and standardised recommendations and guidance (e.g. included in national IPC guidelines) (72, 85), adapted to local context and LMIC-specific needs.
- **Consider resource availability and include the role of caregivers** (29) by tailoring education and communication strategies. One study suggests that caregivers should receive the same level of training as healthcare workers on IPC precautions (30).
- **Build and sustain a safety culture** and improve IPC through ongoing education and training (70), supporting organisational commitment, including visible leadership, adherence to national and international guidelines, evidence-based interventions, regular monitoring, and feedback mechanisms (43, 46, 49, 53, 54, 61,83).

## Core Component 4: HAI surveillance

Out of 281 eligible articles, 132 provided insights into HAI surveillance for the 10 AMS. Among those papers, three research studies were conducted globally, and 11 were conducted in Asia, including at least one member state of the ASEAN region. Key topics include the burden of HAIs (prevalence, incidence, types, pathogens, mortality/morbidity, length of stay, economic burden), surveillance monitoring, and sustainability. Articles addressing AMR and antimicrobial stewardship programmes (ASP) were included when linked to HAIs and IPC programmes.

*Table 9. Distribution of articles by main topic under HAI surveillance (CC4)*

| ***CC4: HAI surveillance*** | **# Articles** |
|---|---|
| HAI Burden: prevalence, incidence, types of HAI (SSI, VAP, nosocomial pneumonia, Catheter-Associated Bloodstream Infection [CABSI], CLABSI, Urinary-tract infection [UTI]/ CAUTI, sepsis, sharps injuries) | 204 |
| Key HAI microorganism profile | 43 |
| AMR surveillance and burden | 29 |
| Mortality and morbidity linked to HAI and risk factors | 16 |
| The length of stay of patients with HAI | 10 |
| Economic burden | 11 |
| COVID-19 and its impact on HAIs and AMR | 5 |

### Main findings

*HAI burden: Prevalence, Incidence, and Types of HAI*

**HAIs pose a significant threat to patient safety and global health, in ASEAN, with notably high prevalence rates** (42, 84, 94). External sources, including fomites, contaminated surfaces, ventilation, and the healthcare environment, are frequently implicated, with pathogens such as *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter spp.*, and *Enterobacter spp.,* including genetically related multidrug resistant (MDR) strains, commonly identified (95). In resource-limited settings, inadequate infrastructure and limited resources increase the burden of HAIs. Limited data and studies (e.g. studies comparing naturally and mechanically ventilated units), further constrain understanding (96).

**HAI prevalence varies significantly in AMS.** A systematic review in ASEAN (1990–2022) reported an overall HAI prevalence of 21.6% (95% CI: 15.5-29.1%) among six of the 10 AMS. Prevalence varied significantly by country, with Indonesia at 30.4% and Singapore at 8.4%. Data from Brunei Darussalam, Lao PDR, Myanmar, and the Philippines were unavailable (94).

**In LMICs, HAI incidence is also high.** A 2022 study in an AMS teaching hospital found a cumulative HAI incidence of 17.9% among children. Various factors such as use of medical devices (e.g. central venous catheters, urinary catheters, tracheostomy), length of stay of more than 7 days, and route of transmission play significant roles in spreading HAIs (41, 43, 97–99). A 2021 global study that included five AMS found that pooled device-associated-HAIs rates were 5.91% and 9.01 device-associated-HAIs per 1,000 bed-days (100).

*Types of HAIs*

**SSIs are a major contributor to the clinical and economic impact of HAIs, with significant variability in prevalence across Southeast Asian countries and AMS.** In an ASEAN upper-middle-income country, SSI was identified as one of the most common types of HAI (16%) in 2022 (101). One specific university hospital reported an overall SSI incidence of 13%, with neurosurgical procedures having the highest SSI rate (17.2%) (104). Meanwhile global data (2014-2023), comprising data from three AMS, revealed that SSI rates are higher in LICs compared to HICs. For example, SSI rates from the International Nosocomial Infection Control Consortium exceeded those from CDC-National Healthcare Safety Network for multiple procedures, such as peripheral vascular bypass (15.69% vs. 2.93%), spinal fusion (6.47% vs. 0.70%), and hip prosthesis (3.68% vs. 0.67%) (102). The incidence of nosocomial infective endocarditis is increasing, possibly due to medical progress.

A 2019 study showed a threefold increase in the infective endocarditis incidence rate (37.4%) over the last six years of the study period. Nosocomial infective endocarditis is commonly associated with Methicillin-resistant *Staphylococcus aureus* (MRSA), with a high mortality rate of 35.7% (103). Common risk factors associated with SSIs include comorbidities and existing medical diagnoses (e.g. diabetes), pre-existing infection, extended postoperative length of stay, and prolonged surgery duration (104, 105). A study of SSI prevalence found that the implementation of IPC practices and ASP decreases the prevalence of SSI (from 7.8% in 2016 to 5.4% in 2019), although this is not statistically significant. Postoperative antimicrobial therapy was significantly reduced after the ASP, and skin preparation compliance increased from 54.4% to 70.5% between assessments (106).

**VAP and nosocomial pneumonia are critical concerns in ICUs.** In one AMS, the VAP incidence is reported at 21.7 per 1,000 ventilator days (2017), contributing to increased length of stay, costs, and antibiotic use (107). A 2022 study across Asia, including four AMS, reported a VAP incidence of 3.75 per 1,000 patient-days (41).

A 2021 global study reported a ventilator-associated events rate of 11.47 per 1,000 mechanical ventilation-days (100). In 2022, nosocomial pneumonia was the most common HAI in one upper-middle-income AMS, accounting for 40% of cases (101).

**Having a central line is a key risk factor for CABSI.** A pooled CLABSI rate of 5.30 per 1,000 central line-days was pointed out by a 2021 global study, comprising five middle-high income AMS showed (100). Peripheral venous CABSI in ICUs across four AMS were reported at 2.65 per 1,000 catheter-days (108). In one AMS, nosocomial bloodstream infections accounted for 22% of HAIs in 2022 (101).

**UTIs are a significant contributor to HAI rates.** A 2021 global study that included five middle-high income AMS found that the CAUTI rate was 3.16 per 1,000 urinary catheter-days (100). A 2020 ASEAN study reported that among in-patients with bacteriuria, 74.2 % of UTIs were HAI (109). The most prevalent HAI pathogens included *P. aeruginosa*, *P. mirabilis*, *E. faecium*, and *A. baumannii*, *E. coli*, and *K. pneumoniae*, contributing to increasing antibiotic resistance (109).

**Surveillance of sharps injuries reveals a decline.** A study on sharps injuries and splash exposures, conducted in a high-income AMS, reported a 10-year decrease in sharps injuries, underscoring the importance of sustained surveillance (85).

*Key HAI microorganism profile*

**Gram-negative bacteria continue to be the most common HAI pathogens, some showing alarming rates of multidrug resistance.** Studies consistently found gram-negative bacteria to be the most common HAI pathogens (46, 94, 95, 107, 108, 110–120). For instance, in a 2021 HAI study in ICUs, in Southeast Asia, involving four AMS, the microorganism profile showed 67.1% were gram-negative bacteria (*Escherichia coli* (22.9%), *Klebsiella spp* (10.7%), *Pseudomonas aeruginosa* (5.3%), *Enterobacter spp.* (4.5%), and others (23.7%) (108). Specifically, *A. baumannii* was found as a predominant pathogen in ICUs in numerous studies, becoming one of the primary causes of HAI, including VAP, nosocomial pneumonia, and UTI (09, 94, 107, 112, 114, 115, 119–123). *A. baumannii* outbreaks were linked with HCF environment and surfaces such as cupboards, computer keyboards, and patient sinks have been reported (101, 124).

*E. coli* and *K. pneumoniae* are frequently isolated in HAI and bloodstream infections (94, 107, 108, 110, 112, 115, 117, 118, 120, 125–132). For example, *Klebsiella* spp. accounted for 10.7% of CABSI related to peripheral venous catheters in 2021 (108). Studies report high multidrug resistance rates, with 82% of *E. coli* and *K. pneumoniae* isolates identified as multidrug resistant, raising concerns due to limited therapeutic options (108, 110, 126).

**Gram-positive bacteria and other pathogens are also contributors to HAI.** *Staphylococcus aureus (S. aureus)* remains a significant contributor to HAIs, with high HAI prevalence rates consistently exceeding 50% in Southeast Asia and stable resistance profiles over a decade (94, 120, 133, 134, 135).

Vancomycin resistance in *S. aureus* was a growing concern in certain settings, although susceptibility to linezolid and glycopeptides is retained (120, 136). Meanwhile fungal infections, particularly *Candida parapsilosis*, are associated with catheter-related bloodstream infections, with risk factors including total parenteral nutrition (98) and respiratory syncytial virus causes nosocomial infections in pediatric settings, with a prevalence of 26% and evidence of in-hospital transmission (137).

*AMR burden*

**AMR is a major global health concern, particularly in LMICs, driven by unnecessary antibiotic use.** Infections caused by MDR Gram-negative bacteria are concerning for vulnerable populations such as neonates (105, 116, 138, 139). Across studies, AMR is a critical challenge, with significant resistance observed in HAI pathogens. The ESKAPE group *(E. faecium, S. aureus, K. pneumonia, A. baumannii, P. aeruginosa, and Enterobacter spp)* includes six highly virulent pathogens strongly linked to antimicrobial resistance (94, 140).

The use of antibiotics when not necessary has accelerated the development and spread of AMR, complicating the treatment of HAIs (111, 141, 142). These infections remain a major cause of morbidity and mortality worldwide, particularly in resource-limited healthcare systems (43, 113, 141, 143, 144).

**High rates of Extended-spectrum beta-lactamase (ESBL) production in *Enterobacterales*, complicating treatment (131, 132).** The high prevalence of ESBL and carbapenemase genes in *Escherichia coli* isolates stresses the importance of monitoring the spread of ESBL and carbapenemase genes in E. coli isolates, particularly in low-resource settings, to inform IPC and antibiotic stewardship strategies (132, 45).

***Methicillin-resistant Staphylococcus aureus (MRSA)* remains prevalent in Southeast Asia.** AMS of surgical wound infections highlights the severity of the AMR problem (101, 103, 107, 133, 145, 146, 147, 148). The MRSA rate varies widely among AMS; for instance, in an LMIC tertiary public hospital, the MRSA prevalence rate was 53.8% between 2020 and 2022 (133), while the prevalence rate of another AMS (MIC)[87] was 7% in 2021 (146). MRSA rates in the patient population remained similar at (n= 42/7).

MRSA isolates carried multiple plasmids with resistance genes, underscoring the role of horizontal gene transfer in the spread of AMR (146). Specifically, in one AMS, MRSA surveillance among HWs found the presence of different clones of MRSA from nasal swabs of HWs belonging to the Department of Pediatrics and Surgery, suggesting that epidemiological typing of MRSA among HWs can provide data that can be used for control measures (149).

[87] https://blogs.worldbank.org/en/opendata/world-bank-country-classifications-by-income-level-for-2024-2025

**Carbapenem-resistant Organism (CRO), CRE, Carbapenemase-producing Enterobacterales (CPE) are an issue even in HICs.** CRE and other multidrug-resistant organisms (MDROs) remain challenging in one HIC of AMS, despite having a robust healthcare infrastructure (135, 150, 151). A scoping review of cleaning of high-touch surfaces in inpatient wards found that CPE prevalence rates and multiple species and genotypes of CPE were detected in both MDRO and non-MDRO wards. CPE established rapidly in the aqueous environment of HCFs, particularly in MDRO wards than in non-MDRO wards (64).

**Other pathogens are present at varying rates.** Resistance to carbapenems was particularly high among gram-negative bacteria, such as Klebsiella pneumonia (101, 107, 122, 145, 152). A high rate of AMR in pathogens such as *A. baumannii* was identified in several AMS, such as carbapenem resistance exceeding 50% for *A. baumannii.* (104, 107, 109, 110, 112, 114, 118, 122, 123, 140, 145, 152–160). Further, *A. baumannii* isolated from the central nervous system showed high resistance to almost all antibiotics, with the highest susceptibility observed for amikacin (64%), tigecycline (53%), and trimethoprim/sulfamethoxazole (43%). The proportion of resistant isolates was higher among samples from ICU patients than non-ICU patients (112). MDR strains of *A. baumanii* accounted for 51% of all VAP cases caused by *A. baumanii.* Prudent use of antimicrobial agents is important to reduce the acquisition of MDR *A. baumannii* (155). Additionally, several AMSs have identified a widespread presence of *P. aeruginosa*, such as carbapenem resistance and the dissemination of resistant clones in ICUs (107, 108, 110, 118, 119, 122, 145, 153, 158, 160, 161).

**Studies identify a *range of k*ey risk factors for acquiring AMR infections and the impacts of these risks**. Risk factors include prolonged ICU stays, mechanical ventilation, central venous catheterisation, and prior antibiotic use (152). MDR infections are associated with increased mortality, prolonged hospital stays, and higher healthcare costs (107, 156). One AMS estimates substantial excess deaths and economic costs attributable to MDR bacteremia annually (163, 164).

*Mortality and Morbidity linked to HAI and risk factors*

**Over the last 30 years, in the ASEAN and Southeast Asia regions, morbidity and mortality rates due to HAIs have increased.** The rise in morbidity and mortality has been exacerbated by the rise of AMR, with gram-negative bacteria, MRSA, CRO, and other pathogens contributing significantly (94, 110, 119, 153). Mortality remains overly high in resource-constrained settings, further underscoring the gravity of the issue (42, 89). As one example of this, a study related to peripheral venous catheters and associated infection showed that mortality in patients with CABSI with peripheral venous was around three times higher than those with peripheral venous and without CABSI (respectively 12.21% vs 4.53%) (9). Mortality of ICU patients with VAP infected with A. baumannii tended to be approximately 1.4 times higher than those infected with other species (119).

**One long term study identifies the risk factors for HAI and mortality**. A 2022 study over 18 years in ICUs in nine Asian countries comprising four AMS, identified that catheter-associated infection, such as CLABSI, VAP, CAUTI, central-line days, urine-catheter days, older age, female sex, and length of stay, were associated with increased mortality risk. The highest mortality risks were associated with mechanical ventilation utilisation ratio, upper-middle-income countries, surgical hospitalisation, pediatric oncology ICU, and adult oncology ICU. It concludes that length of stay increases mortality risk by 1% per bed day. Further, some variables associated with an increased mortality risk are unlikely to change, such as age, sex, national economy, hospitalisation (e.g. oncology), and ICU type (171).

*Length of Stay of Patients with HAI*

**Patients' mean length of stay is longer for patients with HAI and HAI with AMR.** For instance, HAI with A. baumannii isolates is resistant to carbapenems, prolongs hospital stays, and increases mortality (172). A 2023 study found that SSI-positive patients experienced a fivefold increase in post-operative length of stay compared to non-SSI patients in one AMS (104). Similarly, the length of stay of patients with a peripheral venous catheter with peripheral venous CABSI was 7.11 days compared to 4.40 days for patients without peripheral venous CABSI (108). SSI-positive patients experienced an increase in post-operative length of hospital stay (104, 105).

*Economic burden*

**Studies identify that HAI-related costs increase economic burden.** In the ASEAN region, for LMIC and HIC AMS, HAI-related costs increase with economic losses (42, 107, 110, 150, 153), and health and financial burden are much higher in patients with antibiotic-resistant infections (145, 150). For instance, in HIC AMS acute-care hospitals, CRE-HAIs are markedly higher than the carbapenem-susceptible HAIs for all infection types. Based on a CRE-HAI incidence of 233 per 100,000 inpatient admissions, the annual CRE-HAIs cost was approximately US$9,028M based on direct costs, and US$9,155M based on lost bed-days (150).[88] In 2015, one LMIC estimated the mean cost for patients with HAI at US$1,908, 2.5 times higher than for patients without HAI. The mean attributable cost of HAI was US$1,131, and the estimated saving per HAI prevented were US$1,074 (173).

*COVID-19 and Its Impact on HAIs and AMR*

**The COVID-19 pandemic significantly influenced HAI dynamics and AMR surveillance.** Whole-genome sequencing (WGS) effectively traced nosocomial transmission during outbreaks (165), while wastewater surveillance for SARS-CoV-2 and AMR could provide early warning and improve epidemic resilience (166).

[88] Currency converter (24 November 2024) https://www.bing.com/search?q=1%20SGD%20to%20USD&FORM=S00037&filters=ufn:%221%20SGD%20to%20USD%22%20aid:%22de79675229366a3bf9c00cb0b4f461a4%22%20sid:%22SGDUSD%22%20cpair:%22SGDUSD%22%20dstr:%221%22%20currency:%221%22

Secondary bacterial infections in COVID-19 patients frequently involved MDR pathogens, increasing mortality (115). Conversely, enhanced infection prevention measures during the pandemic reduced some hospitals' MRSA and respiratory viral infections (167). Overall, the COVID-19 pandemic has disrupted HAI surveillance and control efforts, necessitating adaptive IPC measures (167–170).

### Identified challenges

**Despite IPC programmes in place, significant challenges and barriers to effective HAI surveillance and control persist across the region.**

These include lack of standardised definitions, reporting methodology (reporting variability and/or under-reporting), safety culture, and accountability (84). Sustaining HAI prevention and utilizing the antibiotic programme's resources to maintain effectiveness in reducing HAI and AMR incidence (142) is another challenge, as is limited and inconsistent implementation of IPC measures, and HAI and AMR surveillance. For instance, some countries' surveillance systems are restricted to laboratory data, limiting a comprehensive understanding of AMR and its impact on public health (174, 175). Insufficient resources also slow progress, including financial, equipment, and human resources, hindering data collection, analysis, and implementation of interventions (42, 59, 84, 89, 176), and weak healthcare infrastructure which includes issues with infection prevention and control practices, antibiotic stewardship, and data management (42, 59, 89).

**A lack of AMR surveillance and ASP is a further challenge.** High rates of AMR in the region pose a substantial threat, demanding effective surveillance and control measures (110, 153) and the development of ASPs integrated with strengthening IPC to reduce MDRO infections (177).

Sustaining ASP success, including reductions in inappropriate carbapenem use, remains essential across settings (141, 178). In one LIC, monitoring of HAI and AMR prevention programmes showed declining effectiveness over five years, with HAI incidence rising from 8.6% to 16.9%, inappropriate antibiotic use increasing from 20.6% to 48.6%, and hand hygiene compliance declined from 62.9% to 51% (142).

Although numerous articles relate to AMR and ASP, most focus on antimicrobial therapeutic use and guidelines training on antibiotics, for instance, antimicrobial consumption and prescription (179), and very few highlight the need to prevent HAI and the crucial role of IPC interventions for preventing AMR.

Notably, surveillance systems such as the Global Antimicrobial Resistance Surveillance System (GLASS), facilitate better tracking of resistance patterns, although underreporting and inconsistent methodologies limit their impact (109, 175).

### Future Considerations

- **The development of standardised national and regional prevention frameworks** is critical. These should incorporate standardised definitions, methodologies, reporting frameworks, and evidence-based guidelines, ensuring adequate staff training (84, 108).
- **Investments in infrastructure and resources for IPC and ASP** implementation are essential, including funds for training staff, equipping laboratories, and implementing effective infection prevention and control practices (42, 59, 84, 89, 176).
- **To produce evidence-based guidance and policy**, further research, such as a longitudinal study, is needed to understand the further expansion of CPE colonisation and its impact on patients (64).
- **Develop a well-designed, robust surveillance plan and prevention strategies**; context-specific and cost-efficient interventions are needed to effectively address the dual burden of HAIs and AMR (84).
- **Provide early warning and advanced surveillance systems** to detect potential undetected HAI/ AMR outbreaks, for instance, to consider establishing wastewater surveillance and using WGS (140, 162).
- **Promote targeted interventions**, such as developing/ updating evidence-based guidelines and SOPs to prevent HAI and AMR, to prevent VAP risk factors that can be changed: limit using tracheostomy, reduce length of stay and mechanical ventilation device utilisation, implement evidence-based VAP prevention recommendations (41); update and expand evidence-based guidelines for antimicrobial use, promote the benefits of targeted antimicrobial therapy, and support the implementation of hospital-based ASP (179); and develop environmental cleaning protocols and monitoring approaches to control the transmission of Acinetobacter baumannii, among others (101).
- **Encourage information sharing** among countries including on AMS to foster continuous regional learning and improvement (84).

## Core Component 5: Multimodal strategies for implementation of IPC interventions

The scoping review identified 51 of 281 articles with information related to multimodal strategies for implementing IPC interventions. Studies involved eight AMS (apart from Brunei Darussalam and Myanmar), two studies were conducted worldwide, and three in Asia, including at least one AMS. The most frequently discussed topics were strategies to prevent and reduce HAIs and AMR, followed by studies examining COVID-19, AMR, and antimicrobial stewardship strategies integrating IPC.

Evaluations of IPC and HH multimodal strategies, including their cost-effectiveness and impact, were also prevalent. Additional aspects mentioned for inclusion in IPC multimodal strategies included caregiver and patient empowerment, sustainability, human resources, OHS, and multisectoral collaboration and coordination.

*Table 10. Distribution of articles by main topic under Multimodal strategies for implementation of IPC interventions (CC5)*

| ***CC5: Multimodal strategies for implementation of IPC interventions*** | **# Articles** |
|---|---|
| Effectiveness of multimodal strategies and interventions | 27 |
| Strategy implementation and coordination | 14 |
| Strengthening IPC organisational structure: surveillance system, COVID-19, OHS of HWs, sustainability, tailored interventions, LMIC | 9 |
| Role of technology and Innovation: WGS | 4 |
| Role of caregivers in IPC | 4 |

## Main findings

The reviewed studies stress the importance of multimodal interventions and strategies, and reveal diverse challenges and strategies for IPC across ASEAN healthcare settings, emphasizing the need to address specific needs and tailor interventions effectively to local contexts, such as for LMIC, and implement multifaceted interventions while strengthening IPC infrastructure.

*Effectiveness of Multimodal Strategies and Interventions*

**The effectiveness of multifaceted IPC interventions and strategies is demonstrated in several studies.** These interventions, often involving HH campaigns, ASP, environmental cleaning, and patient cohorting[89], show significant reductions in HAI rates, antibiotic use, and in-hospital mortality (60, 141, 173, 174, 180, 181). Studies in Asia emphasise the importance of multimodal strategies that reduce length of stay, limit usage of central-line, urinary catheterisation, mechanical ventilation, tracheostomy, to prevent HAI and decrease mortality risk (43, 171). One study shows that the MRSA rate decreased from 8% to 3% when using a multifaceted approach (182). Similarly, qualitative research in an AMS-HIC finds that hospitals implementing IPC strategies to prevent HAIs and control MDROs

[89] Cohorting: Grouping of patients who are colonized or infected with the same resistant organism with the aim to confine their care to one area and prevent contact with other susceptible patients. World Health Organization. (2019). Minimum requirements for infection prevention and control programmes. World Health Organization. https://iris.who.int/handle/10665/330080. License: CC BY-NC-SA 3.0 IGO

include screening for MDRO colonisation, isolation and cohorting policies, HH and sanitation practices, and adequate environment and engineering solutions such as improved ventilation and adequate bed spacing (183).

**Multimodal strategies combining a range of interventions have generally been effective.** Targeted education, audit, feedback, reminders, behavioural interventions, environmental modifications, technological solutions, reminders, and role modelling, have been effective in enhancing HH compliance among various HW professionals (e.g. doctors, nurses, and allied health staff) and other IPC practices (14, 182, 184, 185–191). One study emphasises patient empowerment strategies, using patient education and regular reminders, prompting a significant increase in HH compliance (from 19.1% to 61.7%) was observed (189). In contrast, gains in the effectiveness of the multifaceted intervention in improving HH knowledge and compliance have waned over three years, emphasizing the need for sustained interventions (191).

*Strategy Implementation and Coordination*

**Multiple studies emphasise the need for comprehensive and integrated approaches, withing One Health approach** (60, 99, 151, 171,173, 181, 183, 196–200). One AMS developed a model prevention of MDRO transmission management participation consisting of six elements: 1) workshops; 2) reviewing of knowledge; 3) reminding clients, patients, and caregivers; 4) HH campaigns; 5) supporting protective equipment and medical instruments; and 6) evaluation and feedback of the model's effectiveness. More than 92% of the study sample agreed with the six elements used to prevent MDRO transmission management. This study emphasises a multi-directional approach involving diverse stakeholders (201). Another AMS has IPC strategies at the national level, but lacks multimodal IPC implementation strategies at the HCF level (23).

*Strengthening IPC Organisational Structure and Strategies*

**Several studies emphasise the importance of a strong IPC organisational infrastructure** (26, 173, 174, 193). These include robust surveillance systems, standardised protocols, appropriate training, and supportive leadership. Findings suggest that even resource-limited countries can establish effective IPC programmes through careful planning, targeted interventions, and collaborative efforts. Further, during the COVID-19 pandemic, the critical role of IPC strategies in healthcare settings and the need for timely, strategic, and comprehensive responses involving robust surveillance and stringent IPC measures were emphasised, to continue even after the pandemic (87, 167,184, 194).

*Role of Technology and Innovation*

**Technological advancements are valuable components of multimodal strategies**. These include WGS and telehealth innovations (183, 184, 195, 196), all increasingly recognised in enhancing IPC and surveillance.

*The Role of Caregivers in IPC*

**The role of caregivers in Asian healthcare settings is underscored**. In several studies. One of these studies (30–32, 142) mentions that the recognition of family caregivers in the IPC strategies tends to be ignored (30).

### Identified challenges

**There is a lack of clear, multifaceted and sustainable strategies to address HAI multi-risk factors.** Strategies are needed to address issues such as prolonged hospital stays, catheter use, and inconsistent antibiotic use, and these need to be tailored to LMICs to address local needs and infrastructural limitations (43, 60, 141, 171, 173, 174, 180–183). Being able to sustain the effectiveness of multifaceted interventions (e.g. HH) that tend to wane over time (191) remains a challenge. Further, national-level strategies often lack implementation frameworks at the healthcare facility level.

**There is a lack of strategic integration of IPC into the ASP strategy or insufficient coordination between IPC, AMR and ASP.** Numerous studies of AMR and ASP-related programmes omit IPC considerations, which play a crucial role in preventing HAI and AMR, and there is a need to continue enhancing IPC multimodal strategies in post-outbreak and pandemic events to maintain the gains achieved during health emergencies (87, 167, 194, 184).

**The roles of technology and innovation, and those of caregivers, could be expanded**. Innovative tools (e.g. WGS, telehealth) could support IPC and surveillance systems if incorporated into the IPC strategy. Inclusion of caregivers as an integral part of the IPC multimodal strategies and recognition of their role (30).

### Future considerations

Recommendations from various studies include:

- **Strengthen prevention strategies and enhance policies:** Interconnect IPC measures and strategies to prevent and reduce HAIs and AMR and prevent AMR transmission between healthcare settings (195).
- **Conduct further studies:** For instance, comparing IPC strategies across AMS, could reveal insights into the effectiveness of different approaches.
- **Explore technology in IPC:** Explore the use of technology, such as telehealth and electronic health records, to enhance IPC measures, consider incorporating it in multimodal strategies.
- **Pandemic management strategies:** Healthcare organisations should adopt cautious pandemic response strategies and monitor their effects, balancing patient protection with service accessibility (193).
- **Effectively tailor multimodal interventions to local contexts:** Particularly in LMIC and for local population (198, 192).

- **Future research focusing on behavioural and environmental factors that influence HH compliance:** The effectiveness of multimodal and multidisciplinary interventions to improve HH compliance is confirmed (189).
- **Recognition of good practice:** Leadership involvement and audit feedback, is key components of successful multifaceted interventions (182).

## Core Component 6: Monitoring/audit of IPC practices and feedback

Ninety out of 281 eligible articles contained information related to the monitoring/audit of IPC practices and feedback. These studies crossed eight AMS, excluding Brunei Darussalam and Lao PDR, with two global studies including at least one AMS. Methodologies included narrative reviews, cross-sectional surveys, quasi experimental designs, and qualitative approaches using self-reported questionnaires and direct observation. Direct observation methods (202, 203, 204, 205) provided more objective assessments of IPC compliance compared to self-reported data. The research primarily focuses on HW compliance with IPC guidelines, particularly HH and HCWM, while also examining the impact of interventions on prevention bundle, OHS for HWs, organisational factors, and surveillance digital systems. The feedback mechanism for reporting IPC compliance findings is rarely mentioned.

*Table 11. Distribution of articles by main topic under Monitoring/ audit of IPC practices and feedback (CC6)*

| ***CC6: Monitoring/audit of IPC practices and feedback*** | **# Articles** |
|---|---|
| IPC practices assessment and methodology: M&E tools, digital system, IPC compliance status, HH, HCWM, monitoring of prevention HAI bundle practice, monitoring OHS compliance | 80 |
| Factors influencing IPC compliance: individual, psychological, organisational, and environmental factors | 23 |
| Intervention impact | 12 |

### Main findings

*IPC Practice Assessment and Methodology*

**Numerous studies have investigated HH compliance practices among HWs.** Eighty studies cover HH compliance practices (2, 28, 37, 189, 202–217). While studies emphasise the positive outcomes of IPC and HH compliance in reducing HAI and AMR rates and cost (150, 180, 193, 218–221), a significant gap between recommended practices and actual adherence persist.

Several studies reveal that adherence among HWs remains suboptimal globally (28, 210, 214). For instance, one study notes that while overall HH compliance is increasing, compliance with HH after touching patients' surroundings remains low, despite several interventions, and HAI rates remain unchanged (192). In one countryside hospital in an LMIC, monitoring of alcohol-based hand rub use showed an average compliance rate of 47%, with significant variability across departments (209)

**HCWM compliance practices remain inadequate.** HCWM compliance practices remain inadequate globally (3, 222), including during infectious disease outbreaks such as COVID-19 (4, 13, 17, 223), revealing inconsistencies despite positive attitudes. A Malaysian gap analysis called for a holistic approach emphasizing environmentally safe technologies, occupational safety, and effective waste segregation and minimisation (222).

**Various assessment tools and methodologies are used.** The WHO-IPCAF survey and the HH Self-Assessment Framework helped identify IPC compliance strengths and challenges (193, 8, 224). Some studies assess HH compliance by HW category, showing that methodology focusing on HW category led to a more representative assessment (213). Another, in Cambodia, assessed the KAP of HH practices among nursing and midwifery students, revealing moderate KAP levels and highlighting a need for improved training for those professionals (77, 214). Additionally, observational research in an hospital neonatal unit in Indonesia using CCTV monitoring revealed a compliance rate of 74.5%, with considerable variation across HW's roles and specific HH moments (212).

*Factors Influencing Compliance*

**Several studies emphasise the importance of knowledge, attitude, and perceived practice in influencing IPC compliance.** These include HH, phone hygiene, and aseptic techniques (73, 193, 219, 220, 221, 225). Influencing factors include individual factors such as work experience, education level, age (73, 220), and profession (one study found lower HH compliance among physicians compared to nurses) (226). Organisational factors include leadership, department support, and work category (54, 185, 227, 228).

**Several studies indicate that greater compliance with prevention bundles for MDRO infections can lead to significant reductions in MDRO and MRSA infection rates.** These emphasise the need to address multiple influencing factors to comply with prevention bundles, such as leadership support and adequate resource allocation (54, 73, 121). Factors may be environmental, including workload, time constraints, and adequate resource availability and allocation (28, 211, 214, 218, 224, 225, 229), or psychological, including stress, burnout, and job satisfaction (225, 228), or they may be cultural, since culturally sensitive interventions, knowledge, attitudes, motivation, and sanctions influence HH compliance (28, 121, 214, 211).

*Intervention Impact*

Various interventions have been evaluated and their impact investigated, including:

**Multimodal interventions can improve HH practices (225).** Integrated approaches, including HH promotion, environmental cleaning, patient disinfection, cohorting, and multimodal behaviour change intervention, can improve HH practices (180, 225). Studies examine the impact of these multimodal interventions during COVID-19, suggesting that enhancing comprehensive IPC measures can effectively control HAIs beyond COVID-19 (186, 228).

**WGS can be useful in combination with clinical data to evaluate the impact of IPC intervention (161).** One study reveals the dynamics of *P. aeruginosa* antimicrobial resistance profiles in one AMS.

**Environmental restructuring can encourage IPC adherence.** Improving basic infrastructure and placing reminders can encourage IPC adherence (e.g. HH) (218). In one pediatric ICU, use of floor markings to delineate patient zones significantly increased HH compliance, particularly for the "before patient zone" moment (217).

**Cost-effectiveness analyses are useful.** Findings of cost-effectiveness analyses that consider the different modes of HAI and AMR development and transmission (e.g. CRE-HAI) can be useful in informing future economic evaluations of competing HAI-CRE prevention and treatment programmes in hospitals (150).

**Other approaches met with mixed success.** Intensified HH programmes (231), patient empowerment strategies (37, 189), and real-time feedback mechanisms demonstrate mixed success in improving compliance, for example, reporting a 6% increase in compliance through the use of a HH feedback card (205).

### Identified challenges

Despite encouraging IPC outcomes, limitations and challenges remain.

**Sustaining intervention IPC compliance is a persistent issue.** Sustaining efforts over time to promote adherence to preventive practices to prevent HAI (e.g. during COVID-19) were not significantly impacted by the improved in-hospital IPC efforts (121). One study notes persistent low compliance with HH after contact with patient surroundings, despite multiple interventions (192).

**Limited resources and infrastructure in LMIC threaten the implementation of IPC practices.** During periods of staff shortages and financial constraints (e.g. COVID-19) (232), infrastructure gaps and cost barriers were identified as key challenges to HCWM compliance (4, 13, 223, 233); for example, in one LMIC AMS, 58.5% of provincial hospitals met HCWM regulations (223).

**Lack of national support is also identified by several studies.** Where no strategic plan exists for an IPC M&E framework, including IPC process and core HCF indicators, support for monitoring and feedback is reduced (21, 22, 63, 90).

### Future Considerations

- **Ongoing monitoring, auditing of IPC compliance, and providing feedback at all organisational levels**, from the ground up to leadership, are essential to address these challenges, improving patient and HWs safety, and reducing the global burden of HAIs (8, 218, 224, 227, 232).
- **Addressing identified IPC challenges and ensuring sustainable improvements**, should be a priority, supported by effective strategies and robust systems to monitor IPC practices, assess interventions, and provide feedback (e.g. M&E frameworks, national indicators, tools).
- **A stronger focus on standard precautions and regular monitoring of HH and PPE use** of nursing students during clinical placements should boost attitudes and adherence to best practices (77).
- **Further investigation** is needed (192) when HH compliance increases overall, and HAI rates are unchanged.
- **Tailor interventions** due to differences in influencing factors among various healthcare professional groups (208).

## Core Component 7: Workload, staffing and bed occupancy at facility level

Out of 281 eligible articles, 11 provided information on HCF workload, staffing and bed occupancy. The studies covered seven AMS but did not include Brunei Darussalam, Lao PDR, or Myanmar. One study addressed the Asia-Pacific region, with data from six AMS. The primary focus of these studies was on staffing shortage, workload, and burnout, with fewer mentions of patient bed occupancy, overcrowding, and patient pathways.

*Table 12. Distribution of articles by main topic under Workload, staffing and bed occupancy (CC7)*

| **CC7: Workload, staffing and bed occupancy (at facility)** | **# Articles** |
|---|---|
| Workforce, staff shortage, workload | 6 |
| Staff characteristics and resource constraints: limited capacity of trained HR professionals | 4 |
| Public health emergency - COVID-19 Pandemic | 3 |
| Overcrowding, patient bed sharing, and patient placement | 2 |

## Main findings

*Workforce, Staff Shortage and Workload*

**Several studies highlight the link between workforce shortages and compliance with IPC measures**. Notably, shortage of staff is reported as a root cause of several issues, e.g. high workload, resulting in healthcare professionals being occupied with multiple tasks simultaneously (75). One study specifically notes significant gaps in neonatal care due to workforce shortages and dependence on family members for patient care. A COVID-19 study found that the pandemic worsened existing challenges, such as staff shortages and financial constraints, underscoring the need for national investment in IPC programmes to address these persistent issues (235).

An Asia-Pacific survey on antimicrobial stewardship capacity and workforce needs, including responses from six AMS, reveals a widespread shortage of infectious disease physicians across the region. Of the 139 participants, only 22 (15.8%), including respondents from two AMS, report having more than 10 infectious diseases physicians (177). Further, a lack of full-time IPC nurses is one of the most frequently reported challenges in implementing IPC in one AMS (224).

*Staff Characteristics and Resource Constraints*

**IPC interventions are further undermined by the lack of trained staff.** Limited numbers of trained HWs, infectious disease specialists, and quality training were identified as critical factors affecting the effectiveness of IPC interventions (86, 168). Low compliance with HH is observed despite good knowledge of HH guidelines (226), and one study identifies a need to strengthen the professional healthcare workforce to enhance IPC practices in neonatal settings in particular (234). Another study relates staff (e.g. nurse) education level, length of service, and training concerning patient safety and work environment (e.g. involvement, work cohesiveness, leader's support, task orientation, management control, task clarity, innovation, and physical environment comfort) to Patient Safety Implementation, which includes IPC (236).

*Public Health Emergency - COVID-19 Pandemic*

**The COVID-19 pandemic intensified existing staff shortages.** Additional stressors related to the pandemic, such as the need for quick adaptive measures, reorganisation of hospital space and staff, limited sleep, and burnout, significantly affected IPC practices (185, 168, 235).

*Overcrowding, Patient Bed Sharing, and Patient Placement*

A case study reported rapid implementation of IPC measures in response to the surge of cases, including patient cohorting and engineering controls (168).

### Identified Challenges

- **Staff shortages,** and lack of trained staff, particularly during public heath emergencies, and HCF overcrowding, which undermine IPC interventions. Staff shortages link to high workload, resulting in HWs performing multiple tasks simultaneously (75), further exacerbated by public health emergencies such as the COVID-19 pandemic, and led to burnout (235).
- **The limited number of trained healthcare workers and specialists,** along with lack of quality training (86, 168), and insufficient full-time IPC nurses and communication with the management of the hospitals undermine the effectiveness of IPC interventions (224).
- **HCF overcrowding and bed-sharing practices** also limit adherence to IPC measures (237).

### Future Considerations

Studies offered several recommendations to improve IPC competencies:

- **Strengthen the professional healthcare workforce** and ensure an adequate ratio of trained IPC professionals per hospital bed (e.g. 1:250 hospital bed, as per WHO recommendations) (234).
- **Consider staffing levels** and demand in public health emergencies planning (e.g. pandemics), and consider staff well-being to prevent burnout (168, 185).
- **Invest in quality training and education** for workforce development (86, 168).
- **Address patient overcrowding** and develop or re-enforce bed occupancy regulations to ensure one patient per bed (237).

## Core Component 8: Built environment, material and equipment for IPC at facility level

Of the 281 eligible articles, 22 provided insights into HCF built environments, materials, and equipment relevant to IPC. These studies traverse eight AMS, though none were found for Brunei Darussalam or Lao PDR for this specific component.

One study covers the situation in the Southeast Asia region, drawing data from three AMS. Most articles report on the HCF environment, such as Water, Sanitation and Hygiene (WASH), equipment, and materials used to enable IPC.

*Table 13. Distribution of articles by main topic under Built environment, material, equipment for IPC at facility level (CC8)*

| **CC8: Built environment, material, equipment for IPC at facility level** | **# Articles** |
|---|---|
| Built environment: WASH, sink-to-bed ratio, high-contact surface, air quality, hospital layout | 7 |
| Material and equipment: safety device, mobile phone, LMICs, inadequacy of sterilisation, and medical equipment | 6 |
| Resource constraints: limited access, costly resources, inadequacy of equipment, materials, and unreliable infrastructure | 6 |

## Main findings

Key factors, including adequate facilities, well-designed building infrastructure, appropriate equipment, and essential materials, play a critical role in mitigating the risk of HAIs. Several studies demonstrate the interconnectedness of infrastructure, policy, and practice in achieving effective IPC, including HCWM (2, 3, 4, 5, 6, 7).

*Built environment*

**Deficiencies in WASH infrastructure are commonly observed in resource-limited settings, significantly exacerbating HAI risks (4, 5, 95, 96, 97, 226, 231).** In investigating the environmental context for IPC and WASH practices in rural health centers, gaps in WASH practices are observed, as well as structural, environmental, and social barriers impacting hygiene during delivery and postpartum care (231). Similarly, in other LMIC HCFs, gaps in access to basic WASH services, particularly handwashing facilities, are found across different types of facilities (5). The environment, high-contact surfaces, sinks, toilets, and medical equipment are identified as a top source of bacterial contamination, including MDR strains (95).

**Availability of necessary infrastructure and supplies directly impacts HH compliance.** In one study, HH compliance reached 76% in an ICU with a sink-to-bed ratio of 1:1, compared to 51% compliance with a sink-to-bed ratio of 1:4 (6). Meanwhile a study of HAI risk factors and ventilation observes that while the ventilation type itself is not identified as a significant risk factor, hospital layout and indoor air quality were critical for infection control (238).

*Material and Equipment*

**Studies indicate that materials and equipment can facilitate or hinder IPC interventions.** Studies showed that greater use of safety devices, coupled with improved training, increased education, and awareness, may lead to decreased sharps incidents (85).

Meanwhile the COVID-19 pandemic highlighted disparities between HICs and LMICs in IPC equipment availability, impacting perceived preparedness. For instance, dental academics reported better COVID-19 preparedness in HICs due to IPC equipment availability and policies (194). In one AMS tertiary acute care hospital, although HWs viewed phones as potential HAI sources, many did not clean them regularly due to a lack of readily available disinfection material to clean their phone before and after entering the operating theater, as recommended (238).

*Resource constraints*

**Limited access to resources undermines the effectiveness of IPC interventions.** Limited access to resources, including medical supplies and infrastructure, such as for waste disposal, automatic water tap, ineffective sterilisation, medical equipment, and non-standard isolation rooms, are significant barriers to effective IPC practices (4, 21, 148, 226, 239). While studies also note that ineffective, unreliable infrastructure, absence of distinct patient zones, and layout are identified as barriers, none of these articles mention the availability of HCF building standards to support compliance with IPC. In one AMS (240), unreliable infrastructure, limited institutional support, and costly bacterial culture testing were identified as the main barriers to implementing antimicrobial stewardship.

### Identified Challenges

**Studies highlight how lack of adequate infrastructure and supplies, poor hospital layout and limited institutional support all undermine IPC initiatives.** Lack of adequate WASH infrastructure, poor sink-to-bed ratios, and poor environment to enable IPC practices, particularly in LICs (4, 5, 6, 95–97, 226, 231).

Inadequate hospital layouts and absence of distinct patient zones in overcrowded facilities also obstruct IPC compliance (237, 238). Additional barriers include resource constraints in medical supplies and infrastructure (e.g. safety devices, consumables, sterilisation, automatic taps) (4, 21, 85, 148, 226, 238, 239), as well as inadequate infrastructure (e.g. substandard isolation rooms, waste disposal systems) and limited institutional and financial support (240).

### Future Considerations

To address these challenges, studies highlight the importance of supportive infrastructure and recommend multi-faceted, holistic, integrated approaches to address multiple factors concurrently, such as infrastructural limitations in medical waste management and HH and applying a context-specific approach to enhance IPC compliance, continuous research and innovation to address evolving infection threats (2, 3, 4, 5, 6). Key suggestions include:

- **Resource Supply:** Ensure availability of IPC resources (e.g. disinfectants, PX-UV equipment for environmental cleaning) along with clear, standardised operating procedures and well-managed hospital environments, particularly in LICs (8, 51, 97, 238).

- **Infrastructure Improvement:** Focus on HCF infrastructure and layout enhancement, supported by effective training programmes, robust surveillance, and commitment to best infection control practices (148, 238).
- **Safety Devices and PPE:** Promote greater use of safety devices and PPE, including goggles and face shields, alongside education and awareness to reduce sharps injuries and splash exposures (85). Use of environmentally safe technologies, waste segregation and minimisation, can improve HCWM practice (222).
- **For HCFs considering waterless ICU care:** The complexity of implementing new infection control strategies will require careful attention to both the technical and human factors involved (241).

## Summary of Key IPC Findings and Challenges

This scoping review highlights the challenges several AMS face in implementing effective IPC programmes, and studies highlight interconnected barriers and potential solutions to enhance IPC practices across diverse healthcare settings.

**To be effective, IPC programmes require leadership, a strong organisational structure supported by adequate policies and multisectoral collaboration, and sufficient resources.** Effective leadership, a stronger organisational structure, an adequate ratio of full-time IPC professionals (at least one per 250 hospital beds), and sufficient funding and resources can all strengthen IPC. Limited funding or lack of dedicated budget for IPC activities and resource allocation may jeopardise IPC programmes. Adequate policy, regulations, and laws, for instance for HCWM, and ensuring implementation with an effective operational IPC structure, local collaboration, and education campaigns can all support effective IPC implementation. Effective leadership and multisectoral collaboration and coordination are essential for addressing AMR, ASP and IPC challenges; however, this has yet to be achieved or improved. It is also critical to develop and enforce OHS policies and awareness campaigns particularly in AMS with low vaccination rates for preventable diseases, and to provide targeted IPC interventions in LICs.

**Standardised, context-specific, practical, evidence-based IPC guidelines that reflect the role of family and caregivers are needed, especially in LIC and MIC settings.** While multiple technical IPC guidelines and SOPs exist, inconsistencies remain in guidance and definitions, and there is a lack of adapted guidelines and SOPs for LIC and LMIC settings. There is a need to develop standardised, context specific IPC guidelines that balance ideal and feasible practices based on evidence to provide strong recommendations. Additionally, there is a lack of recognition and guidance for the role of family and caregivers in existing guidance, despite their direct involvement in patient care in Asia.

**Pre-service and in-service IPC education and training for IPC professionals also needs to be standardised, recognised, and competency based.** Training programmes often lack standardisation, competency-based curricula, adequate training methodologies based on adult learning principles, and evaluation mechanisms, particularly in LMICs. There is an absence of officially recognised pre-service or in-service training curricula to train IPC professionals, at the tertiary, secondary, and primary hospital levels.

This is linked to insufficiently trained IPC nurses and professionals and limited professional pathways. There is a need to develop standardised, competency-based, and context-specific in-service and refresher training for all HCF staff (HWs and support staff), including in private and smaller hospitals, and it is recommended to incorporate IPC content in undergraduate and graduate training programmes in all relevant disciplines in AMS, where it has yet to be achieved.

**Improvements in HAI surveillance will facilitate better data and reporting, requiring investments.** A lack of standardised definitions and reporting methodologies and a lack of safety culture and robust surveillance and reporting systems lead to underreporting in the region. Those AMS with insufficient resources, including financial, equipment, human resources, and accountability issues, continue to face barriers to effective HAI surveillance, and the limited availability of HAI data from LMICs restricts understanding of AMR and IPC compliance. Further, high regional HAI and AMR rates necessitate integrating IPC into ASPs to reduce multidrug-resistant infections.

**Multimodal strategies can support IPC interventions.** In some AMS, clear strategies to reduce HAI risk factors, such as prolonged hospital stay, catheter use, and inappropriate antibiotic use, are lacking; and IPC is not well integrated into ASP. In LMICs, there is a lack of tailored multimodal IPC strategies that address local needs and infrastructural limitations. National level strategies often lack implementation frameworks at the HCF level and since the effectiveness of multifaceted interventions (e.g. HH) wanes over time, sustained efforts are needed to maintain gains. Finally, caregivers are not seen as integral to IPC multimodal strategies despite their crucial role in reducing HAI risks.

**Limited monitoring/audit of IPC practices and feedback tend to undermine IPC interventions.** There is a lack of national support, including a strategic plan for the IPC M&E framework with IPC process indicators and a minimal set of HCF IPC core indicators, to support the monitoring of IPC practices and provide feedback. Since the effects of intervention IPC compliance wane over time, it is crucial to continually promote adherence to preventive practices. There is persistent low compliance with HH after contact with patient surroundings, despite numerous interventions. Notably, in LMICs during the COVID-19 pandemic limited resources and infrastructure, including staff shortages and financial hardships in LMICs threatened the implementation of IPC practices.

**Workload, staffing and bed occupancy also reduce the impact of IPC interventions.** Workforce shortages, insufficient full-time IPC nurses/professionals, and high workloads were identified in several AMS, undermining IPC compliance. Further, the limited number of trained HWs and specialists, along with a lack of quality training and limited professional pathways/incentives, challenge the effectiveness of IPC interventions. Finally, overcrowding facilities and bed-sharing practices limit adherence to IPC measures.

**Built environment, materials and equipment for IPC at the facility level also limit IPC.** The lack of adequate buildings, inadequate hospital layout and building plans, poor environmental conditions, substandard materials, and insufficient equipment (e.g. inadequate handwashing stations, poor air quality, deficiencies in WASH infrastructure, poor sink-to-bed ratios, and limited medical supplies) is emphasised throughout the research and impede the implementation of IPC practices.

### Summary of document addressing identified IPC gaps

Potential documents to address IPC gaps and challenges are presented in Table 14.

*Table 14. Identified IPC gaps and potential documents related to IPC gaps*

| # | Identified IPC challenges/ gaps | Potential guidance documents related to IPC gaps | Sources[90] | # of concerned AMS |
|---|---|---|---|---|
| | **Availability of trained IPC professional** | **CC1-IPC programmes, CC3-IPC education and training** | | **10 AMS** |
| 1 | Lack of trained IPC professionals | IPC professional competencies per HCF level, for the ASEAN | CC3/ CC1: TF in-person meeting report (July 2024) | 9 AMS |
| | | Competency-based training curricula for IPC professional | CC3: Summary articles, ref. # 21, 62, 90 | 3 AMS |
| 2 | Lack of IPC professional career pathways | Guidance/ policy to provide or enhance IPC career pathways | CC1: Summary articles, ref. #22, 23 242 | 5 AMS |

[90] Sources from the findings of the IPC scoping review, National IPC programme assessment (IPCAT-MR), and HCF IPC programme assessment (IPCAF-MR).

| # | Identified IPC challenges/ gaps | Potential guidance documents related to IPC gaps | Sources[90] | # of concerned AMS |
|---|---|---|---|---|
| | **OHS for HWs** | **CC1-IPC programmes, CC2-IPC guidelines, CC3-IPC education and training** | | **6 AMS** |
| 3 | Lack of OHS health policies for HWs and guidance document | OHS policy for HWs | CC1: Summary articles, ref. # 25, 26, 27, 28, 66, 67 | 3 AMS |
| 4 | Lack of OHS standardised OHS and HWs immunisation recommendations | OHS guidelines and standardised recommendations | CC2: Summary articles, ref. # 25, 26, 44, 62, 68, 69 | 3 AMS |
| 5 | Lack of OHS training module | OHS IPC training module | CC3: Summary articles, ref. # 20, 63, 91, 92 | 1 AMS |
| | **IPC education and training for HCF staff and HWs** | **CC3-IPC education and training** | | **9 AMS** |
| 6 | Lack of a national system for annual M&E of training effectiveness | Guidance or framework to establish national systems for M&E IPC training effectiveness, with clear performance indicators and feedback mechanisms | IPCAT-MR, Summary articles | 6 AMS |
| 7 | Some in-service and refresher training is yet to be competency-based, for all HCF staff: HWs and support staff, and yet to be aligned with national IPC guidelines and endorsed by a national body | Competency-based in-service training; refresher IPC training curricula for current HCF staff (HWs and support staff)<br>National in-service IPC training curricula, aligned with national IPC guidelines, and guidance to be endorsed by a national body | IPCAT-MR, Summary articles, ref. # 20, 63, 91, 92 | 8 AMS |

| # | Identified IPC challenges/ gaps | Potential guidance documents related to IPC gaps | Sources[90] | # of concerned AMS |
|---|---|---|---|---|
| 8 | Training methodology yet to be enhanced with adult learning principles, targeted educational interventions | Guidance on adult learning and training methods (e.g. simulation-basedinterprofessional learning) | Summary articles, ref. # 39, 71, 72, 77, 78, 85, 86 | 5 AMS |
| 9 | Pre-service training: lack of incorporation of IPC content in undergraduate and graduate training programmes in all relevant health disciplines | Competency-based IPC modules, undergraduate health students | Summary articles, ref. # 92, 242 | 2 AMS |
| | **IPC guidelines** | **CC2-IPC guidelines** | | **9 AMS** |
| 10 | Lack of specific IPC guidelines, culturally adapted and tailored to LMIC contexts, where infrastructure and resources are limited | Specific guidelines or SOPs tailored to the cultural context and resources: | Summary articles, ref.# 29, 30, 47, 48, 59–63, 65, 70 | 8 AMS |
| | | Preoperative Eye Surgery guidelines and SOP to prevent SSI | | 6 AMS |
| | | Prevent VAP, addressing risk factors like tracheostomies, and adapted for LMICs | | 4 AMS |
| | | IPC guidance/protocol to prevent neonatal early-onset sepsis and late-onset sepsis | | 1 AMS |
| | | Standardised guidelines and SOPs for MRSA decolonisation (e.g. routine antiseptic bathing) | | 1 AMS |

| # | Identified IPC challenges/ gaps | Potential guidance documents related to IPC gaps | Sources[90] | # of concerned AMS |
|---|---|---|---|---|
| | | Standardised discharge procedures for patients with MDRO | | 1 AMS |
| | | SOPs to protect HWs from tuberculosis infection | | 1 AMS |
| | | Environmental cleaning SOPs for controlling HAI/ AMR transmission (e.g. A. baumannii) | | 1 AMS |
| | | Monitoring tools of environmental cleaning protocols | | 1 AMS |
| 11 | Lack of specific IPC guidance, culturally adapted, specific for caregivers, where they involved in providing patient care | Culturally adapted guidance to support and educate family and caregivers on IPC measures | Summary articles, ref.# 29, 47, 70 | 2 AMS |
| | ***HAI surveillance*** | **CC4-HAI surveillance** | | **9 AMS** |
| 12 | Absence of standardised case definitions and consistent reporting practices contributed to fragmented or under-reported data, affecting the ability to have a regional overview of HAI trends | Standardised HAI case definitions and procedures for data collection | TF in-person meeting report (July 2024), IPCAT-MR, IPCAF-MR, Summary articles, ref.# 84, 174, 175 | 9 AMS |
| | | Standardised methodology, reporting system guidance | Summary articles, ref.# 84, 174, 175, IPCAT-MR, IPCAF-MR | 5 AMS |
| 13 | Lack of a national HCF HAI surveillance system | HAI surveillance system, and standardised approach for HAI surveillance | Summary articles, ref.# 21, 62, 63, 92, IPCAT-MR | 4 AMS |

| # | Identified IPC challenges/ gaps | Potential guidance documents related to IPC gaps | Sources[90] | # of concerned AMS |
|---|---|---|---|---|
| 14 | Lack of a national plan for HAI Surveillance | National plan for HAI Surveillance programmes | Summary articles, ref.# 62 | 1 AMS |
| | **Multimodal strategies for implementation of IPC interventions** | **CC5-Multimodal Strategies** | | **5 AMS** |
| 15 | Strategies not tailored to the AMS' context, and implementing the national multimodal strategies at the HCF level, or HCF having their own multimodal strategy | Guidance to implement national multimodal IPC strategies at the HCF level, tailored to AMS context (e.g. incorporate the role of caregivers, patient education, staffing, resource constraints, new technology) | IPCAF-MR, Summary articles, ref.# 23, 30, 31, 32, 43, 60, 87, 141, 173, 191, 194 | 4 AMS |
| 16 | Sustain IPC strategies after pandemic or outbreak | Plan to enhance IPC strategies post-pandemic/ outbreak | Summary articles, ref.# 167 | 1 AMS |
| | **Monitoring/audit of IPC practices and feedback** | **CC6-Monitoring/Audit** | | **7 AMS** |
| 17 | Lack of a national strategic plan for IPC monitoring;<br>Lack of an M&E framework with IPC standardised and process indicators, and feedback mechanisms | Guidance to establish a national IPC monitoring framework with a standardised and minimal set of HCF IPC core indicators, and standardised reporting | IPCAT-MR, Summary articles, ref.# 21, 22, 63, 90 | 5 AMS |
| 18 | Lack of institutionalised M&E system/ audit of IPC practices at HCF level | Guidance to establish or improve HCF audit for effectiveness of IPC practices and feedback, with innovative solutions to improve compliance and monitoring | Summary articles, ref.# 8, 21, 22, 63, 77, 90, 180, 192, 205, 208, 213, 217, 218, 222, 224, 227, 232 | 6 AMS |

| # | Identified IPC challenges/ gaps | Potential guidance documents related to IPC gaps | Sources[90] | # of concerned AMS |
|---|---|---|---|---|
| | | SOPs and monitoring tools for the HCF IPC programmes | Summary articles, ref.# 90 | 1 AMS |
| 19 | Lack of training mechanisms for national and local auditors/ assessors | Training packages for national and HCF auditors | IPCAT-MR | 4 AMS |
| 20 | Need for economic evaluations/ cost-effectiveness analyses of HAI prevention and treatment programmes (e.g. CRE) in hospitals | Guidance to conduct studies on cost-effectiveness of compliance with HAI prevention and treatment programmes | Summary articles | 1 AMS |
| | **Workload, staffing and bed occupancy** | **CC7-Workload, staffing, bed occupancy** | | **5 AMS** |
| 21 | Staffing shortages, inadequate ratio of full-time IPC nurses and infectious disease specialists | HCF staffing policy, including IPC professional, adapted to HCF level | IPCAF- MR,<br>Summary articles, ref.# 75, 224, 226, 234 | 4 AMS |
| 22 | Inadequate space between beds | Bed spacing standards/regulations | IPCAF- MR, Summary articles, ref.# 237 | 5 AMS |
| 23 | Inadequate bed-sharing practice | Bed occupancy regulations | IPCAF- MR, Summary articles, ref.# 237 | 5 AMS |
| | **Built environment, material and equipment** | **CC8-Built environment, material and equipment** | | **7 AMS** |
| 24 | HCF building standards to enable IPC | HCF national building standards based on IPC principles, tailored to local contexts | IPCAF- MR | |

| # | Identified IPC challenges/ gaps | Potential guidance documents related to IPC gaps | Sources[90] | # of concerned AMS |
|---|---|---|---|---|
| 25 | Inadequate hospital layout, patient flow | Guidance for hospital layouts and patient flow, based on the HCF national building standards | IPCAF-MR,<br>Summary articles, ref.# 237 | 3 AMS |
| 26 | Lack of adequate environment, ventilation, materials and equipment to enable IPC practice | Standard/specification of equipment, materials for IPC practices | Summary articles, ref.# 4, 5, 8, 51, 85, 95-97, 148, 222, 231, 237 - 240 | 7 AMS |

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hand hygiene compliance, knowledge, and perception in a limited-resource hospital in Indonesia: a randomized controlled trial study. Antimicrobial Resistance and Infection Control, 6, DOI: 10.1186/s13756-017-0179-y.

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242. Infection prevention and control systems in six priority countries in the Western Pacific Region: regional report 2023. WHO-WPRO. 2025 https://www.who.int/westernpacific/publications/i/item/9789290620686

# Annex 5: List of documents related to IPC, per AMS and Core Components

Annex 5 lists IPC-related documents, organised by ASEAN Member States (AMS) and Core Component. Documents were contributed by AMS as part of the national and HCF IPC programme assessment process, and the desk-based scoping review. These materials do not reflect all aspects of programme implementation, which are described in the main report and in Annexes 2 and 3.[91]

**BRUNEI DARUSSALAM**

1. **IPC programmes (CC1)**

1.1 National level[92]

a. Antimicrobial Resistance National Action Plan 2019-2023. Ministry of Health (MoH) and Ministry of Primary Resources and Tourism (MPRT). Brunei Darussalam. 2019. https://faolex.fao.org/docs/pdf/bru202519.pdf

b. Brunei Darussalam. Country Score Justifications and References. Global Health Security Index (GHS INDEX). 2021. https://ghsindex.org/wp-content/uploads/2021/12/Brunei.pdf#:~:text=This%20document%20is%20a%20compilation%20of%20all%20questions%2C,summary%2C%20please%20see%20the%20Country%20Profile%20for%20Brunei

c. Tracking AMR Country Self-Assessment Survey (TrACSS) 2023 Country Report. Brunei Darussalam. FAO. UN environment programme. WHO. OIE. https://amrcountryprogress.org/#/map-view

1.2 HCF level

d. Infection Prevention and Control Programme 2025 Suri Seri Begawan Hospital. Head of IPC Unit. SSB Hospital. English version. https://drive.google.com/file/d/1RMEOLVtnk8plWBiA1-Xa81sEjNQREp7Z/view?usp=drive_link

2. **IPC technical guidelines (CC2)**

2.1 National level

a. Guidance on isolation precautions for the prevention and control of infections in the healthcare setting. MOH. Director-General Medical and Health Services (DGMHS) office. 2020. English version.

[91] List last update: 18 December 2025.

[92] Gathered documents under IPC Programme (CC1) include documents containing information on IPC organizational structure, plan, integrating with other health programmes (e.g. Antimicrobial Resistance/ stewardship, one health)

https://drive.google.com/file/d/1vV0ChcHeRpnaDInxPve8LGj6DP0Erawb/view?usp=drive_link

b. Infection prevention and control guidance for the handling of deceased bodies in Brunei Darussalam. MOH. Director-General Medical and Health Services (DGMHS) office. 2020. https://www.moh.gov.bn/Shared%20Documents/V2finalbodyhandling.pdf

c. Guideline on Healthcare Waste Management. Ministry of Health, Brunei Darussalam. October 2019. English version. https://drive.google.com/file/d/1ZyBqj9mfX4nO2mPzaVOQwgbWW87olOXY/view?usp=drive_link

d. Construction and/or Renovation, Maintenance, Repair and Demolition in The Health Care Setting: Procedure for Infection Control Risk Assessment (ICRA), Implementation and Monitoring. Ministry of Health, Brunei Darussalam. November 2019. English version. https://drive.google.com/file/d/1A7fTQ9JEPDnkJTuyoXek2JnCiTo_FlJj/view?usp=drive_link

e. Guidance on The Prioritization of Use of Isolation Rooms in Healthcare Facilities. Ministry of Health, Brunei Darussalam. September 2020. English version. https://drive.google.com/file/d/1p9HP7bKRcbpfqgZNXhmy2gR7mHAX4Uhx/view?usp=drive_link

## 3. Multimodal strategy (CC5)

3.1 National level

a. Antimicrobial Resistance National Action Plan 2019-2023. Strategic Objective 4.3 Infection Prevention and Control. Ministry of Health (MoH) and Ministry of Primary Resources and Tourism (MPRT). Brunei Darussalam. 2019. https://faolex.fao.org/docs/pdf/bru202519.pdf

## 4. Monitoring/audit(s) of IPC practices and feedback (CC6)

4.1 National level

a. Joint external evaluation of IHR core capacities of Brunei Darussalam. Mission report: 28 October-1 November 2019. WHO. 2020. https://www.who.int/publications/i/item/9789240006973

b. Construction and/or Renovation, Maintenance, Repair and Demolition in The Health Care Setting: Procedure for Infection Control Risk Assessment (ICRA), Implementation and Monitoring. Ministry of Health, Brunei Darussalam. November 2019. English version. https://drive.google.com/file/d/1lHPIeQkvGvqKIY9uK5C4KsgrJKehnzXR/view?usp=drive_link

5. **Workload, staffing and bed occupancy (for HCF) (CC7)**

5.1 National level

a. Guidance on The Prioritization of Use of Isolation Rooms in Healthcare Facilities. Ministry of Health, Brunei Darussalam. September 2020. English version. https://drive.google.com/file/d/1O7vwGVsz2B9K9ss5Q6CJs5IBZ3NrYl37/view?usp=drive_link

## CAMBODIA

1. **IPC programmes (CC1)**

1.1 National level

a. National Infection Control Policy. MOH. 2009. https://niph.org.kh/niph/uploads/library/pdf/PD052_HSD_infection_control_2009.pdf

b. Tracking AMR Country Self-Assessment Survey (TrACSS) 2023 Country Report. Cambodia. FAO. UN environment programme. WHO. OIE. 2023. https://amrcountryprogress.org/#/map-view

2. **IPC technical guidelines (CC2)**

2.1 National level

a. National Guidelines for Infection Prevention and Control for Healthcare Facilities. MOH. Kingdom of Cambodia. 2024. English version. https://drive.google.com/file/d/1kcp_bEfWQxvfzcb-vCJS6Si_SZRmeGrH/view?usp=drive_link

b. National SOP IPC COVID-19.v1. MOH. 2020. Khmer version.

3. **IPC education and training (CC3)**

3.1 National level

a. Programme: Bachelor Degree of Medical Sciences. Course Syllabus for Infection Prevention and Control (IPC) course. MOH. English version. https://drive.google.com/file/d/1ONk2zD48cJGz-UGCOFQ8HgZEPVQEXW_7/view?usp=drive_link

4. **HAI surveillance (CC4)**

4.1 National level

a. HAI Surveillance-Pilot Project HAI-BSI Surveillance Experience Presentation. 2023. English version. https://docs.google.com/presentation/d/1sNql7agHTxvC-

1D9P2fjvxAR2UBdimcX/edit?usp=drive_link&ouid=116351040592830791324&rtpof=true&sd=true

5. **Multimodal strategy (CC5)**

5.1 National level

a. National Strategic plan for IPC (2022-2030). MOH. Khmer - English versions.

https://drive.google.com/file/d/1kiWR5XFZwZNIbG5SDHy3RGU223n1vf_K/view?usp=drive_link

6. **Monitoring/audit(s) of IPC practices and feedback (CC6)**

6.1 National level

a. National Monitoring and Evaluation tool to assess HCF IPC programme and compliance: IPC_Tool_Final_V3 (2020). https://ee.humanitarianresponse.info/x/bcYgBwXx

b. Joint external evaluation (JEE) of IHR core capacities of the Kingdom of Cambodia. WHO. 2016. https://www.who.int/publications/i/item/WHO-WHE-CPI-2017.11

**INDONESIA**

1. **IPC programmes (CC1)**

1.1 National level

a. MoH of Indonesia Regulation about National IPC Guidelines at Healthcare facilities_MOH.2017. Indonesian version.

b. Tracking AMR Country Self-Assessment Survey (TrACSS) 2023 Country Report. Indonesia. FAO. UN Environment Programme. WHO. OIE. 2023. https://amrcountryprogress.org/#/map-view

2. **IPC technical guidelines (CC2)**

2.1 National level

a. IPC Technical guidelines. MOH. 2020. Indonesian version.

3. **Multimodal strategy (CC5)**

3.1 National level

a. National Plan AMR 2020-2024. MOH. 2022. Indonesian and English versions. Including “Strategic objective 3. Reducing infections through sanitation, hygiene, and infection prevention and control” (page 173). Indonesian - English versions.

https://drive.google.com/file/d/1eX8YItpwb3bad2pEi6cjrhbwB0rdxPXi/view?usp=drive_link

4. **Monitoring/audit(s) of IPC practices and feedback (CC6)**

4.1 National level

a. Joint external evaluation of IHR core capacities of the Republic of Indonesia. Mission Report: 20-24 November 2017. WHO. 2018. https://www.who.int/emergencies/operations/international-health-regulations-monitoring-evaluation-framework/joint-external-evaluations

**LAO PDR**

1. **IPC programmes (CC1)**

1.1 National level

a. Tracking AMR Country Self-Assessment Survey (TrACSS) 2023 Country Report. Lao PDR. FAO. UN environment programme. WHO. OIE. 2023. https://amrcountryprogress.org/#/map-view

2. **IPC technical guidelines (CC2)**

2.1 National level

a. General Infection Prevention and Control Guidelines for Lao Healthcare facilities. MOH. 2020. https://www.who.int/laos/internal-publications-detail/national-infection-prevention-and-control-guidelines-(amendment)-2020-(lao)

b. Infection Prevention and Control Guidelines for District Hospitals and Health Centres (LAO). MOH. 2016. https://www.who.int/laos/internal-publications-detail/infection-prevention-and-control-guidelines-for-district-hospitals-and-health-centres-(lao)

3. **Multimodal strategy (CC5)**

3.1 National level

a. National Strategy (2022–2032) and Five-Year Development Plan (2022–2027) for Infection Prevention and Control for all Healthcare Facilities. MOH. 2023. https://www.who.int/laos/internal-publications-detail/national-strategy-(2022-2032)-and-five-year-development-plan-(2022-2027)-for-infection-prevention-and-control-for-all-healthcare-facilities-(lao)

b. National Strategic Plan on Antimicrobial Resistance in Lao PDR 2019 – 2023. Ministry of Health and Ministry of Agriculture and Forestry. 2019. Lao - English versions. https://www.who.int/publications/m/item/lao-

pdr-national-strategic-plan-on-antimicrobial-resistance-in-lao-pdr-2019-2023

4. **Monitoring/audit(s) of IPC practices and feedback (CC6)**

4.1 National level

a. Infection Prevention and Control assessment tool. Lao People's Democratic Republic. Version 3. MOH. 2022. English version. https://drive.google.com/file/d/1rrkf3Cr8TCNlQRVwEqsf-gv8trxnvNpV/view?usp=drive_link

b. Joint External Evaluation (JEE) of IHR core capacities of the Lao People's Democratic Republic. Mission Report 17-24 February 2017. WHO. 2017. https://www.who.int/publications/i/item/WHO-WHE-CPI-REP-2017.35

5. **Workload, staffing and bed occupancy (for HCF) (CC7)**

5.1 National level

a. Lao PDR. National Health Statistic Report 2021. MOH, Department of Planning and Cooperation. 2023. English version. https://drive.google.com/file/d/1_mPNjXqx6mg89Oi0dSziiejbvGZayy5Y/view?usp=drive_link

6. **Built environment, materials and equipment for IPC (for HCF) (CC8)**

6.1 National level

a. Lao PDR. National Health Statistic Report 2021. MOH, Department of Planning and Cooperation. 2023. English version. https://drive.google.com/file/d/1M9AQ944ByU1ztBtPFks4X7YsR466n2Pn/view?usp=drive_link

**MALAYSIA**

Websites of Malaysia MOH/KEMENTERIAN KESIHATAN MALAYSIA (KKM) for Policy, Guidelines and SOP: https://www.moh.gov.my/; https://myohar.moh.gov.my/publications-human-health/

1. **IPC programmes (CC1)**

1.1 National level

a. Policies and Procedures on Infection Prevention and Control 2019. 3rd Edition. Ministry of Health Malaysia. https://anyflip.com/fzsta/htje/basic

b. Policies and Procedures on Infection Control. Quality Medical Care Section, Medical Development Division, Ministry of Health Malaysia. 2009. Printed 2010. 2nd edition. https://myohar.moh.gov.my/publications-human-health/

c. Tracking AMR Country Self-Assessment Survey (TrACSS) 2023 Country Report. Malaysia. FAO. UN environment programme. WHO. OIE. 2023. https://amrcountryprogress.org/#/map-view

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4.1 National level

a. The Malaysian Action Plan on Antimicrobial Resistance (MyAP-AMR) 2022-2026, include IPC as a key Priority. https://cdn.who.int/media/docs/default-source/antimicrobial-resistance/amr-spc-npm/nap-library/malaysia-amr-nap-2022-2026.pdf?sfvrsn=f5fd5df4_3&download=true

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5.1 National level

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6.1 National level

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b. Joint External Evaluation (JEE) of IHR core capacities of Malaysia. Mission report: 21-25 October 2019. WHO. 2020. https://www.who.int/publications/i/item/9789240015296

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7.1 National Level

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b. GUIDELINES FOR VIRTUAL CONSULTATION SERVICES AT HEALTH CLINICS. MyGovUC 2.0 Google Workspace (GWS). 2022. FAMILY HEALTH DEVELOPMENT DIVISION. MOH MALAYSIA (Guideline for reducing overcrowding). http://www.moh.gov.my

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c. Gobal Health Security Index. 2021. https://ghsindex.org/wp-content/uploads/2021/12/Myanmar.pdf

d. GMS-Regional Workshop for Laboratory Services and IPC Country Presentation[Myanmar]. 2018. Dr. Moe Khaing M.B.,B.S, M.Med.Sc(Public Health), M.Sc(Health Care Administration) Director (Medical Care) Department of Medical Services Ministry of Health and Sports (Myanmar: Slides 10-31).

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1.2 HCF level

*Tertiary HCF Level*

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f. Office Order IPC Committee_28-7-2024. Burmese version.

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i. Infection Control Committee Organization and Duties, Infection Control Team and Duties. Burmese version.

*Secondary HCF Level*

j. Hospital Infection Control Guidelines Magway General Hospital 2024. Burmese version.

k. Pathein General Hospital - IPC Programme. Burmese version.

*Primary HC Level*

l. Action Plan for Infection Prevention and Control in NyaungLayBin Hospital (2024-2025). Burmese version.

**2. IPC technical guidelines (CC2)**

2.1 National Level

a. Hospital Infection Control Guidelines. Ministry of Health and Sports. 2016. https://www.mohs.gov.mm/ckfinder/connector?command=Proxy&lang=en&type=Main&currentFolder=/Publications/Guideline/&hash=a6a1c319429b7abc0a8e21dc137ab33930842cf5&fileName=Hopital+Guide+18-10-2016.pdf

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2.2 HCF Level

*Tertiary HCF level*

c. Mandalay General Hospital (MGH). Burmese version.

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*Secondary HCF Level*

j. Pathein General Hospital - IPC Guidelines. Burmese version.

**3. IPC education and training (CC3)**

3.1 HCF Level

*Tertiary HCF level*

a. Safe Injection Training presentation. Burmese version.

b. Hospital Waste Management – Training presentation. Burmese version.

**4. HAI surveillance (CC4)**

4.2 HCF Level

*Tertiary HCF level*

a. Mandalay General Hospital (MGH). Record-HW-Needle prick injury_2024. Burmese version.

*Primary HC Level*

b. Wound sepsis register. Burmese version.

**5. Multimodal strategy (CC5)**

5.1 National Level

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Objective 3: Hygiene and IPC. https://rr-asia.woah.org/wp-content/uploads/2020/03/myanmar_myanmar-national-action-plan-for-containment-of-antimicrobial-resistance.pdf

## 6. Monitoring/audit(s) of IPC practices and feedback

### 6.1 National Level

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### 6.2 HCF Level

*Tertiary HCF level*

d. Hospital IPC checklists Operation Theatre, SO Women and Children hospital. Burmese version.

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f. CHECKLIST FOR INFECTION PREVENTION AND CONTROL (Tool). English version. https://drive.google.com/drive/folders/19j4Ggfb4WXAI9RzEo5MhtFNMhY9z-j35

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h. Mandalay General Hospital (MGH). English version.

1) Laboratory Infection Control Checklist Schedule and Tool. Clinical Pathology Department, Mandalay General Hospital.

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*Secondary HCF level*

i. Pathein Hospital. Checklist for infection control tool and results. Burmese version.

*Primary HC level*

j. Checklist for Infection Prevention – Results 26.12.2024. Burmese version.

**7. Workload, staffing and bed occupancy (CC7)**

7.1 National Level

a. Hospital Statistics Report. 2017-18. Ministry of Health and Sports. The Republic of the Union of Myanmar. June 2020.

7.2 HCF Level

*Tertiary HCF level*

b. Patient Flow and Referral System-Emergency Department. Burmese version.

**8. Built environment, materials and equipment for IPC (CC8)**

8.1 National Level

a. Myanmar Essential Health Services Access Project. Environmental Management Plan. MOH. 2014. English version.

https://documents.banquemondiale.org/fr/publication/documents-reports/documentdetail/758731468060302941/myanmar-essential-health-services-access-project-environmental-management-plan

**PHILIPPINES**

**1. IPC programmes (CC1)**

1.1 National Level

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**2. IPC technical guidelines (CC2)**

2.1 National Level

a. Interim Guidelines on the Infection Prevention and Control (IPC) for COVID-19 (February 26, 2020). PSMID and PHICS COVID-19/ DHO. 2020. https://www.psmid.org/guidelines-on-infection-prevention-and-control-ipc-for-covid-19/

**3. IPC education and training (CC3)**

3.1 National Level

a. DOH Infection Prevention and Control Training Manual. Volume II for Health Facility Administrators. The University of the Philippines-College of Medicine (UPCM) IPC Working Group. UPCM in collaboration with the Department of Health. 2020. https://www.scribd.com/document/520001995/2020-DOH-IPC-FINAL-Administrators-ed-02142020

b. DOH Academic E-learning Platform. Infection Prevention and control National IPC training for specific topic exists: COVID-19. https://learn.doh.gov.ph/course/index.php; https://learn.doh.gov.ph/login/index.php

**4. Multimodal strategy (CC5)**

4.1 National Level

a. IPC Strategic plan (2016-2020). https://www.slideshare.net/PhicsInfection/directions-of-ipc-in-the-philippines

**5. Monitoring/audit(s) of IPC practices and feedback (CC6)**

5.1 National Level

a. Joint External Evaluation (JEE) of IHR core capacities of the Republic of the Philippines. Mission report: 10-14 September 2018. WHO. 2019. https://iris.who.int/handle/10665/325319

## SINGAPORE

### 1. IPC programmes (CC1)

1.1 National Level

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b. Tracking AMR Country Self-Assessment Survey (TrACSS) 2023 Country Report. Singapore. FAO. UN environment programme. WHO. OIE. 2023. https://amrcountryprogress.org/#/map-view

### 2. IPC technical guidelines (CC2)

2.1 National Level

a. SGP MOH Website for IPC guidelines and Standards. https://www.moh.gov.sg/hpp/all-healthcare-professionals/guidelines/GuidelineDetails/infection-prevention-and-control-guidelines-and-standards

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h. National IPC guidelines for Primary Care. MOH. 2022. https://www.hpp.moh.gov.sg/docs/librariesprovider4/default-document-library/national-ipc-guidelines-for-primary-care_on-moh-website_finalcfeeec720d8e48c88e26b91118c6736f.pdf?sfvrsn=7b60a4d5_0

i. The National Infection Prevention and Control Guidelines For Community Hospitals. MOH. Singapore. 2021. https://www.moh.gov.sg/docs/librariesprovider4/default-document-library/national-ipc-guidelines-for-chs_on-moh-website_23april.pdf?sfvrsn=e521db0a_0

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https://drive.google.com/file/d/1K_aa4xu9-RoCMXv4TPeb_c4pw4GrGbwu/view?usp=drive_link

**3. IPC education and training (CC3)**

3.1 National Level

a. Singapore Field Epidemiology Training Programme (S-FETP), Communicable Diseases Control. MOH. 2020. https://www.moh.gov.sg/docs/librariesprovider5/resources-statistics/communicable-diseases-control---the-singapore-fetp-enterprise.pdf

**4. Multimodal strategy (CC5)**

4.1 National Level

a. National Strategic Action Plan on Antimicrobial Resistance. Agri-Food and Veterinary Authority of Singapore (AVA), Ministry of Health (MOH), National Environment Agency (NEA), National Water Agency (PUB).

2017. https://www.moh.gov.sg/resources-statistics/reports/national-strategic-action-plan-on-antimicrobial-resistance

5. **Monitoring/audit(s) of IPC practices and feedback (CC6)**

5.1 National Level

a. Joint external evaluation of IHR core capacities of Singapore. Mission report: 16-20 April 2018. WHO. 2018. https://www.who.int/publications/i/item/WHO-WHE-CPI-REP-2018.25

6. **Built environment, materials and equipment for IPC (CC8)**

6.1 National Level

a. Infection Prevention and Control specifications for New Healthcare Buildings. MOH of Singapore. Revised 2024. https://www.hpp.moh.gov.sg/docs/librariesprovider4/allied-health/infection-prevention-and-control-specifications-for-new-buildings-revised-2024_final.pdf?sfvrsn=8b101231_1

**THAILAND**

Note, all documents are in Thai language, except when specified in English.

Thai year in Gregorian calendar: 2565 for 2022; 2566 for 2023; 2567 for 2024, etc.

1. **IPC programmes (CC1)**

1.1 National Level

a. Tracking AMR Country Self-Assessment Survey (TrACSS) 2023 Country Report. Thailand. FAO. UN environment programme. WHO. OIE. 2023. https://amrcountryprogress.org/#/map-view

b. National Infection Control Committee Report 2566 (2023).

c. National Infection Control Committee Report 2565 (2022).

d. National Infection Control Committee Report 2564 (2021).

2. **IPC technical guidelines (CC2)**

2.1 National Level

a. Updating IPC Guidelines for Thailand 2024. The Nosocomial Infection Control Group of Thailand, Ministry of Public Health, Department of Disease Control, Bamrasnaradura Infectious Diseases Institute (BIDI). 2024. https://ddc.moph.go.th/uploads/ckeditor2//files/IPC%20Guidelines%20for%20Thailand%202024.pdf

b. Master Plan: Holistic Pandemic Management; Chapter 2. Guidelines for prevention and control of infectious diseases transmission in Hospitals.

MOPH. Bamrasnaradura Infectious Diseases Institute (BIDI). 2023 (2566 Thai calendar).

c. Practical Guide for IPC in Hospital. 2nd Edition. MOPH. BIDI. 2017 (2560 Thai Calendar).

d. Practical Guide for IPC in Hospital. MOPH. BIDI. 2007 (2550 Thai Calendar)

e. Addressing the Challenges of Hospital Infection Prevention and Control in Thailand. MOPH. BIDI. 2022 (2565 Thai calendar). https://fliphtml5.com/xuvfr/zcdo/Addressing_the_Challenges_of_Hospital_Infection_Prevention_and_Control_in_Thailand/

f. Guide to diagnosing healthcare associated infections. MOPH. BIDI. 2018 (2561 Thai calendar).

g. Diagnostic criteria for healthcare associated infections. MOPH. BIDI. 2013 (2556 Thai Calendar).

h. Manual for Infectious Disease Operations. Ebola Virus Disease. 2015 (2558 Thai calendar).

i. Guidelines for IPC in community hospital. MOPH. BIDI. (date: unknown)

j. Guidelines for preventing Antimicrobial Resistance (AMR). MOPH. BIDI. 2019 (2562 Thai calendar).

k. Guidelines for Prevention and Control Healthcare associated Infections. MOHP. BIDI. 2020 (2563 Thai calendar).

l. Guidelines for self-assessment of the prevention and control of HAIs for hospital accreditation. MOPH. BIDI. 2015 (2558 Thai calendar).

m. Guidelines for the prevention and control of drug-resistant pathogens. BIDI. 2014 (2557 Thai calendar).

n. Guidelines for the Prevention of Ventilator-Related Pneumonia MOPH. BIDI. 2009 (2552 Thai calendar).

o. HA Guidelines for prevention of infection associated with cuts and contact with blood or secretions. MOPH – BIDI. 2014 (2557 Thai calendar).

p. Manual for improving air quality in healthcare facilities. BIDI.2017 (2560 Thai calendar).

q. Manual for Nursing Patients with Communicable and Re-emerging Diseases Volume 4. MERS-CoV, EVD, Diphteria. BIDI.

r. Manual for nursing patients with communicable disease Full Version_Volume 5. MOPH. BIDI. 2018 (2561 Thai calendar).

s. National Tuberculosis Control Program Guidelines, Thailand, 2018. MOPH. https://www.tbthailand.org/download/Manual/NTP2018.pdf

t. Blueprint Management for Emerging Infectious Diseases (Lessons learned from COVID-19). Second Edition. MOPH. BIDI. 2022 (2565 Thai calendar).

**3. Multimodal strategy (CC5)**

3.1 National Level

a. The National Strategic Action Plan for Hospital-Associated Infection Prevention and Control 2023-2027. Ministry of Public Health, Department of Disease Control. BIDI. The Nosocomial Infection Control Group of Thailand. 2022. https://ddc.moph.go.th/uploads/ckeditor2//files/IPC%20.pdf

b. National Infection Prevention and Control Action Plan (2019-2021).

c. Master plan: Holistic Pandemic Management. The Nosocomial Infection Control Group of Thailand. MOPH, Department of Disease Control. BIDI. 2023 (2566 Thai calendar).

d. Action Plan for Disease Prevention and Health Hazards in the event of an influenza pandemic. BIDI. 2017 (2560 Thai calendar).

**4. Monitoring/audit(s) of IPC practices and feedback (CC6)**

4.1 National Level

a. Joint external evaluation of IHR core capacities of The Kingdom of Thailand. Mission report: 31 October – 4 November 2022. WHO. 2023. English version. https://iris.who.int/bitstream/handle/10665/373171/9789240080270-eng.pdf?sequence=1

b. Joint external evaluation of IHR core capacities of The Kingdom of Thailand. 2017. English version. https://drive.google.com/file/d/1UAgXmrmmHM-ogels1fLWGMRsFClEvDha/view?usp=drive_link

**VIET NAM**

Note: All documents are in Vietnamese, except when specified English.

**1. IPC programmes (CC1)**

1.1 National Level

a. 2016-2020 National Action Plan Strengthening Infection Control in Health-care Facilities. MOH. 2016. Promulgated by Decision 1886/QD-

BYT (2016). https://thuvienphapluat.vn/van-ban/The-thao-Y-te/Quyet-dinh-1886-QD-BYT-2016-Ke-hoach-kiem-soat-nhiem-khuan-co-so-kham-chua-benh-2016-2020-321544.aspx

b. Circular No. 16/2018/TT-BYT (2018), providing guidance on the implementation of infection control system in health care facilities. MOH. July 2018. https://thuvienphapluat.vn/van-ban/EN/The-thao-Y-te/Circular-16-2018-TT-BYT-prescribing-infection-control-in-healthcare-facilities/398657/tieng-anh.aspx

c. National Hospital IPC Quality Standard, No.6858/BYT. MOH.2016.

**2. IPC technical guidelines (CC2)**

2.1 National Level

a. Guidelines for Infection Control in Medical Examination and Treatment Centers. MoH. 2017. Promulgated by the Decision No. 3916/QĐ-BYT (2017) (Package of 6 guidelines). https://thuvienphapluat.vn/van-ban/the-thao-y-te/Decision-3916-QD-BYT-2017-on-approval-for-guidelines-on-infection-control-in-health-care-facilities-383306.aspx

b. IPC specific guidelines (e.g. for COVID-19; Decision No.468/QD-BYT on Guidelines For Infection Prevention and Control for COVID-19 Acute Respiratory Disease In Healthcare Establishments. MOH 2020.

https://vanbanphapluat.co/decision-468-qd-byt-2020-infection-prevention-and-control-for-covid-19-acute-respiratory-disease

c. Decision No. 1616/QD-BYT (2020) on Interim Guidelines on Technical Requirements for COVID-19 PPE and Classification and Selection. MOH. 2020. https://thuvienphapluat.vn/van-ban/The-thao-Y-te/Quyet-dinh-1616-QD-BYT-2020-huong-dan-phan-loai-lua-chon-bo-trang-phuc-phong-chong-Covid-19-439706.aspx

**3. IPC education and training (CC3)**

3.1 National Level

a. Infection Control Training/ guidelines Material. Ministry of Health, 2012 (Promulgated by the Decision No. 5771 / BYT-K2ĐT. MOH. 2012) https://thuvienphapluat.vn/cong-van/Lao-dong-Tien-luong/Cong-van-5771-BYT-K2DT-2012-Chuong-trinh-Tai-lieu-Kiem-soat-nhiem-khuan-can-bo-Y-te-209583.aspx

**4. HAI surveillance (CC4)**

4.1 National Level

a. Surveillance HAI, CAUTI and BSI Training material. 2023.

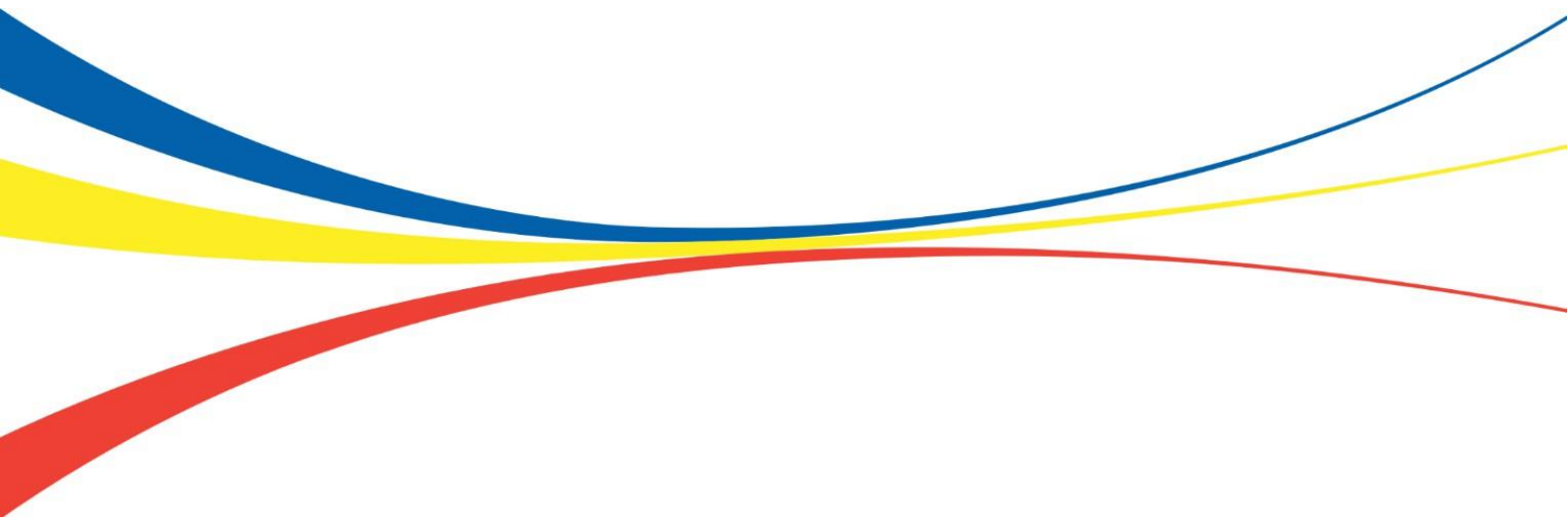
**5. Monitoring/audit(s) of IPC practices and feedback (CC6)**

6.1 National Level

a. National Hospital IPC Quality Standard, No.6858/BYT. MOH.2016.

   It contains nine national criteria, to assess the quality of health-care facilities IPC program (Promulgated by the Decision No. 6858/QD-BYT. MOH. 2016) https://thuvienphapluat.vn/van-ban/EN/The-thao-Y-te/Decision-5338-QD-BYT-2020-promulgation-of-Criteria-for-Inspection-and-Evaluation-of-Hospital-Quality/460687/tieng-anh.aspx

b. Joint External Evaluation of IHR Core Capacities of Viet Nam. Mission Report: 28 October-4 November 2016. WHO. 2017. English version. https://www.who.int/publications/i/item/WHO-WHE-CPI-2017.21



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