Leong *et al.*
Antimicrobial Resistance & Infection Control (2024) 13:108
https://doi.org/10.1186/s13756-024-01447-9

Antimicrobial Resistance and Infection Control

RESEARCH

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Baseline evaluation of the World Health Organization (WHO) infection prevention and control (IPC) core components in Pacific Island Countries and Territories (PICTs)

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Abstract

Background Comprehensive infection prevention and control (IPC) programmes are proven to reduce the spread of healthcare-associated infections (HAIs) and antimicrobial resistance (AMR). However, published assessments of IPC programmes against the World Health Organization (WHO) IPC Core Components in Pacific Island Countries and Territories (PICTs) at the national and acute healthcare facility level are currently unavailable.

Methods From January 2022 to April 2023, a multi-country, cross-sectional study was conducted in PICTs. The self-reporting survey was based on the WHO Infection Prevention Assessment Framework (IPCAF) that supports implementing the minimum requirements of the WHO eight core components of IPC programmes at both the national and facility level. The results were presented as a 'traffic light' (present, in progress, not present) matrix. Each PICT's overall status in achieving IPC core components was summarised using descriptive statistics.

Results Fifteen PICTs participated in this study. Ten (67%) PICTs had national IPC programmes, supported mainly by IPC focal points (87%, n = 13), updated national IPC guidelines (80%, n = 12), IPC monitoring and feedback mechanisms (80%, n = 12), and waste management plans (87%, n = 13). Significant gaps were identified in education and training (20%, n = 3). Despite being a defined component in 67% (n = 10) of national IPC programmes, HAI surveillance and monitoring was the lowest scoring core component (13%, n = 2). National and facility level IPC guidelines had been adapted and implemented in 67% (n = 10) PICTs; however, only 40% (n = 6) of PICTs had a dedicated IPC budget, 40% (n = 6) had multimodal strategies for IPC, and 33% (n = 5) had daily environmental cleaning records.

Conclusions Identifying IPC strengths, gaps, and challenges across PICTs will inform future IPC programme priorities and contribute to regional efforts in strengthening IPC capacity. This will promote global public health through the prevention of HAIs and AMR.

Keywords Infection prevention and control, Healthcare-associated infections, Antimicrobial resistance, WHO IPC core components, Low- and middle-income countries

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Background

Infection prevention and control (IPC) is increasingly reflected in the emerging public health priorities of the World Health Organization (WHO) [1]. The COVID-19 pandemic revealed the urgency of preventing and controlling the transmission of infectious diseases

through strengthening IPC at all healthcare system levels to ensure resiliency and preparedness [2, 3]. Beyond COVID-19, IPC is an evidence-based approach to preventing and reducing the burden and related harm of healthcare-associated infections (HAIs) to patients, healthcare workers, and visitors to healthcare facilities, and plays a crucial role in combating the global public health threat of antimicrobial resistance (AMR) [4, 5].

HAIs, including hospital-acquired pneumonia, surgical site infections, AMR infection, and catheter-associated urinary tract infections (CAUTI) occur frequently as adverse events in healthcare delivery [6]. Their impact on morbidity, mortality, and economic burden is well established in the literature [7–10]. The WHO estimates that hundreds of millions of patients are affected by HAIs every year, and the implications that this has on their lives are incalculable [8]. In 2016–2017, the European Centre for Disease Prevention and Control (ECDC) calculated that 4.5 million patients admitted to acute care hospitals in the European Union (EU) and European Economic Area (EEA) suffer every year from HAIs [11]. More recently, the transmission of SARS-CoV-2 throughout healthcare settings globally was profound during the first waves of the pandemic in 2020 [7]. Up to 41% of those hospitalised with confirmed COVID-19 were infected in healthcare settings, and the prevalence of infection among healthcare workers ranged from 0.3% to 43.3% [12, 13].

HAIs pose significant challenges to healthcare systems worldwide, regardless of country income level [8]. However, it is of particular concern in low- and middle-income countries (LMICs), where it is estimated that 15 out of every 100 patients acquire a HAI during their hospital stay, close to double the rate of high-income countries [4, 8]. There are certain factors particular to LMICs contributing to this difference including limited healthcare infrastructure, inadequate IPC guidelines, funding and resource allocation restraints, and the high burden of infectious disease [7]. By implementing cost-effective IPC interventions, such as effective hand hygiene, an estimated 70% of HAIs could be prevented [7]. Additionally, through initiatives including the implementation of comprehensive IPC programmes, antimicrobial stewardship, and increased surveillance and monitoring, HAI burdens can be reduced [14].

Efforts are being made globally to combat HAIs through comprehensive IPC programmes at the national and acute healthcare facility level. In 2016, the WHO released evidence-based and expert consensus-informed guidelines that detail effective IPC strategies [15] summarised into eight IPC core components [15]. These eight core components are: (1) IPC programmes, (2) IPC guidelines, (3) IPC education and training, (4) Surveillance, (5) Multimodal strategies, (6) Monitoring and audit of IPC practices and feedback, (7) Workload, staffing, and bed occupancy, and 8) Built environment, materials, and equipment for IPC at the facility level [15]. When comprehensively incorporated into IPC programmes, these core components support HAI and AMR prevention; promote patient, healthcare worker and visitor safety; and strengthen capacity building at the national and facility levels [15, 16]. Further work has been conducted by the WHO in formalising both minimum requirements for implementing core components [16] and tools for their assessment, including the Infection Prevention and Control Assessment Framework (IPCAF) [15, 17] to benchmark national- and facility-level IPC performance and support the implementation of the core components.

The first global IPC report released by the WHO in 2022 detailed IPC programme implementation in countries within all six WHO regions [7]. When 2021–2022 global IPC survey results were compared to a similar survey conducted in 2017–2018 within the WHO's Western Pacific Region (WPRO), improvements were seen in key IPC programme indicators including: having an IPC-trained national focal point, the presence of an in-service IPC curriculum, conducting HAI surveillance, and monitoring IPC practices and feedback; however, no improvements were identified in the number of countries with national IPC programmes, budget allocation to IPC, evidence-based and standardised national guidelines, and multimodal strategies for implementing IPC [7]. Importantly, only 4 out of 37 countries within WPRO participated in this recent global survey, with no representation from the 22 nations that make up the Pacific Island Countries and Territories (PICTs) and represent a combined population of approximately 2.3 million people [18].

Given the absence of participation from a significant number of countries within the region, the results have limitations, meaning that further investigation to assess and improve IPC practices is justified [7]. A comprehensive assessment of the IPC situation in WPRO, specifically the currently underrepresented PICTs, will identify gaps to inform future IPC programme priorities and implementation strategies, thus contributing to regional and global efforts in advancing IPC practices. Additionally, it will contribute to improving the overall health status of this population, who are burdened by infectious diseases such as tuberculosis and malaria, and high rates of non-communicable diseases (NCDs) [19–21].

Aim

The study aimed to assess IPC programmes in PICTs against the WHO Core Components for Infection Prevention and Control (IPC).

Methods

Study design

A self-reporting, descriptive cross-sectional survey was used to assess the IPC situation in PICTs against the WHO minimum requirements for IPC programmes [16] due to the cost-effectiveness and ease of implementation [22] of the study design. The survey questions were multiple choice and adapted from the IPCAF tool at the facility and national levels to suit the status and context of IPC programmes in PICTs [15, 17]. The IPCAF is a globally validated evaluation tool used to benchmark national- and facility-level IPC performances and support the implementation of the eight IPC core components [15, 17]. While eight core components address facility-level challenges (1–8), six are relevant at the national level (1–6) [15]. At the facility-level, the tool generates a final score between 0 and 800 and assigns IPC performances on a continuum ranging from 'inadequate' to 'advanced'; thus, gaps in current practice can be identified, and quality improvement initiatives fostered [17]. Specific versions and variations of the IPCAF exist, and it can be tailored to the assess the IPC standards in different healthcare settings and countries [17].

Survey instrument

The survey tool utilised in this study comprised six demographic programmatic questions and a further 47 questions subdivided into sections corresponding to seven WHO IPC core components. Questions related to IPC core component number seven (7) (workload, staffing, and bed occupancy) were not included in this survey as this component falls outside the immediate scope of work of both IPC focal points and external advisers in the implementation of IPC programmes. All survey questions regarding the core components were multiple choice with options of either 'yes','no', 'tick all that apply", or other predefined responses for frequency-related questions. The survey was pilot tested in Fiji by IPC officers based at Lautoka and Labasa Hospitals and revised from their feedback before being disseminated to IPC focal points in all PICTs for completion.

Setting and study population

This study involved 15 PICTs (Cook Islands, Fiji, Federated States of Micronesia (FSM), Kiribati, Republic of Marshall Islands (RMI), Nauru, Niue, Palau, Papua New Guinea (PNG), Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, and Vanuatu). The focus was on the healthcare professionals or teams responsible for organising and implementing IPC activities within PICTs located either in the national Ministry of Health (or equivalent) or the main referral facility (hospital) in the country or territory. These healthcare professionals had all received IPC training prior to undertaking the survey, but this may have been at an informal level. The surveys were completed by the IPC Focal Points in all PICTs, with the exception of Tokelau and the Cook Islands, where the surveys were completed by the Chief Nursing Officer. In Niue, the survey was completed by the Principal Public Health Officer. The main referral facility was accepted to be demonstrative of the national Ministry of Health level.

Data collection

Effective engagement with the survey tool required a comprehensive understanding of IPC terminology and concepts to ensure accurate data reporting; therefore, healthcare professionals or teams responsible for organising and implementing IPC activities in the selected countries and territories were invited to participate in this study through electronic mail (email) with a link to the survey in SurveyMonkey. The survey was initially distributed in January 2022 and followed up periodically by the researchers. Non-respondents were followed up again in March 2023.

Data analysis

Data analysis was performed using Microsoft Excel. Data was organised and cleaned, with responses utilised from those with complete datasets only (single respondents from either the Ministry or facility that had completed all survey questions). Due to the exploratory nature of this research, there was no impact on the study from missing datasets. For analysis, if multiple surveys were received from facilities or health ministries within a country, the most relevant location (Ministry or facility) and/or the respondent with responsibility for ongoing IPC assessment and activities (often the formally or informally appointed IPC focal point) was selected. Because the survey instrument was adapted from the IPCAF tool, a revised scoring system presented results as a 'traffic light', or 'red-yellow-green' matrix (rather than a numeric scoring system), designed to record the respective status of 'present', 'in progress' or 'not present' of each core component of the IPC programme [20]. The results were calculated using descriptive statistics [22]. Each country or territory's overall progress and status in achieving the IPC core components are presented in proportions.

Ethics

The Griffith University Human Research Ethics approved full ethical clearance for this research, Ref No. 2023/679.

Endorsement for PICT participation in this study was obtained from Pacific Infection Prevention Control Network (PICNet) meeting member country representatives on the July 19th, 2023 and through further email correspondence on meeting outcomes.

Results

From January to April 2023, 24 individual responses, including both health ministries and healthcare facilities, were received from 15 countries. After applying exclusion criteria, 10 facility-level (Cook Islands, Fiji, FSM, Kiribati, RMI, Nauru, Palau, Tokelau, Tonga and Tuvalu) and five national-level (Solomon Islands, Vanuatu, Samoa, PNG and Niue) responses were included in the final analysis. Table 1 summarises the overall achievement of core components.

Overall status by country

At 83%, Samoa had the highest percentage of core components present. Tonga and Tuvalu had 73% of core components present, followed by the Cook Islands, Kiribati, Nauru, and the Solomon Islands with 67%. 58% of core components were achieved in Fiji, Palau, and PNG. Tokelau had 50% of core components present, and less than half were present in FSM (25%), RMI (25%), Niue (33%), and Vanuatu (42%) (Fig. 1).

Core component 1: infection prevention and control programmes

National IPC programmes with clearly defined objectives and annual work plans were reported in 67% (n = 10) of the participating PICTs. At the facility level, 47% (n = 7) PICTs had IPC programmes with clearly defined objectives and an annual work plan. Similar results were seen with IPC committees supporting IPC programmes at the national and facility levels, with 67% (n = 10) and 73% (n = 11) PICTs respectively answering 'yes' to these questions. IPC focal points were reported to be present in 87% (n = 13) of PICTs at the national level. IPC focal points were absent in Fiji and Palau at the national level; however, both PICTs did report having an appointed IPC officer in charge of the programme at the healthcare

Table 1 Overall achievement of core components

Core component		Indicator	Summary	
			Countries	%
CC1	IPC Programmes	National IPC Programme	10	67
		IPC focal point	13	87
		Dedicated budget	6	40
CC2	National and Facility level IPC guidelines	Updated national IPC guidelines	12	80
		Guidelines adapted and implemented	10	67
CC3	IPC education and training	Mandatory in-service training provided to healthcare workers	3	20
CC4	HAI surveillance	HAI defined component of national IPC program	10	67
		Surveillance and monitoring procedures implemented	2	13
CC5	Multimodal strategies for IPC activities	Multimodal strategies being implemented	6	40
CC6	IPC monitoring and feedback	Monitoring/audit of IPC practices	12	80
CC8	Built environment, materials and equipment	Accessible records of daily environment cleaning	5	33
		Waste management plan	13	87

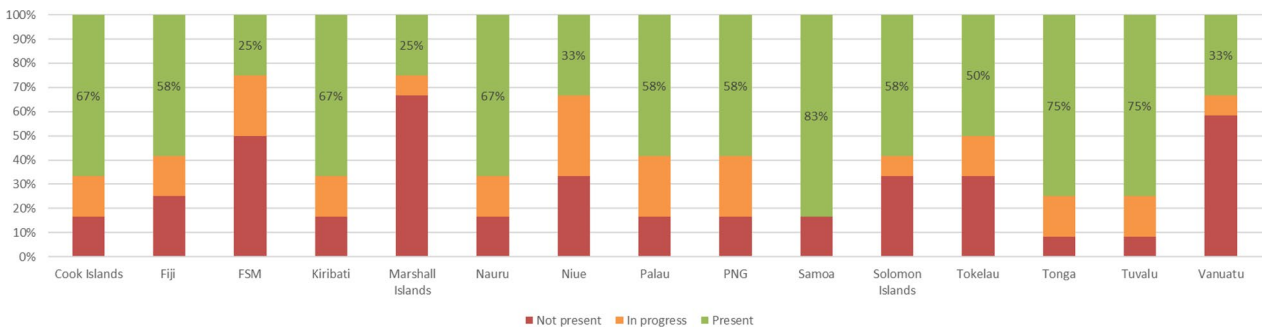

Fig. 1 Overall progress on IPC Core Components by Pacific Island Country/Territory

facility level. Senior hospital leaders participated in IPC committees in most PICTs (80%, n = 12). Only 40% (n = 6) PICTs reported dedicated national budgets for IPC programmes specifically covering IPC activities. The availability of timely and accurate delivery of results by microbiological laboratories was reported as present in 80% (n = 12) of the PICTs.

Core component 2: national and facility-level infection prevention and control guidelines

80% (n = 12) of PICTs reported having national IPC guidelines in place that had been updated within the last five years. 67% (n = 10) of PICTs reported having more than 75% (11 or more) of the 15 key standard IPC healthcare facility guidelines and standard operating procedures (SOPs) specified in the survey tool. These SOPs and guidelines include standard and transmission-based precautions, hand hygiene, outbreak management and preparedness, prevention of infections, prevention of hospital acquired pneumonia, prevention of the transmission of multidrug-resistant pathogens, disinfection and sterilisation, healthcare worker protection and safety, injection safety, waste management, and antibiotic stewardship[17]. The Cook Islands, FSM, RMI, and Niue reported having 26 to 74% (5 to 10) of these guidelines in place and were thus rated as 'in progress' in the matrix system. Vanuatu was the only country to report that less than 25% (less than 4) of these guidelines and SOPs were adapted and implemented. Healthcare workers received specific training related to new and updated IPC guidelines in 60% (n = 9) of PICTs, and the implementation of these IPC guidelines was regularly monitored in 80% (n = 12) PICTs.

Core component 3: infection prevention and control education and training

IPC education and training received one of the lowest scores overall. While all except one PICT (Vanuatu) had at least one personnel with IPC experience or additional non-IPC personnel (e.g., nurses, doctors, IPC champions) to lead IPC training, only 20% (n = 3) of healthcare workers in PICTs reported new employee and annual training regarding IPC practices within the healthcare facility. Approximately 53% (n = 8) of PICTs indicated that IPC education and training were conducted for new employees and at least annually; however, as the training was not a mandatory requirement for staff by the facility or Ministry (per WHO IPC minimum standards), these were classified in the rating matrix as 'in progress'. In healthcare facilities, Vanuatu and RMI (13%, n = 2) disclosed that IPC education and training were provided 'never or rarely'. 60% of PICTs (n = 9) did, however, state that there were periodic evaluations on the effectiveness of training programmes (e.g. hand hygiene audits).

Core component 4: health care-associated infection surveillance

Over half of the PICTs (67%, n = 10) reported having HAI surveillance as a defined or formally established component of the national IPC programme. 33% of PICTs (n = 5) (FSM, RMI, Niue, Solomon Islands, and Tokelau) answered 'no' to this question. The capacity for and implementation of HAI surveillance and monitoring procedures was the lowest scoring area of all IPC core components. Only 13% (n = 2) of PICTs were rated as having HAI surveillance and monitoring capacity present, with this classification based on reporting of more than 75% of key surveillance and monitoring mechanisms/indicators for HAI being in place (surgical site, catheter-associated urinary tract, central line-associated bloodstream, peripheral line-associated bloodstream, and ventilator-associated infections; the monitoring of infections in healthcare workers and vulnerable populations (neonates, intensive care, burns and immunocompromised); consistent surveillance case definitions; adequate laboratory capacity; standardised data collection and analysis; and the use of surveillance data to tailor healthcare facility based plans for improving IPC practices). 53% of PICTs (n = 8) (Fiji, Kiribati, Nauru, Niue, Palau, PNG, Tokelau, and Tonga) were rated as 'in progress' with 26—75% of HAI surveillance and monitoring procedures in place; however, the remaining 33% (n = 5) (Solomon Islands, FSM, RMI, Tuvalu, and Vanuatu) were rated as 'not present' as they had less than 25%. Less than half of PICTs monitored infections in vulnerable populations (40%, n = 6) and HCWs (40%, n = 6). However, half (53%, n = 8) reported the use of standardised data collection methods (e.g., active prospective surveillance) according to international surveillance protocols, and nearly three-quarters (73%, n = 11) reported that adequate laboratory capacity was available for HAI surveillance activities.

Core component 5: multimodal strategies for implementing infection prevention and control activities

40% (n = 6) of PICTs reported the presence of all 4 elements of multimodal strategies for implementing IPC. These multimodal strategies included the availability of necessary infrastructure and supplies when implementing existing IPC interventions; the availability of supplies when implementing new IPC interventions; monitoring compliance and timely feedback; and IPC reminders, posters and other awareness tools. 53% (n = 8) of PICTs reported having between 1 and 3 of these strategies implemented, resulting in an 'in progress' status;

however, RMI reported 'no' multimodal strategies for implementing IPC.

Core component 6: monitoring/audit of IPC practices and feedback and control activities

In nearly all PICTs (80%, n = 12), the monitoring and auditing of IPC practices and feedback were reported as 'yes'. Half of the PICTs (53%, n = 8) reported having well-defined monitoring plans, including clear goals, targets, and activities, and the systematic tools to collect this data. Only 20% (n = 3) of PICTs reported monitoring across all key processes and indicators including: the "five moments of hand hygiene", usage of alcohol-based hand rub or soap and water, indwelling catheter insertion/care, wound-dressing change, cleaning of the ward environment, transmission-based precautions, waste management, and the reprocessing of reusable medical devices. The remaining 80% (n = 12) of PICTs reported varying monitoring levels across these eight key processes and indicators.

Core component 8: built environment, materials, and equipment for IPC at the facility level

Water, sanitation, and hygiene (WASH) infrastructure and availability were assessed. Only 60% (n = 9) of PICTs surveyed reported 'yes' to having adequate water services always available, and 33% (n = 5) of PICTs had the minimum recommended toilet facilities available. Additionally, 60% (n = 9) of PICTs advised that they always had sufficient power to all wards. There were records of daily environment cleaning reported in only 33% (n = 5) of PICTs. Most PICTs (87%, n = 13) had adequate waste management plans at the facility level, and 93% (n = 14) had functional waste collection containers for non-infectious, infectious, and sharps waste near point of use.

Discussion

To our knowledge, this is the first published report assessing the WHO core components of IPC programmes at the national and facility level across multiple PICTs, providing valuable evidence for regional efforts to strengthen IPC capacity, respond to future disease outbreaks, and prevent HAIs and AMR.

There is a paucity of published data on the status of IPC core components across PICTs. One study by Marme et al. used the IPCAF tool to assess tuberculosis IPC practices against the WHO IPC core components in district hospitals within Papua New Guinea (PNG); however, to date, this is the only known published assessment [23]. This creates challenges for assessing IPC progress over time. However, if we consider our results against other findings in IPC, specifically within the WPRO region and across low-resource settings and other LMICs, it can be inferred that similar strengths, challenges, and limitations in IPC programmes have been observed to that outlined in the results from this study [3, 7, 23–26].

This study showed encouraging results related to core component 1 of IPC programmes. While the proportion of PICTs having a national IPC programme with clearly defined objectives and annual work plans (67%, n = 10) was similar to the proportion of countries globally with national IPC programmes in the 2021–2022 WHO survey (61.3%), the proportion of PICTs appointing trained IPC focal points was higher (87% vs. 72.6%) [7]. A rapid change in appointing trained IPC focal points can also be seen when comparing this study's results to a 2017–2018 survey within the WPRO region (87% vs. 50%) [7]. One explanation for this is that PICTs rapidly appointed an IPC focal point to cope with the increasing demands of the COVID-19 pandemic, having yet to establish an IPC programme. 67% (n = 9) of respondent PICTs had a facility level IPC programme. While this result is less than the 80% of IPC programmes in facilities reported in the 2023 PNG study [23], it should be noted that all PICTs responding to the survey indicated they had clear objectives for IPC activities, whereas facilities in PNG did not. Clear objectives in IPC programmes allow for the establishment of measurable indicators to track progress, evaluate IPC effectiveness, and identify improvement areas to reduce the burdens of HAIs and AMR [15, 16].

One gap identified within core component 1 which is consistent with other LMICs, is that there is a lack of dedicated budget for carrying out IPC activities [7]. Compared to the 2017–2018 survey (50%, n = 2) and 2021–2022 WHO global surveys (50%, n = 2) for the WPRO region, this study showed no improvements in dedicated IPC budgets within PICTs [7]. Additionally, PICTs scored lower than the global proportion (48.4%) of countries meeting this minimum requirement in another 2021–2022 survey [7]. One possible explanation for this is that during COVID-19 IPC budgets were allocated to PPE and other resources rather than specifically to IPC activities [7]. The lack of financial investment in IPC programmes, weak legal frameworks, and competing national interests were also identified as common barriers to progress within core component 1 in LMICs globally and could also contribute to the lack of improvement seen in PICTs [7].

Core component 2 promotes the development of evidence-based IPC guidelines as a minimum requirement to guarantee that a basic level of implementation of IPC programmes is supported, and that they are adapted to the local context and reviewed every five years for the purpose of reducing HAIs and AMR [15, 16]. Core component 2 scored one of the highest results in the survey of PICTs which was similar to WPRO regional results

reported in the 2021–2022 national IPC global survey [7] and a global study by Tomczyk et al. which showed weighed IPCAF scores in HICs and LMICs to be highest in this core component [14].

Of particular concern for the results from the PICTs was that in core component 3 IPC education and training, only 20% (n = 3) of PICTs had mandated annual IPC training and education, which is lower than what was seen within the WPRO region in 2017–2018 (75%, n = 3) and again in 2021–2022 (100%, n = 4) [7]. A review of the evidence suggests that this is a recurring challenge found in LMICs and low-resource settings despite HCW education and training being a well-documented approach to reducing HAI and AMR [27, 28]. Indeed, there is no specific curricula for the training of IPC staff within the region. Cancedda et al. indicate that education and training are often limited in LMICs due to inappropriate funding, poor alignment of training and resources to suit local priorities, and insufficient emphasis on the acquisition of practical skills, which also likely contributed to the findings in this study [28]. This is emphasised again in two studies in healthcare facilities in Pakistan that found that IPC education and training was irregular and not standardised, which was directly linked to lower levels of PPE compliance among HCWs [24, 29]. However, it should be noted that this challenge is not unique to LMICs, with the minimum requirements for core component 3 consistently scoring low across all countries regardless of income level [7].

In regard to core component 4, while HAI was a defined component of national IPC programmes in 60% (n = 9) of PICTs, significant shortcomings were identified in the implementation of HAI surveillance and monitoring procedures (13%, n = 2). These findings were inconsistent with results published in the global IPC report, which indicate that within the broader WPRO region there have been consistent improvements in core component 4 from 2017 to 2022, with 75% (n = 3) and 100% (n = 4) of countries meeting this indicator respectively [7]. This inconsistency may be due to little representation from LMICs in the global IPC report [7]. The literature also suggests that LMICs face resource constraints including a shortage of trained personnel, insufficient laboratory capacity, inadequacies in electronic health record systems and data management systems, and lack of financial investment, that create barriers to successfully meeting the minimum requirements of core component 4, which could elucidate the survey findings [7].

There is also a recognised need within both the PICT responses and from global literature, for improvement in core component 4 and 5 regrading HAI surveillance, specifically surveillance and monitoring, and multimodal strategies to support IPC programmes. One study conducted by Phan et al. in Vietnam, another LMIC in WPRO, found that significant, sustained effects of a comprehensive multimodal campaign supported with education and training improved hand hygiene compliance from 21.5% to 75.1%, while HAI incidence decreased from 1.10 to 0.45 episodes per 1000 patient-days respectively [26].

Findings from this survey of PICTs are consistent with these other global studies regarding core component 6. In 2021–2022 100% (n = 6) of countries surveyed in the WPRO region reported having established the minimum requirements for national strategic plans for IPC monitoring, and 83.3% (n = 5) had hand hygiene compliance as a key indicator [7]. 80% (n = 12) of PICTs reported carrying out monitoring and auditing of IPC practices and feedback, and more specifically, 80% (n = 12) reported monitoring hand hygiene compliance.

Finally, while not included in the global IPC report for WPRO specifically, results for core component 8 reported by PICTs were consistent with the general analysis of this core component throughout the global report, particularly concerning the difference between HICs and LMICs [7]. Key challenges reported regarding inadequate supplies and infrastructure, particularly for WASH, are similar challenges to what was reported in the survey results across national and facility levels in PICTs [7]. Similarly, a 2022 survey completed across public hospitals and COVID-19 temporary treatment and monitoring facilities in the Philippines, emphasised an unsatisfactory disposal capacity for healthcare waste across facilities [31]. Despite these challenges, PICT responses regarding the presence of waste management plans in health facilities (87%, n = 13) are reassuring. Functional waste collection containers for non-infectious, infectious, and sharps waste near point of use are critical to ensuring the safety of HCWs and waste collectors and for reducing the spread of diseases to the community via secondary transmission [31] and this was also rated highly across the PICTs (93%, n = 14).

Limitations

Though adapting the IPCAF tool to suit the region provided an alternative way to collect data that still allowed for comparisons between other global studies regarding the WHO IPC core components, the data collected relied on self-reporting by healthcare professionals or teams responsible for organising and implementing IPC activities, and no training was provided on how to complete the survey. As such, results have not been validated independently, are subject to bias, and may not accurately reflect the actual implementation of IPC practices. Though responses were similar from those received from the same country, the main difference identified between

the responses selected for the analysis (primarily from IPC Focal Points) and those excluded was organisational knowledge of policies and procedures including guidelines available and implemented, governance arrangements and in-service training arrangements. This is often due to the role of the respondent, and their direct participation in IPC program planning and implementation. Additionally, while the findings are valuable, they may not be generalisable to other regions or PICTs who did not participate in the survey due to the specific contextual factors of each country and health system and the fact that this survey was completed by national IPC focal points rather than all facilities in a nation or territory. As such, it was not possible to disaggregate data from national and facility-levels.

Recommendations

By taking advantage of the unique opportunity COVID-19 created in bringing IPC to the forefront, progress in achieving the minimum requirements of IPC core components has already been seen across most PICTs [32–34], most significantly in the appointment of focal points and development of workplans outlined in core component 1.

While adapting evidence-informed international IPC guidelines to the local context in LMICs can be challenging due to resource constraints, differing sociocultural factors, and variations in healthcare system structures and local epidemiology, it is recommended that partners, donors and Ministries of Health continue to work collaboratively with local IPC committees, IPC focal points and national level health ministries to establish relevant, feasible and context-specific IPC guidelines within each PICT, which will contribute to improved patient outcomes through reduced HAI and AMR burdens [14–16]. Adherence to these guidelines should also be monitored, and HCWs need education to understand the theoretical background of the recommendations better so that they are appropriately applied [15, 16].

Additionally, ongoing investment is required for the development of national and facility level budgets and workplans in order to support the development of a skilled IPC workforce, and virtual systems for monitoring, reporting, and acting on surveillance of key indicators including HAI [32].

Due to the low performance across all PICTs in core component 3, it is recommended that training programs should be mandated, regularly updated, and tailored to the specific needs of each PICT. Collaborations with regional and international partners can support the development and delivery of this. Additionally, implementing multimodal strategies for IPC under core component 5, supported by training and education activities, would create sustainable solutions for advancing core component 3 and 4 compliance simultaneously [30].

Undertaking monitoring and providing feedback on key indicators of IPC processes, such as the five moments of hand hygiene, would also support PICTs in achieving the minimum requirements for core component 6. Moreover, IPC monitoring and feedback as outlined in core component 6 is relatively simple and more affordable than conducting HAI surveillance per core component 4 [26, 30].

For core component 8, though waste management planning rated well in PICTs, WASH facilities and procedural monitoring were rated much lower. Investment in WASH infrastructure is critical. Additionally, one cost-effective way PICTs could support progress in meeting the minimum requirements of IPC in core component 8 and promote HAI incident reduction is to monitor compliance with environmental cleaning by making cleaning records accessible and available to all HCWs.

In terms of future studies, it is recommended that an in-depth assessment of IPC programmes against all eight WHO IPC core components be conducted using both the national and facility level IPCAF tools across all PICTs. This would provide a better understanding of the progress and challenges faced by different PICTs and health systems/facilities with the ability to conduct standardised comparisons due to the standardised IPCAF scoring system.

Aligned to key recommendations from the WHO 2022 Global Report on IPC and the minimum requirements for core components of IPC programmes, the PICNet, supported by the researchers, is also committed to developing a regional IPC monitoring dashboard that will allow countries to visualise their progress towards achieving the minimum requirements for IPC across core components at the national and facility-levels [7, 32]. This monitoring mechanism would allow for independent third-party verification of achievement of core component compliance including submission of evidence of guidelines and procedures, whilst also providing a more contextualised approach to core component compliance throughout the region.

Conclusions

To make sustainable and durable progress in IPC, now is the time to place greater emphasis on reducing IPC gaps through enforcing national and facility level IPC programmes and guidelines, dedicating adequate budgets to IPC improvement, providing mandatory IPC education for healthcare workers, and conducting HAI surveillance within healthcare facilities. Collaboration and coordination between PICTs, regional organisations, and international

partners is critical to these efforts in reducing the burden of HAIs and AMR whilst enhancing public health outcomes.

Abbreviations

PICT	Pacific Island Countries and Territories
IPC	Infection prevention and control
HAI	Healthcare-associated infections
AMR	Antimicrobial resistance
WHO	World Health Organization
WPRO	Western Pacific Region
CC	Core component
IPCAF	Infection Prevention and Control Assessment Framework
WASH	Water, sanitation, and hygiene
HCW	Healthcare workers
COVID	Coronavirus disease
LMIC	Low- and middle-income country
HIC	High-income country
PPE	Personal protective Equipment
NCD	Non-communicable disease
PICNet	Pacific Infection Prevention Control Network
PNG	Papua New Guinea
FSM	The Federated States of Micronesia
RMI	The Republic of the Marshall Islands
SOP	Standard operating procedures

Acknowledgements
We acknowledge that this study would not have been possible without contribution from Pacific Island Countries and Territories (PICTs). We recognise the expertise, and dedication of IPC focal points in facilitating the data collection process.

Author contributions
ML contributed to the study design, data collection and analysis, interpretation of data and revised the article for content and language. RP contributed to the interpretation of data and wrote the manuscript. MW contributed to the data analysis, and interpretation of data, and revised the article for content and language. AM contributed to article preparation and reviewed the article for content, context, and language. P-AZ contributed to the interpretation of data, article preparation and revised the article for content and language. All the authors have read and approved the final manuscript.

Funding
This paper did not receive funding and there are no conflicts of interest identified by the authors.

Availability of data and materials
The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Ethical clearance for this research was approved by the Griffith University Human Research Ethics, Ref No. 2023/679. Endorsement for PICT participation in this study was obtained from the Pacific Infection Prevention Control Network (PICNet) Chair on the 19th of July 2023.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 14 February 2024 Accepted: 31 July 2024
Published online: 27 September 2024

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