

# Implementation strategies to improve infection prevention and control in healthcare facilities in Sub-Saharan Africa: A scoping review of evidence, practices and gaps

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## Systematic Review

**Keywords:** Infection prevention and control, healthcare associated infections, hand hygiene, implementation strategies, healthcare workers, scoping review, Sub-Saharan Africa, health facilities, multimodal improvement strategy

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**Implementation strategies to improve infection prevention and control in  
healthcare facilities in Sub-Saharan Africa: A scoping review of evidence, practices  
and gaps**

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## **Abstract**

**Introduction:** Infection prevention and control (IPC) is essential for improving patient safety and reducing healthcare associated infections (HAIs). Many IPC interventions have been implemented across sub-Saharan Africa (sSA), however, implementation strategies used, their processes and reported outcomes have not been synthesised. This scoping review mapped implementation strategies used in health facilities to identify common strategies and approaches, their outcomes and facilitators and barriers to their implementation.

**Methods:** We conducted a scoping review guided by the PRISMA-ScR framework. Peer-reviewed studies conducted in sSA published in English and reporting IPC interventions or implementation strategies across health facilities were included. Data extraction captured study characteristics, IPC practices, implementation strategies and their outcomes and facilitators and barriers of implementation. Descriptive summaries were prepared for each study. Qualitative content analysis was used to synthesise key emergent findings across the studies, ultimately producing a narrative synthesis.

**Results:** Sixty-one studies from 22 countries were included. IPC practices included hand hygiene, environmental cleaning, neonatal IPC bundles and surgical site infection prevention bundles. Five implementation strategies were identified to promote these practices: 1. training and education; 2. monitoring, audit and feedback; 3. quality improvement; 4. improving IPC resources and supplies; and 5. multimodal strategies. Most study interventions used multiple approaches and reported improvements in compliance with IPC practices. Facilitators included leadership support, reliable IPC resources, IPC focal persons and feedback loops. Barriers included staff shortages, high workload, inadequate IPC resources and lack of sustainability if external support to IPC ended.

**Conclusion:** Improvements in IPC practices are feasible when strategies are multifaceted, supported by leadership, IPC resources are provided and continuous monitoring and feedback is

established. However, sustainability is still a challenge, as IPC programmes require strong facility-level systems with strong leadership to ensure long-term improvements in IPC practices and reductions in HAIs.

**Keywords:**

Infection prevention and control; healthcare associated infections; hand hygiene; implementation strategies; healthcare workers; scoping review; Sub-Saharan Africa; health facilities; multimodal improvement strategy

## Introduction

Infection prevention and control (IPC) is a fundamental component of patient safety. It plays a vital role in reducing avoidable infections and associated mortality and healthcare costs (1,2). Effective IPC programmes prevent the transmission of infectious microorganisms within healthcare settings by promoting evidence-based practices such as hand hygiene, aseptic technique, environmental hygiene and appropriate use of personal protective equipment (PPE). The World Health Organization (WHO) identifies IPC as a core element of resilient health systems, emphasising its importance in routine care as well as during outbreaks and public health emergencies (3,4).

IPC implementation remains suboptimal in many low- and middle-income countries (LMICs), where there are inadequate IPC resources and inconsistent supply chains, inadequate staffing and overcrowding of wards, which affects adherence to evidence-based practices (5). The burden of healthcare associated infections (HAIs) is thought to be higher in low-income countries than in high-income countries. The most reported HAIs are surgical site infections (SSIs), bloodstream infections (BSIs) and device-associated infections (6,7). These infections mainly occur in admitted patients in hospitals and contribute to prolonged hospital stays, increased antimicrobial use and higher healthcare costs and mortality rates, further straining already resource-limited health systems.

To address these challenges and reduce HAIs, the WHO has developed guidelines stipulating eight core components to support the establishment and strengthening of IPC programmes (3). At the heart of the core components framework sits implementation of multimodal strategies, which combine system change, training, monitoring, reminders and culture change to improve compliance with IPC practices.

The existence of guidelines alone does not guarantee implementation. Without implementation support, adequate resources and contextual adaptation, IPC guidelines

remain underutilised in routine practice (8). Implementation strategies are essential to bridge the “know-do” gap between the evidence-based IPC recommendations and actual practice. Implementation strategies refer to methods or ways used to enhance the adoption, integration and sustainability of clinical interventions within a real world setting (9,10). In the context of IPC, these strategies include but are not limited to monitoring, audit and feedback systems, capacity building and training, use of IPC champions, supportive supervision, availability of adequate IPC resources or a combination of these or as described in the multimodal improvement strategy approach (11,12). Across sSA, these strategies have been implemented with different levels of success, influenced by the hospital organisation culture, staffing, procurement processes and infrastructure (5,11). While studies have examined IPC interventions and implementation strategies, evidence remains varied across countries, clinical areas and operational approaches. Some studies focus on improving hand hygiene, others on the HAIs and others focus on general IPC (1,13,14). This variation is challenging for the policy makers, researchers and practitioners to determine which implementation strategies are effective.

Given these gaps, we conducted a scoping review to synthesise the existing evidence on the implementation strategies that can be applied to improve IPC practices in healthcare facilities in sSA. Implementation challenges contribute substantially to persistent gaps between IPC guidelines and practices. Therefore, synthesising available evidence is critical for informing development of context-specific implementation strategies, identifying research gaps and guiding policy priorities. Hence, a scoping review is the appropriate method to comprehensively characterize the current landscape of implementation strategies to support decision-making for strengthening IPC practices to further contribute to the reduction of HAIs.

## **Methods**

## Study design

This scoping review follows the methodological guidance provided by the Joanna Briggs Institute Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR). We address the research question: what implementation strategies have been undertaken in sSA to operationalise IPC practices in hospitals, and what have they achieved? Our objectives were: 1) to describe the IPC practices most commonly addressed by the implementation strategies; 2) to evaluate the implementation strategies used to support these IPC practices; and 3) to summarise implementation facilitators and challenges.

## Search Strategy

A comprehensive literature search was conducted using three electronic databases: CINAHL, MEDLINE, PubMed and Global Health. These databases were selected because they provide extensive coverage of healthcare, public health and global health, which is relevant to IPC. The search used predefined keywords and the synonyms in Table 1, which were combined using Boolean operators ('AND' and 'OR') to enhance specificity.

**Table 1.** Search terms

| Keywords                      | Related search terms                                                                                                                                                                                                                                                         |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IPC practices                 | "Infection prevention and control" OR "infection prevention" OR "infection control" OR IPC OR "infection prevention measures"                                                                                                                                                |
| Implementation strategies     | "methods" OR "techniques" OR "interventions" OR "best practices" OR "implementation strategies" OR "quality improvement" OR "quality improvement" OR program* OR training OR monitoring OR audit OR compliance OR fidelity OR "behaviour change"                             |
| Hospitals                     | hospitals OR "secondary care" OR "tertiary care" OR "acute health facility"                                                                                                                                                                                                  |
| Sub-Saharan African countries | "Sub-Saharan Africa" OR "Africa South of the Sahara" OR "East Africa" OR "West Africa" OR "Central Africa" OR "Southern Africa" OR "Angola" OR "Benin" OR "Botswana" OR "Burkina Faso" OR "Burundi" OR "Cabo Verde" OR "Cameroon" OR "Central African Republic" OR "Chad" OR |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | "Comoros" OR "Congo" OR "Democratic Republic of the Congo" OR "Republic of the Congo" OR "Côte d'Ivoire" OR "Ivory Coast" OR "Djibouti" OR "Equatorial Guinea" OR "Eritrea" OR "Eswatini" OR "Swaziland" OR "Ethiopia" OR "Gabon" OR "Gambia" OR "Ghana" OR "Guinea" OR "Guinea-Bissau" OR "Kenya" OR "Lesotho" OR "Liberia" OR "Madagascar" OR "Malawi" OR "Mali" OR "Mauritania" OR "Mauritius" OR "Mozambique" OR "Namibia" OR "Niger" OR "Nigeria" OR "Rwanda" OR "Sao Tome and Principe" OR "Senegal" OR "Seychelles" OR "Sierra Leone" OR "Somalia" OR "South Africa" OR "South Sudan" OR "Sudan" OR "Tanzania" OR "Togo" OR "Uganda" OR "Zambia" OR "Zimbabwe" |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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## 137 **Inclusion criteria**

138 The review covered peer-reviewed articles, published in English and conducted in sSA.  
 139 Studies were also included if they: (i) reported IPC interventions or implementation  
 140 strategies; (ii) described or measured outcomes related to IPC practices (e.g., hand hygiene,  
 141 aseptic technique), or implementation outcomes; (iii) used any study design, including  
 142 quantitative, qualitative or mixed methods; and (iv) were conducted in secondary or tertiary  
 143 health facilities.

## 144 **Exclusion criteria**

145 Study articles not written in English were excluded from this review due to the capacity of the  
 146 reviewers. Editorials, reports, protocols and policies were also excluded. Studies that did not  
 147 focus on IPC or that focused on microbiology without the IPC implementation component  
 148 were also excluded. Studies conducted outside sSA and not within hospitals were excluded.

## 149 **Study selection**

150 All search results were imported into Rayyan and duplicates were removed. Titles and  
 151 abstracts were screened independently by two reviewers, DN and RM, against a predefined  
 152 set of inclusion and exclusion criteria. Studies that appeared relevant had their full text

retrieved for further assessment. Full texts were evaluated in detail against inclusion and exclusion criteria and reasons for exclusion were documented. Disagreements during the screening were resolved through discussion. A PRISMA flow diagram was used to illustrate the study selection process, including the number of records identified, screened, included and excluded at each stage.

## **Data charting**

Data charting is the systematic process of capturing and organising relevant information from the included studies in a structured way to facilitate synthesis (15,16). For this review, a standardised data charting form was developed in Microsoft Excel, informed by the review objectives and inclusion criteria. Key data extracted included: bibliographic data (author, year, country); target IPC practices; intervention(s); implementation strategy/ies to support the IPC practices; facilitators of implementation; barriers of implementation; and outcomes—either implementation outcomes, IPC practice measures, or both. The data charting was iterative; the form was pilot tested on a sample of studies and refined to ensure consistency of use between researchers and comprehensiveness.

## **Data analysis**

Data analysis involved synthesising and summarising the extracted data to map key concepts, evidence types and research gaps (15–17). In this review, data analysis included generating descriptive summaries, followed by carrying out qualitative content analysis to produce a narrative synthesis. A descriptive numerical summary was generated to present the distribution of studies by the year of publication, country and IPC practices or implementation strategy/ies. Qualitative content analysis was applied to categorise and synthesise findings related to implementation strategies, IPC practices, facilitators and barriers to implementation and reported outcomes. Data were charted in tables and narratively synthesised. This approach involved a cross-study synthesis to highlight

emerging patterns, identify knowledge gaps and inform future research priorities. The findings generated through this analysis are presented in the results section below.

## **Results**

A total of 478 studies were identified through searches of electronic databases (CINAHL, MEDLINE, PubMed and Global Health). After the removal of 219 duplicates, 259 studies remained for screening. Title and abstract screening led to the exclusion of 167 studies that did not meet the predefined inclusion criteria. Subsequently, 92 full-text articles were retrieved and assessed for eligibility. Of these, 31 studies were excluded due to the reasons shown in Figure 1.

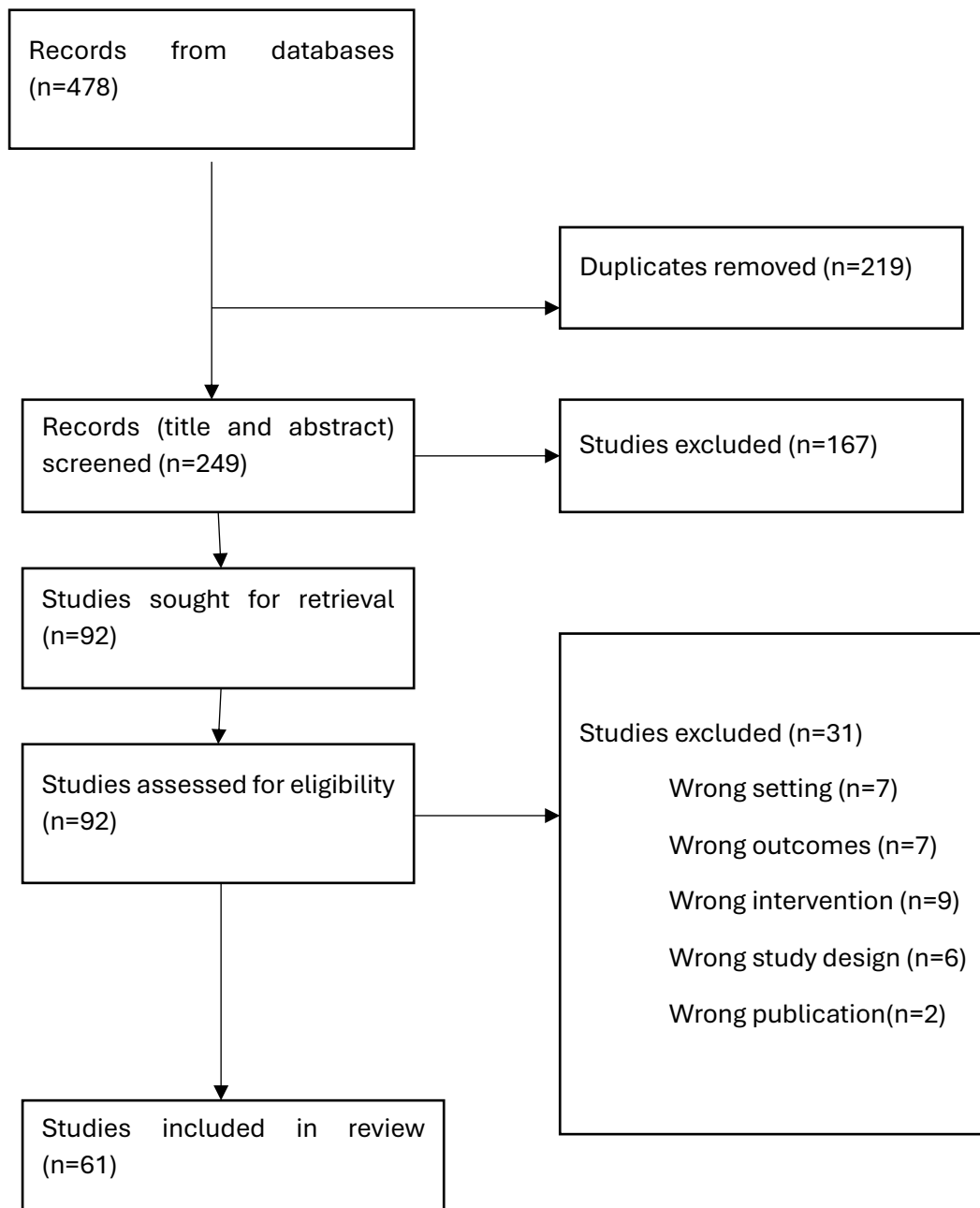


Figure 1. PRISMA flow diagram – Study selection process

In total, 61 studies met the inclusion criteria and were included in the final review and data was extracted as shown in Table 2. In line with the guidance on scoping reviews, results are presented descriptively and narratively to map the distribution of evidence and key patterns across the studies.

The review included studies from 22 countries, with most studies from Ethiopia (n=11), South Africa (n=6), Nigeria (n=6) and Kenya (n=5). These studies were conducted between 2005 and 2025, with most studies (60%) carried out between 2020 and 2025. Hand hygiene was the most targeted IPC practice (45%) followed by measures for prevention of surgical site infections (18%). Commonly used implementation strategies included training, provision of alcohol-based hand rub (ABHR), giving reminders on IPC practices and messages, supervision of HCWs IPC practices and audit and feedback processes.

### **Combining IPC Core Components into Implementation Strategies**

Most examples of IPC implementation identified by this review combined multiple components or strategies to improve IPC practices. We have summarised these as five implementation components in this review, which largely map to the WHO IPC core components. These include training and education; monitoring, audits and feedback; quality improvement; IPC resources/supplies; and multimodal approaches.

In this scoping review, a distinction was made between the WHO multimodal improvement strategy and multifaceted (combined) approaches. A study was classified as having implemented the WHO multimodal improvement strategy if it explicitly incorporated all the defined element—system change, training, monitoring, reminder/communication and culture change. Studies were classified as multifaceted approach when the implemented a combination of two or more IPC core components (e.g. training, audit and feedback, IPC resource provision, IPC leadership engagement) as an integrated strategy. This helped us to differentiate between interventions associated with the structured WHO multimodal framework and those showing practical combinations of IPC core components in the real setting.

### **Training and education of healthcare workers**

Training and education of HCWs were the most commonly used components in IPC implementation strategies across all the studies, although delivery methods, duration and content varied. Approaches included structured workshops and seminars (25,29,35,39,42,44,73), bedside coaching and demonstration, especially for environmental cleaning and care bundles (52,57–59,66,69) and the use of training videos and clinical simulations (52,74). The train-the-trainer model was used in studies that conducted scale up of the initial training (64,73).

Overall, training interventions were found to improve knowledge and confidence among HCWs. For example, in a hand hygiene study in Guinea, knowledge on hand hygiene among HCWs improved from a mean test score of 13/25 to 19/25 (29). In a COVID-19 IPC study in Ethiopia, it was revealed that HCWs were more confident in the use of PPE when donning/doffing after training (73). Training worked best when it was reinforced by supervision, combined with availability of resources and quality improvement structures, and adapted to local context. However, one-off training rarely led to sustained change in practice, drops in hand hygiene compliance after an initial higher compliance post training was observed (26,43).

### **Monitoring, audits and feedback**

Monitoring, audits and feedback loops were mostly combined with use of reminders (visual or verbal) to improve IPC practices among HCWs. Hand hygiene monitoring often used direct observations using WHO tools (19,25,29,30,32,39,42,44). Others conducted general IPC assessments using the Infection Prevention and Control Assessment Framework and Hand Hygiene Self-Assessment Framework (39,72). Other monitoring methods included environmental audits using adenosine triphosphate testing and violet ultraviolet gel (57,58), as well as surveillance of infection rates. Tillekeratne et al (74), demonstrated that continuous surveillance and reminder signs encouraging daily catheter review and weekly infection

prevention rounds by matrons led to a reduction from 30.4 infections per 1,000 catheter-days to 4.6 infections per 1000 days in catheter-associated urinary tract infections.

Feedback was delivered in different ways across the studies, these included dashboards, ward or departmental review meetings and multidisciplinary team reviews (13,23,39,44,53–56). Monitoring, audits and feedback as a strategy improved IPC compliance, especially in hand hygiene. For example several studies reported increased hand hygiene compliance following implementation audits and feedback processes, including improvement from 34% to 76% in one and from 19.9% to 53.8% in another (27,39). Standardised audit systems were associated with improved compliance from 77.4% to 85.2% in 523,000 hand hygiene moments.

#### **Quality improvement teams**

Development of quality improvement teams as an implementation strategy was reported by several studies (20,24,39,40,44). These teams coordinated the intervention implementation, monitoring and feedback processes, and championed local problem solving. Interventions led by quality improvement teams include establishment of teams or committees, use of checklists as audit tools, improvements in resource availability and routine performance review. For example, nurse-led quality improvement initiative and structured frameworks were used to guide multifaceted interventions that combined staff training, reminders, monitoring and leadership engagement, which led to improved hand hygiene compliance and strengthened team accountability (20,24).

#### **IPC supplies and resources**

Many studies (13,18–20,25–30,33,36–38,40–44,46,57–59) addressed structural barriers by improving access to resources such as ABHR, sinks, soap, paper towels, PPE, disinfectant solutions and sterile processing equipment. In several countries, studies used local production of ABHR as a strategy to enhance availability, affordability and sustainability in adherence to hand

hygiene practices among health workers in health facilities (18–20,25,26,28,29,36,38,40–42,44,66,69). Some studies implemented water sanitation and hygiene innovations by installing handwashing sinks, making bed spacing improvements and enhancing supply chain systems (21,57,58,60,65,71). These system changes were associated with improvements in compliance to IPC practices and reduction in HAIs, especially when combined with training and continuous monitoring and feedback.

### **Multimodal strategies**

Many studies (13,19,23,25–30,32,33,35,36,38,39,41–43,49) utilised and advocated for multimodal strategies to improve IPC practices in hospitals, although multimodal IPC strategies varied in content between sites. Studies combined strategies such as system change, training, audit and feedback, reminders and behavioural change reinforcement. Many studies adapted the WHO multimodal improvement strategy and integrated training, availability of ABHR, visible reminders and leadership engagement, which was mainly implemented in hand hygiene studies (13,18,19,23,25,26,28–30,32,33,35–37,41,42). Other multifaceted interventions combined environmental restructuring, communication tools, daily monitoring and supervision (57–59). Several studies demonstrated measurable improvements following the implementation of multimodal strategies. For example, studies in Ethiopia, South Africa and Uganda reported improved hand hygiene compliance after introducing a combination of ABHR availability, training, reminders, audits and giving feedback, leadership engagement and use of IPC or hand hygiene champions (13,27,32,39). Multimodal strategies were also used beyond hand hygiene. A multi-centre study across hospitals in Kenya, Uganda, and Zambia revealed that combining SSI prevention measures with teamwork and safety steps reduced SSI rate and improved adherence to preventive measures (49).

### **Implementation facilitators and barriers**

Across the included studies, implementation of IPC interventions was influenced by organisational, behavioural and resource related facilitators and barriers.

### *Implementation facilitators*

Several studies identified resource availability and good systems as a key facilitator of IPC implementation. Access to ABHR, especially locally produced at the facility, was frequently reported to support hand hygiene compliance (25,28,31). Locally produced ABHR was viewed positively and enabled continuity of supply, which was particularly helpful in very low-resource settings. Availability of funds, including mechanisms such as revolving funds, facilitated sustained availability of resources (46).

Leadership and governance factors were consistently reported as enabling successful implementation. Studies highlighted leadership engagement at facility and national levels, strengthening IPC committees and institutional capacity as important facilitators for sustained IPC improvements (13,21,25,27,41,44,72). Some studies used IPC champions to reinforce good practices and accountability amongst HCWs (27,30,33).

Pre-existing quality improvement structures, mentoring hubs and partnerships with external agencies further supported implementation efforts (23,24,29,32,34,50). Existing quality improvement platforms provided organisational structures through which IPC interventions could be integrated into routine improvement activities such as regular performance reviews and problem-solving meetings. Mentoring hubs and supportive supervision mechanisms enabled continuous skills development, reinforced adherence to IPC practices and provided guidance to HCWs during implementation. In addition, partnerships with external agencies—including non-governmental organisations—often provided technical expertise, training support and material resources that strengthened implementation in low-resource settings. External technical support such as WHO involvement and global quality improvement expertise were also found to enable implementation of IPC interventions (25,53,56).

Other facilitators of implementation include staff buy-in, positive attitudes towards IPC, adaptable WHO IPC tools and contextual influences such as increased risk awareness during disease outbreaks (21,35,37).

### *Implementation barriers*

Resource and infrastructure constraints were the most frequently reported barriers. These included inadequate hand hygiene infrastructure, lack of soap and running water, overcrowding, inconsistent ABHR supply and shortages of essential IPC materials (22,28,29,32,38–40,61–63). Delayed procurement processes and lack of funds were found to limit access to resources (64). Limited knowledge of IPC practices, lack of training, lack of experienced trainers, low motivation and poor attitudes contributed to suboptimal compliance (23,35,37,50). High workload, time constraints and competing clinical demands further affected adherence to IPC practices (13,32,43). At the systems level, weak governance and monitoring mechanisms further constrained implementation. These included inadequate supervision, lack of regular audits, absence of IPC expertise or staff and weak surveillance systems for HAIs (21,25,30,43). Together, these system gaps limited the ability of facilities to monitor performance and sustain improvements over time.

## **Discussion**

This scoping review demonstrates that multifaceted and multimodal strategies were consistently more effective than single component interventions for improving IPC practices across the health facilities in sSA. Across these studies, strategies included combinations of training and educating staff; monitoring, auditing and feedback mechanisms; use of quality improvement; leadership engagement and improving availability of IPC resources. Similar findings have been reported, where sustained improvements in IPC practices have been achieved through coordinated interventions that combine behaviour, organisational and structural changes rather than relying on isolated activities such as training (78). This review therefore reinforces the growing consensus

that improving IPC practices in healthcare facilities requires multifaceted implementation approaches.

Training was a central strategy in most interventions identified in this review. However, the findings also indicate that training alone is insufficient to sustain IPC behaviour change (26,43). Similar observations have been reported in other IPC studies showing that knowledge acquisition does not automatically translate into practice without organisational reinforcement mechanisms such as monitoring, supervision and leadership support (25,79–81). Translation of knowledge into practice can be affected by contextual issues such as workload, resource constraints, absence of feedback mechanisms and weak institutional support. Evidence from both low- and high-income settings suggests that training is more effective when embedded within a multifaceted improvement approach that combines education with system change, monitoring, and leadership engagement (39,44,59,73,81). This aligns with the WHO recommendation that IPC training should be continuous, competency-based and supported by feedback and reinforcement mechanisms (3).

Monitoring, audit and feedback also emerged as key facilitators of improved IPC compliance and performance across the studies. Structured observation, audit tools and timely feedback were frequently associated with significant improvements in hand hygiene and reduction in HAIs (23,24,29,39,50,55,57,58,74,76). Similar mechanisms have been widely used in high-income settings, where routine surveillance and monitoring have contributed to sustained improvement in IPC practices (82,83). In some studies included in this review, nurse-led monitoring systems were instrumental in sustaining compliance, highlighting the potential contribution of mid-level leaders in IPC programs (27,76). Monitoring and providing feedback to staff acts not only as a technical activity but also as a behaviour reinforcement mechanism that sustains accountability and culture change. However, in several low-resource healthcare settings, monitoring activities were irregular, lacked standardised tools and were hindered by inadequate staffing or the

absence of dedicated IPC teams (5). Strengthening monitoring systems, therefore, requires institutional commitment, investment in IPC infrastructure and integration of IPC indicators into hospital quality management systems. Continuous feedback mechanisms that are non-punitive and participatory can also promote motivation and compliance amongst HCWs (26,82,84,85).

The WHO recommends the multimodal improvement strategy as a key approach for improving IPC practices in the health facilities(3,12). Consistent with this recommendation, the studies included in this review demonstrate that multimodal approaches are generally effective in improving IPC compliance. Similar findings have been reported elsewhere showing that multimodal infection control interventions were effective in improving adherence to IPC practices and reducing HAIs (86–89). However, implementation across the studies was diverse. Some studies applied all the five WHO-recommended elements while most studies adopted a combination of three or more components tailored to context (18,25,28,29,31,38,41–43). These findings suggest that the effectiveness of IPC interventions is not necessarily dependant on strict adherence to the WHO-defined multimodal structure, but rather the integration of multiple complementary strategies that address behavioural, organisational and resources constraints with healthcare settings.

Evidence from other studies indicate that multimodal strategies are most effective when supported by enabling institutional conditions, including leadership engagement, functional IPC programmes, availability of essential IPC supplies and mechanisms for routine monitoring and feedback (84,87). These factors create an environment that enables HCWs to translate IPC knowledge into practice. Without these supporting structures, training alone is unlikely to produce sustained behaviour change. This supports the broader implementation science perspective that behaviour change in complex healthcare systems requires multifaceted interventions rather than isolated strategies (90,91).

Availability of IPC resources and supplies was another fundamental factor for improving IPC practices in health facilities. Reliable access to ABHR, PPE, sterile equipment, cleaning materials and IPC infrastructure were consistently associated with improved compliance with IPC practices. For example, local production of ABHR in Rwanda, Guinea and Ethiopia (29,32,38) increased availability of ABHR and reduced reliance on external supply chains which led to improved compliance to hand hygiene among the HCWs. Our findings are consistent with a study conducted in Germany that found an association between the availability of ABHR and improved hand hygiene compliance (92). Inadequate IPC resources were reported in several settings, which affected the improvements gained through training or monitoring interventions (18,20,23,24,37,40,58,60,65). Limited and inconsistent financing for IPC activities has been identified as a factor contributing to a shortage of IPC resources. A group of experts has similarly highlighted inadequate IPC funding as a barrier to effective IPC implementation in both low-and high-income settings and recommended dedicated budget allocation to support IPC activities (93). These findings emphasise the importance of allocating sufficient financial resources for IPC programmes and strengthening procurement systems to ensure reliable availability of IPC materials.

Leadership engagement and organisational support were also critical determinants of successful IPC implementation. Facilities with functional IPC committees, visible leadership support , IPC champions and regular supervision were more likely to demonstrate improvements in IPC practices (13,21,31,40,70). Leadership support can influence organisational culture and reinforce adherence to IPC standards. For example, Huis and colleagues in the Netherlands found that role modelling and leadership support increased hand hygiene compliance compared to the control group (94). Although conducted in a high-income setting, the findings highlight the importance of leadership involvement in promoting behaviour change among HCWs.

Across the studies included in this review, leadership and governance challenges were frequently linked to systemic barriers such as limited budgets, inadequate infrastructure, poor attitudes amongst HCWs, inadequate staffing, overcrowding and inconsistent water supply. In several settings, weak leadership structures were further compounded by limited IPC knowledge among managers themselves, resulting in weak accountability mechanisms and inconsistent enforcement of IPC standards. Evidence suggests that inclusion of leadership in IPC training and monitoring of IPC activities strengthens ownership and institutional commitment (3,12,95).

These findings align with the WHO's IPC core components, which emphasise that leadership commitment, adequate human resources and infrastructure are foundational to effective IPC implementation (12,96,97). However, this review also highlights that in many low-resource hospitals, IPC is still perceived as an external or donor driven initiative instead of an integral component of the hospital management (18,23,25,29,30,32,49,50,53,62,98). In contrast, settings where IPC is embedded within the institutional governance structures and budgets—such as private health facilities in South Africa—demonstrated more sustainable IPC implementation (13,27,76). This emphasises the importance of institutionalising IPC within health system governance and financing to ensure long-term sustainability.

Another important finding from this review is the conceptual overlap between the WHO multimodal improvement strategy and the WHO core components of IPC framework. Many studies included in this review implemented what can be described as multifaceted approaches without explicitly framing them within the WHO multimodal strategy. This overlap may contribute to variability in how interventions are designed, described and reported across studies, highlighting the need for a clearer conceptual alignment in future research.

This review contributes to existing knowledge by synthesising evidence on IPC implementation strategies across diverse healthcare settings in sSA and highlighting the contextual factors that influence their effectiveness. While previous literature has demonstrated the effectiveness of

multimodal strategies (87), this review emphasises the importance of enabling institutional conditions, including governance structures, leadership engagement, resource availability and monitoring systems in determining implementation success in low-resource settings.

#### *Implications for policy and practice*

Strengthening IPC in healthcare facilities in sSA requires coordinated action across governance, capacity building and system support. At policy level, ministries of health should integrate IPC within the national health system strategies and ensure dedicated financing for IPC programmes in line with the WHO core components (3,84,99). At facility level, IPC should be institutionalised through functional IPC committees, designated IPC focal persons and routine monitoring systems to support implementation and accountability (3,25). Regular supportive supervision and audit and feedback processes should be conducted in facilities to reinforce adherence to IPC practices amongst HCWs (83,87). Strengthening facility IPC committees and governance structures has been associated with improved IPC programme implementation and monitoring (12,89,100). At ward level, IPC champions and peer learning mechanisms can facilitate translation of guidelines into routine practice and strengthen local ownership of IPC activities, as revealed in a review in Europe (83,100). Finally, sustained improvements require reliable availability of essential IPC supplies and infrastructure, including hand hygiene materials, PPE and environmental cleaning resources.

#### *Areas for future research*

This review found that most interventions combined several strategies such as monitoring, reminders and resource provision but rarely assessed the independent effect of each component. Therefore, future studies should examine the relative contribution of individual components within multifaceted IPC implementation strategies. Understanding which elements are the most influential would help optimise intervention design and guide resource allocation in resource-constrained settings. Although several studies reported short-term improvements in

IPC practices, few evaluated whether these gains were maintained over time or expanded across wards or facilities. Further research should therefore also assess the sustainability and scalability of IPC interventions. In addition, future studies should apply implementation science frameworks to better understand contextual factors influencing the adoption, fidelity and sustainability of IPC interventions.

#### *Study strengths and limitations*

This review provides a comprehensive synthesis of implementation strategies used to improve IPC practices in healthcare facilities across the sSA. By mapping the evidence from multiple countries and healthcare settings, the review identifies the commonly used strategies, implementation approaches and existing gaps in literature. The use of scoping review methodology enabled the inclusion of diverse study designs, providing a broad overview of IPC interventions and implementation strategies in the region.

However, there are some limitations to be noted in this review. First, the review relied on published, which may introduce publication bias and limit inclusion of relevant programme reports or grey literature. Second, consistent with scoping review objectives, the methodological quality of included studies was not formally assessed. Finally, variation in study designs, intervention components and outcome measures limited the ability to directly compare effectiveness across studies. Despite these limitations, the review provides important insights to inform future research, policy and implementation efforts aimed at strengthening IPC in healthcare facilities.

#### **Conclusion**

IPC improvements in sSA are mainly driven by multifaceted, contextually adapted implementation strategies that encompass training, IPC leadership initiatives, quality improvement, monitoring and feedback and reliable availability of IPC resources. While progress

has been made, implementation remains a challenge due to resource constraints, weak governance structures and inconsistent monitoring systems. These findings emphasise the need for multifaceted, contextually tailored interventions that address both structural and behavioural barriers to IPC compliance. Strengthening health facility management and leadership structures, ensuring adequate funding, supporting IPC committees and including monitoring and quality improvement within routine health services are essential for sustaining long-term improvements in IPC practices and reducing HAIs across the region. The findings from this review offer an evidence base from which to inform policy and practice, supporting low-resource countries in improving IPC as a cornerstone for patient safety.

#### **Declarations**

#### ***Ethics approval***

Not applicable

#### ***Consent for publication***

Not applicable

#### ***Availability of data and materials***

Not applicable

#### ***Competing interests***

The authors declare that they have no competing interests

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## **Authors' contributions**

DN: conception and design, acquisition, analysis and interpretation of data, drafting and revision of the manuscript. RM: acquisition and interpretation of data. TOB: revision of the manuscript. NF: revision of the manuscript. TT: critically revised the manuscript for its scientific contents.

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921 **Table 2. Data extraction from the included studies**

|   | Author, year, country             | IPC practice                                      | Implementation strategies                                                                                                                                                                                                                            | Barriers                                                                                                                                                                                                     | Facilitators                                                                                                                                                              | Outcome                                                                                                                                                                                                                                                |
|---|-----------------------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Saito et al 2017(18)<br>Uganda    | Hand hygiene (HH) among healthcare workers (HCWs) | System change (availability of alcohol- based hand rub (ABHR) at point at care); training and refresher sessions on use of ABHR; monitoring of hand hygiene and feedback; daily patient follow-up for HAIs; visual reminders                         | Lack of sinks and scarcity of water; shortage of gloves; overcrowding wards led to lack of supervision; variation in documentation; intern doctors performing caesarean sections; sick leave of senior nurse | Local factory ensured ABHR availability at the hospital; strong buy-in from staff after training; support from external partners; use of senior personnel as HH champions | Overall HH compliance increased from 9% to 56% but remained below 50% in Obstetrics department (44%). Relative risk for HAIs reduced in paediatric and surgical departments from 1.14 to 0.38, but increased in obstetric department from 1.14 to 3.14 |
| 2 | Yaqub et al. 2024 (19)<br>Nigeria | HH among doctors                                  | WHO hand hygiene multimodal; provision of hospital produced ABHR, HH training education; monitoring observations; daily verbal reminders; posters; staff engagement                                                                                  | Low baseline compliance; limited knowledge; renovation of disrupted water supply                                                                                                                             | Leadership support                                                                                                                                                        | HH compliance increased from 17% to 69%; doctors preferred reminders from nurses rather than patients                                                                                                                                                  |
| 3 | Kamanga et al. 2021(20)<br>Malawi | HH practices and facilities in burns unit         | Nurse-led quality improvement (QI) hand hygiene - HH checklist; assessment of HH facilities; HH committee; procurement of ABHR/bucket/soap; weekly hand hygiene monitoring by champions; mentorship from the facility QI team; posters and reminders | Inadequate HH facilities; inadequate resources; delays in procurement of ABHR; overcrowding; myths that gloves replace hand hygiene                                                                          | Strong nurse leadership; reminders during meetings; low-cost solutions (buckets, soap); committee ownership improved sustainability                                       | Availability of HH facilities improved from 37% to 95%; HH compliance increased from 22% to above 80%; nurse-led QI effective in burns unit                                                                                                            |

|   | Author, year, country                   | IPC practice                                          | Implementation strategies                                                                                                                                                                                                                                                                                                                                                                               | Barriers                                                                                                                                                                                                                                                                                                          | Facilitators                                                                                                      | Outcome                                                                                                                                                                                                     |
|---|-----------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | Brink et al. 2020. (13)<br>South Africa | HH compliance;                                        | Multi-faceted, system change (ABHR at point of care); training (HH observers, all staff, staff orientation); monitoring & feedback (real time, weekly dashboards, feedback at handovers, IPC meetings, board meetings); leadership (nursing and management); communication (posters, reminders, role models, campaigns); champions (hospital leaders as champions); action planning (improvement plans) | Time constraints for champions with competing clinical duties; staff turnover outsourced require continuous training; weak commitment and low motivation in some hospitals; communication gaps; observer bias; data inconsistency few/many observations; time of observations nights/weekends; device limitations | Strong nursing leadership; benchmarking across wards and hospitals; social influence; routine awareness campaigns | HH improved 77% July 2016 to 85% in July 2017; 523 422 observations; improvements across cadres/wards; stronger governance; standardised HH monitoring platform; integration of HH in governance structures |
| 5 | Kanagasabai et al. 2021(21)<br>Liberia  | Hand hygiene and broader IPC                          | Water, sanitation, hygiene and waste (WASH) renovations; increased HH stations, mentoring and supply chain improvements                                                                                                                                                                                                                                                                                 | Infrastructure collapse; severe WASH gaps; limited IPC workforce; cost of the intervention                                                                                                                                                                                                                        | Leadership support from Ministry of Health (MoH); alignment with existing standards; the danger of Ebola          | HH improved (Bomi 36% to 89%; St. Timothy 86% to 88%); WASH standards met                                                                                                                                   |
| 6 | Moiwo et al. 2023 (22)<br>Sierra Leone  | Hand hygiene compliance across two tertiary hospitals | HH reminders; improved infrastructure (handwash stations, veronica buckets); ABHR supply; supervision; on-the-job training; standardised observation tool                                                                                                                                                                                                                                               | Poor infrastructure in one hospital; limited running water; reconstruction disruption; inconsistent ABHR in some wards; few reminders in some departments                                                                                                                                                         | None identified                                                                                                   | HH compliance improved in Connaught hospital from 51% to 60% improvements linked to supply and reminders; HH compliance reduced from 40% to 32% in 34MH hospital due to reconstruction                      |

|    | <b>Author, year, country</b>        | <b>IPC practice</b>                            | <b>Implementation strategies</b>                                                                                                                                                                                                                                                         | <b>Barriers</b>                                                                                                                                          | <b>Facilitators</b>                                                                                                                                                                                     | <b>Outcome</b>                                                                                                                                                            |
|----|-------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7  | Lenglet et al. 2019 (23)<br>Nigeria | Hand hygiene adherence to five moments         | ABHR availability at point of care; infrastructure clean water and bed spacing; training of trainers; cascade training; digital observation; dashboards for immediate feedback                                                                                                           | lack of soap and water on the stations; lack of infrastructure and overcrowded wards; lack of knowledge; physicians adherence reduced after intervention | Medecins Sans Frontieres support for training and provision of supplies; staff engagement in feedback loops                                                                                             | HH 32% to 57%; major gains in Anka and Noma hospitals<br>Physicians adherence dropped 34% to 8.6%                                                                         |
| 8  | Kallam et al. 2018 (24)<br>Ghana    | Hand hygiene in neonatal intensive care unit   | Clinical champions; Interactive Systems Framework guided adaptation; adapted hand hygiene training course, visual posters with familiar faces; reminders during meetings; adequate paper towel; sharing implementation progress openly; quality improvement team leadership and coaching | Overcrowding; limited resources; low baseline adherence during the night; high neonatal sepsis burden                                                    | Existing quality improvement infrastructure; trained clinical champions; Interactive Systems Framework provided structure for implementation; strong hospital leadership                                | HH compliance increased from 67% to 92%; HH compliance during night shift HH increased by 36%; this demonstrated effectiveness of combining QI and implementation science |
| 9  | Allegranzi et al. 2010 (25)<br>Mali | Hand hygiene in low-resource referral hospital | WHO multimodal; local ABHR production and placement at point of care; baseline/follow-up audits and performance feedback; educating staff; knowledge/perception surveys; reminders; leadership engagement                                                                                | Inadequate sinks, soap and towels; no existing IPC expertise; lack of ABHR                                                                               | Feasible and affordable locally produced ABHR; high staff appreciation of the performance each component of the intervention of locally produced ABHR; strong WHO support and national level engagement | HH 8% to 21.8%; 93% of HH actions were done with ABHR not water and soap; improved knowledge and perceptions;                                                             |
| 10 | Müller et al. 2021 (26)<br>Guinea   | Hand hygiene practice with local ABHR use      | WHO multimodal; Participatory co-design with hospital staff; baseline to intervention to two follow-ups; ABHR production and quality control; surveys; interviews/focus group discussions; direct HH observations using WHO tool; regular feedback loops; designated HH coordinator      | Concern about overuse of ABHR by HCWs; understaffing; high workload; water constraints; inconsistent ABHR ingredients supply; later compliance decline   | Positive perception of locally produced ABHR; staff appreciation of the intervention; improved ABHR access at point of care; leadership engagement; tailored training based on needs                    | HH compliance improved 45.1%; knowledge improved; low ABHR consumption at 36% of estimated need;                                                                          |

|    | <b>Author, year, country</b>           | <b>IPC practice</b>                      | <b>Implementation strategies</b>                                                                                                                                                                                              | <b>Barriers</b>                                                                                                                                                                     | <b>Facilitators</b>                                                                                                                                    | <b>Outcome</b>                                                                                                                                                                           |
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| 11 | Patel et al. 2016 (27)<br>South Africa | Hospital-wide hand hygiene compliance    | Multifaceted HH programme; Needs assessment; weekly presentations, training sessions for all cadres; reminders; dedicated HH champions per ward; leadership support; independent IPC teams conducted audits and gave feedback | High workload; skin irritation from ABHR; accessibility issues; behavioural resistance and forgetfulness                                                                            | Strong leadership and management support; champions driving accountability; regular feedback using graphs                                              | HH compliance improved—Before contact from 34% to 76%; after contact from 47% to 82%; created cultural change; improved compliance across all wards                                      |
| 12 | Ndegwa et al. 2019 (28)<br>Kenya       | Hand hygiene using locally produced ABHR | WHO hand hygiene toolkit training; ABHR quality control; point-of-care ABHR placement; continuous medical training; HH audits and feedback; focus group discussions                                                           | HCWs disliked the smell/feel of local ABHR; sporadic availability ABHR, leaky pumps, rusty padlocks used to secure the bottles, inconsistent refilling; high workload in some wards | Bedside availability improved access and acted as reminder; portability of pocket size bottles                                                         | Overall HH compliance improved from 28% to 38%.                                                                                                                                          |
| 13 | Muller et al. 2020 (29)<br>Guinea      | Hand hygiene with ABHR production        | WHO multimodal strategy; Participatory approach; ownership through HH committee; training for healthcare workers; audits and feedback; ABHR consumption monitoring; surveys; observations of the five moments of HH           | Lack of sustainable ABHR production (lack of test strips); water shortages; staff shortages; infrastructure gaps                                                                    | Local ABHR improved independence; involvement of pharmacy staff; feasibility of implementation; high staff engagement; external technical partnerships | Knowledge on HH improved from 13/25 to 19/25; compliance to hand hygiene 24% to 72%; HH compliance was highest in before aseptic procedures; there was ten times increase in use of ABHR |

|    | <b>Author, year, country</b>             | <b>IPC practice</b>                                                  | <b>Implementation strategies</b>                                                                                                                                                                                                                                 | <b>Barriers</b>                                                                                                                                 | <b>Facilitators</b>                                                                                                        | <b>Outcome</b>                                                                                                                                                                                             |
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| 14 | Gobte et al. 2024 (30)<br>Cameroon       | Hand hygiene using wall-mounted ABHR                                 | Train-the-trainer; onsite HH workshops and demonstration; wall mounted ABHR dispensers; HH champions per ward; monitoring and feedback; daily meetings for data discussion; supportive supervision; hand hygiene using the WHO tool                              | Lack of surveillance systems; understaffing; inconsistent AHBR refills; empty pocket bottles; high patient load in maternity and surgical wards | WHO and Infection Control Africa Network support; staff willingness to participate                                         | HH 33.3% to 83.1% to 87.2%; ABHR consumption increased 1,242ml to 5,670ml to 7,740ml; sustained improvement                                                                                                |
| 15 | Fofanah et al. 2024(31)<br>Sierra Leone  | ABHR tolerability, acceptability, Hand hygiene behaviour among staff | WHO standardised protocol; provision of unlabelled 500ml ABHR bottles; tolerability reporting tools; objective skin integrity assessments; ABHR consumption tracking; 3 follow-ups (day 1, day 3-5, day 30)                                                      | Skin dryness remained a concern; variation across cadres; limited water supply                                                                  | Strong national ABHR production program                                                                                    | ABHR was well tolerated in 97% of the participants; acceptability of ABHR by participants varied according to criteria (smell 88%, colour 95%, dryness 52%; daily average use of ABHR was 71.6ml. 76ml/day |
| 16 | Gebremicael et al. 2024 (32)<br>Ethiopia | Hand hygiene compliance among HCWs                                   | Adapted WHO multimodal strategy; Baseline HH infrastructure survey; training 5-day workshop; strategic placement of ABHR at every bed; WHO observations; IPC committee leadership; motivational activities and refresher sessions; follow-up audits and feedback | Non-functioning dispensers; water shortage; limited HH infrastructure; supply chain issues with imported sanitizers;                            | In-house ABHR reducing cost; leadership support and external partnerships; strong staff engagement; multidisciplinary team | HH compliance improved from 5% to 37% to 56%; all indications improved; nurses & interns had highest gains; microbiology confirmed improvement                                                             |

|    | <b>Author, year, country</b>         | <b>IPC practice</b>                      | <b>Implementation strategies</b>                                                                                                                                                                                                                            | <b>Barriers</b>                                                                                                                                           | <b>Facilitators</b>                                                                                                                                                               | <b>Outcome</b>                                                                                                                                                                   |
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| 17 | Schmitz et al. 2014 (33)<br>Ethiopia | Hand hygiene adherence                   | Adapted WHO multimodal strategy; baseline assessment; intensive HH training sessions; personal sanitizer bottles to HCWs; weekly HH observations by trained champions; leadership involvement; monitoring                                                   | Inadequate sinks and lack of soap; poor WHO sanitizer tolerability smell; low compliance among physicians; high workload                                  | Commercial ABHR improved acceptance; hospital leadership support; continuous feedback and role modelling; posters increased visibility of guidelines                              | HH compliance improved from 2% to 13%; improvement across cadres except physicians; 71% of the HCWs preferred commercial ABHR                                                    |
| 18 | Samuel et al. 2005 (34)<br>Eritrea   | Routine handwashing practices among HCWs | In-service training; weekly follow-up visits; feedback discussions; promotion of motivation and rewards; facilitative supervision and coaching; IPC committee; direct observations; educational and training sessions; portable water, hand towels and soap | Lack adequate and poorly located sinks; poor attitudes among doctors; lack of clear HH standards; limited hand washing supplies at baseline; lack of time | High staff interest in training; existing national quality assurance culture; motivated nurses and assistants; leadership support for quality improvement                         | Improved HH compliance after training; improved patient satisfaction; demonstrated feasibility of national IP standards                                                          |
| 19 | Uneke et al. 2014 (35)<br>Nigeria    | Hand hygiene compliance                  | Knowledge attitude and practice survey; multiple HH WHO training; focus group discussions to identify barriers; reminders; placement of ABHR bottles at the point of care and provision of 250ml bottles; trained observers                                 | Lack of previous structured HH training; low compliance among doctors; perceptions HH is time-consuming; attitude issues before the intervention          | WHO tools adapted to local context; strong engagement of nurses, head of nursing coordinated distribution of hand rub; leadership support and stakeholder involvement in meetings | Overall HH compliance improved post intervention 65% (nurses 73%, doctors 60%) highest improvement was after body fluid exposure (75%); ABHR was used in 67.5% of the HH actions |

|    | <b>Author, year, country</b>          | <b>IPC practice</b>                                              | <b>Implementation strategies</b>                                                                                                                                                                                                                                                    | <b>Barriers</b>                                                                                                                                       | <b>Facilitators</b>                                                                                                                                 | <b>Outcome</b>                                                                                                                                                                   |
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| 20 | Pfafflin et al. 2017 (36)<br>Ethiopia | Hand hygiene compliance in maternal, neonatal & paediatric wards | WHO multimodal; 4-day workshop, training sessions provision of local ABHR; baseline assessment; surveys; unannounced hand hygiene observations; feedback to staff and leadership; award for best performing ward; local transfer of ownership to hospital management                | Baseline HH compliance 1.4%; lack of sinks and running water; limited staff rotation and training coverage; heavy workload; inconsistent glove misuse | Strong staff engagement after training; leadership involvement; continuous monitoring to support improvement                                        | HH compliance increased from 1% to 12% then to 13%; ABHR use post-intervention was 98%                                                                                           |
| 21 | Feyissa et al. 2014 (37)<br>Ethiopia  | Hand hygiene using Joanna Briggs Institute best practice audit   | Observation audits; Joanna Briggs Institute audit criteria; education sessions; reminders; public posting of poor results; role modelling by senior clinicians; interprofessional project team; feedback to teams; stakeholder engagement                                           | Inadequate availability of soap/water; low staff motivation; no regular audits culture; misperception and negligence                                  | Strong leadership and stakeholder engagement; positive staff attitudes after exposure to evidence                                                   | Overall HH compliance improvement 80% across all HH criteria; increased awareness and behavioural change                                                                         |
| 22 | Budd et al. 2016 (38)<br>Rwanda       | Hand hygiene compliance in limited water settings                | Multidisciplinary team; ABHR efficacy/quality control tests; cost analysis; all staff training; visual reminders; strengthened supply chain through pharmacy; local production of 100 litres of ABHR; hospital-wide rollout; routine audits and feedback; performance data meetings | Intermittent water supply; only 10 wash stations in the hospital                                                                                      | Strong multidisciplinary team leadership; internal HH champions; use of local language enhanced understanding; verbal reminders for students        | HH compliance increased from 59% to 67%; ABHR use increased from 46% to 58%; 71% cost savings; institutionalised supply chain; national interest in scale up of the intervention |
| 23 | Kasujja et al. 2024 (39)<br>Uganda    | Hand hygiene compliance                                          | WHO multimodal HH- establishment of IPC committees; customised monitoring tools; continuous quality improvement (CQI) plan development (stakeholder mapping, strength weakness opportunity and threats, ranking                                                                     | Inadequate supplies; variation in resources; high workload                                                                                            | Strong MoH support; training and education; availability of WHO Infection Prevention and Control Assessment Framework, Hand Hygiene Self-Assessment | HH compliance increased from 20% to 54%; HCWs HH knowledge improved from 45% to 76%;                                                                                             |

|    | Author, year, country             | IPC practice                                                      | Implementation strategies                                                                                                                                                                                                                                                                               | Barriers                                                                                                                                                                                  | Facilitators                                                                                                                  | Outcome                                                                                                                                             |
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|    |                                   |                                                                   | interventions); monthly mentorship and supportive supervision; information education and communication materials; HCW training/continuous professional development                                                                                                                                      |                                                                                                                                                                                           | Framework tools; motivated facility teams                                                                                     | IPCAF scores improved from 547 to 635; HHSF scores from 252 to 350                                                                                  |
| 24 | Berman et al. 2021 (40) Ethiopia  | Hand hygiene, workflow safety, environmental hygiene in burn unit | Systems Engineering Initiative for Patient Safety analysis; direct observation of workflow and HH actions; co-design of HH stations; training and sensitisation sessions; removal of hazards; multidisciplinary team meetings; iterative tests of change and improvement cycles poster and TV messaging | Shortage of water, soap, alcohol-based hand rub; poor usage of HH station; materials locked away in nurses' station; low awareness of HH opportunities among staff; high patient workload | Strong nurse leadership; engaged burn unit team; communication between HCWs about patient safety                              | Significant HH compliance improvement from 9% to 72%; more efficient workflow; reduced hazards                                                      |
| 25 | Mvukiyehe et al. 2023 (41) Rwanda | Hand hygiene compliance in Intensive Care Unit (ICU)              | WHO multimodal; training workshops for nurses and doctors; observations of WHO 5 moments; placement of ABHR at all ICU points; IPC mentorship; monthly HH audits and feedback; reminders                                                                                                                | Very low baseline HH compliance; overcrowding; shortage of staff and heavy workload for nurses                                                                                            | Motivated ICU leadership; support from national IPC programme; availability of paper towels and ABHR; engagement of ICU staff | Hand hygiene compliance 25% to 75%; availability of ABHR improved from 76% to 99%                                                                   |
| 26 | Holmen et al. 2016 (42) Rwanda    | Hand hygiene compliance (physicians and nurses)                   | WHO multimodal 2.5 to 3.5 hours training sessions in local language; reminders in clinical areas; ABHR distribution; pharmacy supported ABHR production; surveys; HH observations; monitoring and feedback                                                                                              | Inadequate sinks; overcrowding and high workload in wards; poor glove disposal; lack of knowledge;                                                                                        | Hospital leadership commitment; ABHR pocket bottles increased access; strong staff engagement                                 | HH compliance improved from 34% to 69%; knowledge of correct HH practice increased from 41% to 78%; 100% ABHR use; physicians used more than nurses |
| 27 | Holmen et al. 2017 (43) Rwanda    | Sustainability of hand hygiene improvement                        | Follow-up hand hygiene observations; knowledge/perception surveys; re-engagement of staff; use of locally produced ABHR; multi-year sustainability assessment                                                                                                                                           | HH declines post-project (69% to 37%); ongoing gaps in infrastructure; high staff turnover;                                                                                               | Sustained knowledge gains; emerging patient safety culture                                                                    | HH compliance dropped from 69% in 2015 to 37 % in 2016;                                                                                             |

|    | Author, year, country                      | IPC practice                                                           | Implementation strategies                                                                                                                                                                                                                                                   | Barriers                                                                                                                                                                                       | Facilitators                                                               | Outcome                                                                                                                           |
|----|--------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|    |                                            |                                                                        |                                                                                                                                                                                                                                                                             | competing clinical demands                                                                                                                                                                     |                                                                            |                                                                                                                                   |
| 28 | Kibira et al. 2022 (44)<br>Kenya           | Hand hygiene compliance to five moments                                | Continuous quality improvement; root cause analysis and driver diagrams; 6-day IPC training; ABHR procurement and placement; mentorship and monthly feedback meetings; strengthening IPC committees; audits using WHO HH observation tool; sharing of data across hospitals | Few sinks; intermittent water; poor baseline knowledge; inadequate ABHR, soap supplies; absent IPC committees; proper HH practice been replaced by use of gloves                               | Multidisciplinary IPC committees; facility and MoH leadership support      | HH compliance improved from 27% to 44%; HH compliance before aseptic procedure remained low 14% baseline to 19% post intervention |
| 29 | Muhammed et al. 2025 (45)<br>Sudan         | Surgical hand scrub compliance for SSI prevention                      | Two-cycle audit with educational intervention and re-audit structured audit checklist; team training (video demonstrations, hands on); direct observation; real-time feedback to staff; comparison of the two cycles                                                        | Time constraints; lack of training; staff turnover; inconsistent technique; limited resources                                                                                                  | Surgical team engagement; video-based learning                             | Surgical hand scrub compliance improved from 63% to 94%;                                                                          |
| 30 | Brisibe et al. 2015 (46)<br>Nigeria        | Surgical site prevention (SSI) prevention during c-section             | Hospital IPC policy (sterile consumables, antiseptics, dressing packs); instructional policy implementation; training for staff; system change (supply of IPC resources, strengthening departmental accountability)                                                         | Lack of surveillance system; discontinued training program; resource constraints; high baseline SSI rates                                                                                      | Strong managerial support: revolving fund ensured availability of supplies | SSI rates reduced from 13% to 10%                                                                                                 |
| 31 | Ademuyiwa et al 2021 (47)<br>Multi-country | SSI prevention in abdominal surgery (skin preparation and suture type) | Chlorhexidine 2% vs iodine 10%; triclosan sutures vs non-coated sutures; standardised surgical safety checklist implementation; central and local procurement; training for use of (video, picture card, in-person demos)                                                   | High baseline overall SSI rates (22%); resource constraints in low- and middle- income countries hospitals; variation in perioperative practices; emergency surgeries; rural surgical capacity | Strong multi-country collaboration                                         | No difference in SSI rates in both types of skin preparation and sutures                                                          |

|    | <b>Author, year, country</b>                                                         | <b>IPC practice</b>                  | <b>Implementation strategies</b>                                                                                                                                                                                     | <b>Barriers</b>                                                                                                                                                                                | <b>Facilitators</b>                                                                                                                                    | <b>Outcome</b>                                                                                                                    |
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| 32 | NIHR CHEETAH trial 2022 (48)<br>multi-country                                        | Preventing SSIs at abdominal closure | Changing glove and instruments during skin closure; standardised training; use of trail stickers as prompts and reminders; monitoring and feedback; strategies for bias and non-compliance; use of local resources   | Variation in resources; non-masking of surgeons to the intervention; low recruitment numbers; imbalances in surgical emergencies and contamination                                             | Feasibility across diverse hospitals; surgeon engagement                                                                                               | Change of instruments and gloves reduced SSI by 13%                                                                               |
| 33 | Allegranzi et al 2018 (49)<br>Multi country (Kenya, Uganda, Zambia, Zimbabwe)        | Surgical site infection prevention   | WHO multimodal perioperative bundle; training on perioperative standards; surgical safety checklist reinforcement; antibiotic timing; sterility and aseptic technique strengthening; leadership engagement           | Resource gaps; variable infrastructure and performance between hospitals; low baseline compliance                                                                                              | WHO technical support; local leadership support; teamwork; pre-existing standardized data collection tools                                             | SSI rates reduced 8% to 3%; sustained improvements                                                                                |
| 34 | Nofal et al 2025 (50)<br>Multi country (Liberia, Madagascar, Malawi, India, Bolivia) | Surgical site infection prevention   | Scaleup of Clean-Cut multimodal quality improvement programme; peer to peer mentorship by Ethiopian expert; local team capacity building; standardised observation tools                                             | Resource variability between hospitals; need for experienced trainers; infrastructure limitations in some hospitals                                                                            | Mentoring from the Ethiopian hub; standardized Clean-Cut manual and training materials; strong hospital leadership buy in; adaptation to local context | SSI rates decreased from 28% to 12%; improved compliance across all areas; demonstrated global scalability of Clean-Cut programme |
| 35 | Fast et al. 2018 (51)<br>Benin                                                       | Instrument sterile processing        | 2-week course; hands-on demonstration of sterile processing workflow; follow up weekly (one day/week) mentoring for 2 months; hospital sterile processing assessment tool; knowledge tests pre and 4-month post-test | Workers not trained in sterile processing; unsafe sterile processing practices (storage, wrong use of bleach, no inspection); inadequate equipment; reliance on outdated sterilisation methods | Strong collaboration with MoH; participants gained pride and increased professional identity; recognition of safety                                    | improved knowledge on sterile processing average scores 57% to 71%; reduced unsafe bleach use                                     |
| 36 | Ernest et al. 2021 (52)<br>Tanzania                                                  | SSI prevention in C-section patients | Interdisciplinary team training for 5 days; simulation training on surgical safety checklist; quarterly mentorship visits; documentation                                                                             | Low surgical safety checklist uses during baseline (4%); poor team                                                                                                                             | Team based approach; infection prevention bundle integration                                                                                           | Surgical safety checklist use increased from 4% to                                                                                |

|    | Author, year, country               | IPC practice                                                          | Implementation strategies                                                                                                                                                                                                                                                                                                                                | Barriers                                                                                                                                                                     | Facilitators                                                                                                                                                                                                             | Outcome                                                                                                                                                                                                      |
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|    |                                     |                                                                       | improvement; file reviews; coaching on clinical decision making                                                                                                                                                                                                                                                                                          | communication; inconsistent use of best practices; record keeping variation                                                                                                  | into routine practice; facility and regional leadership buy-in                                                                                                                                                           | 95%; SSI rates dropped from 14% to 1%; perioperative mortality dropped by 39%                                                                                                                                |
| 37 | Starr et al. 2024 (53) Ethiopia     | National-scale perioperative IPC (Clean Cut)                          | Clean Cut national implementation in 16 hospitals; pre-implementation baseline assessments; QI coaching for facility teams; surgical safety checklist adaptation workshops; process mapping; monthly mentorship; data feedback dashboards; continuous training and onsite action plans                                                                   | Variation in hospital infrastructure; training gaps in some hospitals; high staff turnover; delays in supply chain                                                           | Strong MoH support; presence of multidisciplinary teams; robust data tools; LIFE box support and global quality improvement expertise                                                                                    | Improved - Surgical safety checklist 16% to 43%; surgical hand scrub and skin antisepsis 46% to 66%; timely antibiotic administration 17% to 39%; surgical instrument 10% to 39%; linen sterility 13% to 36% |
| 38 | Forrester et al. 2020 (54) Ethiopia | Six perioperative IPC standards (Clean Cut surgical safety checklist) | Clean Cut multimodal programme in 5 hospitals; multidisciplinary team formation; modification of surgical safety checklist; continuous data collection; monthly team meetings; process mapping to identify breaks in practice; locally driven improvement plans; 30-day patient follow-up; SSI monitoring; onsite training for data collectors and staff | Low baseline compliance; infrastructure gaps (equipment, drapes, sterilization); poor management process; gaps in knowledge; high surgical workload and inadequate resources | Strong multidisciplinary leadership; surgical safety checklist as a communication tool; local solutions; repeated feedback loops; resident surgeon driving implementation; stakeholders meeting with visual process maps | Compliance improved from a mean 2.9 to 4.5 out of six critical standards; SSI rates reduced from 7.4% to 5.8%                                                                                                |
| 39 | Forrester et al. 2018 (55) Ethiopia | Clean Cut (six components)                                            | Mapping of all perioperative steps by both; team building and stakeholders meeting; baseline assessment of compliance; surgical safety checklist; locally led feedback and implementation                                                                                                                                                                | Lack of resources; lack of training; shortage of staff                                                                                                                       | Engaged surgical and theatre teams; clear mapping outputs revealed easy solutions; organizational workflow adjustments; integration of surgical safety checklist improved communication                                  | Surgical hand scrub compliance improved from 24% to 68%; sterile items indicators improved from 4% to 87%;                                                                                                   |

|    | <b>Author, year, country</b>              | <b>IPC practice</b>                                                                       | <b>Implementation strategies</b>                                                                                                                                                                                                                                                                | <b>Barriers</b>                                                                                                                                                                 | <b>Facilitators</b>                                                                                                                                           | <b>Outcome</b>                                                                                                                                                   |
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| 40 | Mammo et al. 2024 (56)<br>Ethiopia        | Six perioperative Clean-Cut standards in Caesarean section                                | Clean-Cut multidisciplinary teams' creation; setting up surveillance & data systems; surgical safety checklist modification and process mapping; action plans; targeted training; refresher workshops; continuous monitoring                                                                    | High baseline SSI rates (11%–14%); variation in infrastructure and team capacity; competing clinical demands; burden of data collection; pausing implementation during training | Endorsement from national level; Lifebox expertise in quality improvement; validated evidence based Clean Cut tool; detailed surveillance for problem-solving | No significant overall SSI reduction: perioperative standards improved; high compliance linked to 68% lower maternal mortality and 36% lower perinatal mortality |
| 41 | Dramowski et al 2021 (57)<br>South Africa | Environmental cleaning in neonatal ICU                                                    | Neo-CLEAN multimodal package; training and education for nurses and mothers; reminders and visual prompts; monitoring and audits using UV lights; placement of wipes; feedback loops (pasted and verbal); task shifting (mothers cleaning baby's zone)                                          | Overcrowding; shortage of staff; frequent reuse and sharing of equipment; stock outs of disinfectant wipes; high turnover and need for repeated reminders                       | Strong buy-in from nurses and mothers; visual checklists improved recall; UV audits created awareness of missed areas;                                        | Cleaning of UV marked places increased from 23% to 74%; neonatal bloodstream infections decreased from 6.7 to 3.9/1000 patient days                              |
| 42 | Gon et al. 2021 (58)<br>Tanzania          | Environmental hygiene (surface cleaning, linen management, training)                      | TEACH CLEAN bundle - needs assessment; adaptation workshops; participatory training methods for low literacy staff; 7-module curriculum; champion led supervision of cleaners; weekly swabs for microbiological cleanliness; gel dot tests for cleaning action; qualitative fidelity assessment | Insufficient cleaning supplies; limited training opportunities; lack of supportive supervision; high patient load against the available cleaning staff                          | High acceptability of the TEACH CLEAN; feasible adaptation to local context                                                                                   | Microbiological cleanliness improved from 19% to 41%                                                                                                             |
| 43 | Maina et al. 2025 (59)<br>Kenya           | Environmental cleaning; waste management; HH among mothers & HCWs; equipment reprocessing | Use of ward assistants for routine IPC tasks; structured and unstructured observations; sensitization for mothers on hand hygiene; delegated cleaning/waste tasks to trained assistants; continuous supervision by clinical teams; mixed methods facility assessments                           | Inconsistent HH compliance among HCWs; high workload; insufficient cleaning supplies; poor infrastructure; equipment maintenance challenges                                     | Strong stakeholder engagement (mothers and nurses)                                                                                                            | There were cleaner wards; improved maternal HH practices; persistent gaps in HCW HH compliance and equipment processing                                          |

|    | <b>Author, year, country</b>                                                | <b>IPC practice</b>                                                  | <b>Implementation strategies</b>                                                                                                                                                                                                                                                             | <b>Barriers</b>                                                                                                         | <b>Facilitators</b>                                                                                                                                           | <b>Outcome</b>                                                                                                                                                        |
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| 44 | Rondinelli et al 2020 (60)<br>Sierra Leone                                  | Environmental cleanliness, waste disposal, PPE use                   | Rapid Improvement Model QI collaborative in 8 facilities; weekly coaching visits; monthly learning sessions; 37 item IPC performance checklist; collaborative goal setting; best-practice sharing; QI team training; continuous monitoring and coaching                                      | Weak baseline IPC practices; limited PPE/supplies; staff shortages; lack of routine monitoring before intervention      | Strong national IPC programme; donor support; use of simple measurable standards                                                                              | Overall IPC compliance improved from 67% to 96%; PPE compliance from 85% to 89%; waste disposal compliance from 63% to 99%; environmental cleanliness from 51% to 99% |
| 45 | King et al. 2021 (61)<br>Tanzania                                           | general IPC compliance                                               | Safe Care quality improvement package - two training sessions; monthly audits and feedback; mentorship visits; standardised observation tool; surveys; standardised patients undercover                                                                                                      | Insufficient intervention intensity; resources constraints for quality improvement; inadequate finances to drive change | None identified                                                                                                                                               | No improvement 57% vs 55%                                                                                                                                             |
| 46 | Oji et al. 2018 (62)<br>Liberia                                             | IPC (safe care standards), hand hygiene, waste management, isolation | Mentorship; IPC training; coaching; supportive visits; safe care standards monitoring; supply chain management from monthly to quarterly                                                                                                                                                     | Remote poorly accessible during rains; poor infrastructure; staff shortages; limited supplies                           | Full HCW participation, all trained; WHO/MoH support; high motivation due to fear of Ebola outbreak                                                           | Safe care standards compliance improved from 75% to 90%; waste management and isolation improved 60% to 87%                                                           |
| 47 | Farotimi et al. 2018 (63)<br>Nigeria                                        | Standard precautions among nurses                                    | Structured IPC training; pretest-post-test design; training with lecture/demonstration; attitude/practice questionnaire; observation checklist for actual practice; PRECEDE framework                                                                                                        | Lack of prior training; poor attitudes; high sharp injuries; behavioural risks; resource constraints                    | Reinforcement by IPC nurses                                                                                                                                   | Positive attitude 69%; practice improved from 41% to 52%; there was alignment between reported and observed practices                                                 |
| 48 | Kassa et al. 2025 (64)<br>Multi country (Ethiopia, Kenya, Tanzania, Uganda) | IPC standards, PPE compliance, IPC focal-point competencies          | Regional IPC learning network; IPC compliance assessment using Center for Diseases Control and Prevention-adapted tool; competency self-assessments for IPC focal points; virtual session and onsite supervision; MoH supported mentorship; use of structured workplans and resource sharing | Low initial IPC compliance; gaps in HCW training, screening and triage; supply chain issues in some facilities          | Strong MoH and Center for Diseases Control and Prevention technical support; rapid sharing of tools and resources via learning network; facility level buy-in | Hospital IPC compliance improved with percentage points Ethiopia 27, Tanzania 27, Kenya 32, Uganda 22; focal-point competence 4.5/5;                                  |

|    | Author, year, country                | IPC practice                                                                                             | Implementation strategies                                                                                                                                                                                                                                         | Barriers                                                                                                                                                          | Facilitators                                                                                                                             | Outcome                                                                                                                                                                                    |
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|    |                                      |                                                                                                          |                                                                                                                                                                                                                                                                   |                                                                                                                                                                   |                                                                                                                                          | PPE compliance 65% to 92%                                                                                                                                                                  |
| 49 | Gwaikolo et al. 2024 (65)<br>Uganda  | Availability of WHO IPC core components at facility level                                                | Use of modified WHO IPC tool; repeated supportive supervision visits; mentorship and coaching; feedback to facility leaders; facility action plans based on gaps; follow up assessments                                                                           | PPE shortages: score drops in some centres; inconsistent availability of trained IPC staff; resource constraints across districts                                 | WHO/MoH collaboration; regular assessments; multidisciplinary teams; district resource mobilisation                                      | Overall IPC score increased from 65% to 75%; shows that supportive supervision is an effective quality improvement strategy                                                                |
| 50 | Lemm et al. 2025 (66)<br>Ethiopia    | Reduction of neonatal healthcare associated bloodstream infections (BSI) in neonatal intensive care unit | 6-month multimodal IPC intervention - IPC focal person; strengthened ABHR supply; 2 weekly virtual feedback; neonatal intensive care unit staff capacity building; data-driven corrective actions                                                                 | High baseline BSI burden; high-risk low birth weight infants; limited IPC expertise at baseline                                                                   | None identified                                                                                                                          | Healthcare associated BSI reduced from 333/1000 admissions to 74/1000 admissions then increased to 96/1000 admissions; 80% mortality reduction; each extra hospital day increased BSI risk |
| 51 | Okomo et al. 2024 (67)<br>The Gambia | Environmental cleaning and hospital hygiene in neonatal and labour wards                                 | Train the trainer model; adapted TEACH CLEAN training for neonatal units' supportive supervision and feedback; local needs assessment; contextualised standard operating procedures and frequency guides; pictorial guides; continuous observation and monitoring | COVID-19 disruption; understaffing; water interruptions; material shortages; overcrowding; equipment movement affecting cleaning; limited literacy among cleaners | Experienced training partners; pictorial, literacy sensitive materials; senior staff engagement; structured, WHO-backed training package | No microbiological improvement; minor behaviour gains; key standards (fresh cloths, one-swipe method) not sustained                                                                        |

|    | <b>Author, year, country</b>                            | <b>IPC practice</b>                                                                                             | <b>Implementation strategies</b>                                                                                                                                                                                                                                                                                                 | <b>Barriers</b>                                                                                                                                            | <b>Facilitators</b>                                                                                                                | <b>Outcome</b>                                                                                                                                                                       |
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| 52 | Dramowski et al. 2024 (68)<br>South Africa              | Neonatal short peripheral catheter insertion and maintenance                                                    | Neonatal short peripheral catheter care bundle (HH, skin antisepsis, nurse assistance, intravenous carts, securement dressings); staff training and live demos; standard operating procedures on carts; research nurse monitoring compliance; daily short peripheral catheter review                                             | Overcrowding; limited securement dressings; staffing constraints for assistant role; high baseline unplanned removals due to infiltration and dislodgement | Engagement of nursing staff                                                                                                        | No improvement in catheter dwell time; 80% unplanned removal of catheters persisted; 44% full bundle compliance; no phlebitis detected                                               |
| 53 | Mwananyanda et al. 2019 (69)<br>Zambia                  | Neonatal bloodstream infections/sepsis prevention (hand hygiene; Chlorhexidine bathing; environmental cleaning) | Multifaceted neonatal intensive care unit IPC - bundle two and half raining sessions for all staff; WHO five moments posters; daily ABHR dispenser checks and refills; Chlorhexidine protocols/daily baths; text message reminders on PPE, hand hygiene and catheter care; enhanced cleaning; prospective monitoring of outcomes | Overcrowding 60 cots against 75 neonates; short of staff; high baseline sepsis; inadequate study staff led to missed hand hygiene observations             | Pharmacy support for ABHR production; strong leadership support; clear cleaning and Chlorhexidine bathing protocols                | Mortality reduced from 24% to 18%                                                                                                                                                    |
| 54 | Ephraim et al. 2018 (70)<br>Liberia                     | Comprehensive IPC during Ebola outbreak (isolation, waste management, staffing)                                 | Four rounds supportive supervision WHO IPC consultants and county health teams; minimum standards tool; onsite coaching and problem solving; supply reinforcement (PPE, chlorine, bins); facility walkthroughs; immediate mentoring; feedback session and action plans                                                           | Baseline weak IPC systems; fear of Ebola among staff; infrastructure gaps; low baseline IPC scores; poor isolation facilities                              | WHO and MoH leadership support; pre-positioning of IPC supplies; nationwide training; multidisciplinary teams; regular supervision | IPC administration 62% to 88%; staffing and training 81% to 96%; supply and equipment 91% to 98%; screening and triage 69% to 89%; waste management 66% to 96%; isolation 26% to 67% |
| 55 | Kabego et al. 2023 (71)<br>Democratic Republic of Congo | Facility-level IPC performance during Ebola outbreak                                                            | Multimodal IPC package - training (Ebola viral disease, basics); IPC ring strategy; weekly assessments; performance contracts and financial incentives; supportive supervision by mentors; strengthening IPC supply chain                                                                                                        | Pre-existing weak IPC systems; IPC supply shortages; capacity differences between public and private facilities                                            | Strong leadership and mentorship; availability of IPC kits                                                                         | Median IPC score improved from 44% to 79% in 8 weeks; performance correlated with training coverage                                                                                  |

|    | Author, year, country                     | IPC practice                                                                             | Implementation strategies                                                                                                                                                                                                                                                                                                                              | Barriers                                                                                                                                                                                                         | Facilitators                                                  | Outcome                                                                                                                                                              |
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| 56 | Lee et al. 2023 (72)<br>Nigeria           | Facility-wide IPC readiness during COVID-19 in HIV service delivery settings             | Multimodal COVID-19 IPC improvement programme baseline and follow up needs assessments; quality improvement approach; monitoring checklists; inventory tools; engagement with IPC focal persons                                                                                                                                                        | Leadership engagement declined over time due to routine military rotation; reduced training retention at follow-up; gaps in waste management; varied capacity across facilities                                  | Military structure supported rapid roll-out                   | Small infrastructure improvements; declines in program structure/training; PPE availability improved from 80% to 89%                                                 |
| 57 | Woldeamanuel et al. 2024 (73)<br>Ethiopia | COVID-19 IPC (masking, screening and isolation, environment cleaning, IPC communication) | Safety Officer programme 4 days train the trainer for all staff; training for all staff; safety officers in all wards to enforce IPC adherence; coaching and mentorship during the training; RE-AIM evaluation framework; direct observation of IPC practices among all staff                                                                          | High workload; limited IPC committees in some facilities; PPE shortages; fear of the pandemic among staff                                                                                                        | Ministry and partner support                                  | 95% of clinical staff adhered to wearing masks; better cleaning adherence; all cadres trained; improved IPC culture                                                  |
| 58 | Tillekeratne et al. 2014 (74)<br>Kenya    | Catheter-associated urinary tract infection prevention                                   | Low-cost multifaceted catheter-associated urinary tract infection reduction; one-hour didactic sessions; videos and case-based learning; reminder posters above beds; IPC rounds evaluating catheter need; modified catheter-associated urinary tract infection definition; active surveillance of symptoms; daily monitoring of catheterized patients | High baseline catheter-associated urinary tract infection rates; lack of urine culture access; understaffing                                                                                                     | Matrons' involvement; strong engagement from interns & nurses | Catheter-associated urinary tract infections reduced from 30.4/1000 catheter-days to 0; catheter utilization 0.14 to 0.09; reduced inappropriate catheter use        |
| 59 | Legenza et al.(75) 2022<br>South Africa   | Clostridioides difficile management (diagnosis, treatment and IPC precautions)           | Clostridioides difficile diarrhoea alert checklist sticker placed in patient charts; Consolidated Framework Implementation Research guided champions; bespoke training sessions; research - practice partnerships with academic institutions; frameworks to document implementation modification; stakeholder engagement                               | Differences in facility readiness; lack of IPC champions in some facilities; unequal engagement across the hospitals; competing clinical priorities; lack of Clostridioides difficile infection testing capacity | None identified                                               | Improved Clostridioides difficile infection recognition and treatment; key constructs associated with uptake (champions, leadership, tension for change, simplicity) |

|    | Author, year, country                     | IPC practice                                                                    | Implementation strategies                                                                                                                                                                                                                                                                                                                    | Barriers                                                                                                                                                                                  | Facilitators                                                                                             | Outcome                                                                                                                                               |
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| 60 | Richards et al. 2017 (76)<br>South Africa | Central line associated bloodstream infection prevention in intensive care unit | Implementation central line associated bloodstream infection prevention bundle; national quality improvement collaborative; real time audits and feedback; clinician training and retraining; use of intensive care unit safety champions; standard insertion/maintenance bundles; regular feedback dashboards to leaderships; peer learning | Low baseline bundle compliance; variation in intensive care unit staffing and skill mix; limited data collection experience; competing clinical priorities in busy I intensive care units | Strong Netcare national leadership; standardised data tools; supportive culture of safety within Netcare | Central line associated bloodstream infections reduced by 50%; high-performing Intensive care units achieved 80% bundle compliance; scalable QI model |
| 61 | Ombajo et al. 2024(77)<br>Kenya           | Control of Candida auris transmission in critical-care units                    | Epidemiologic investigation with IPC outbreak control bundle; point-prevalence surveys; establish outbreak team; enhanced environmental cleaning; data-driven cohorting; HH reinforcement; multidisciplinary outbreak response team                                                                                                          | High baseline colonisation in critical care units; limited fungal diagnostics; weak routine surveillance; intensive care unit patients with multiple invasive devices                     | Strong collaboration with Center for Disease Control and Prevention                                      | <i>C. auris</i> colonisation 42% to 1% in 2 months; 9 months without new candida auris cases                                                          |

922 ABHR = Alcohol-based hand rub; CQI = continuous quality improvement; HH = hand hygiene; ICU = intensive care unit; QI = quality improvement;

923 WASH = water, sanitation and hygiene

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