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Infection Prevention in Practice

journal homepage: www.elsevier.com/locate/ijip

Impact of supportive supervision visits on the availability of World Health Organization infection prevention and control core components in health facilities in Southwestern Uganda

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ARTICLE INFO

Article history:

Received 13 October 2023

Received in revised form

19 January 2024

Accepted 15 February 2024

Available online 11 March 2024

Keywords:

Supportive supervision

Infection prevention and

control

Uganda

Sub-Saharan Africa



SUMMARY

Background: In sub-Saharan Africa, the provision of infection prevention and control (IPC) measures are often limited by resource constraints.

Aim: To determine the association of supportive supervision activities with the availability of the WHO core components for IPC at health facilities in Southwestern Uganda.

Methods: We employed a before and after quality improvement study design. We conducted a baseline assessment of the availability of the WHO IPC core components and provided supportive supervision activities, which was followed by a second IPC assessment. We included health centers II-IV, which have increasing clinical care capacity, and regional hospitals.

Findings: Of 244 regional health facilities, baseline assessment occurred at 111 (45%) of which 23 (21%) were reassessed. The number of facilities in the Red (<70%) category for each core component stayed the same or decreased at each facility type, but there was an increase from five to six health center III facilities scoring Red (<70%) for PPE. The number of facilities in the Green (>85%) category for each core component stayed the same or was increased at each facility type, but there was a decrease from four to two health center III facilities scoring Green (>85%) for instrument processing. There was an increase in the median (interquartile range [IQR]) overall score for all facilities (65 [54–72] vs 75 [68–83], $P=0.0001$).

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Conclusion: Supportive supervision activities were associated with improved availability of the core components of IPC at health facilities in Southwestern Uganda. PPE should be prioritized in health care facilities in Southwestern Uganda.

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Introduction

Optimal clinical outcomes are dependent upon high quality health care service delivery. In sub-Saharan Africa, the provision of high quality health care services may be limited by a small workforce with a heavy work burden, low pay, training needs in key practices, inadequate supplies, and the absence of an infrastructure that enables the provision of the desired service [1–3]. To ensure optimal outcomes, quality improvement requires that limited available resources are optimally used to improve the delivery of necessary practices, procedures, and programs [4,5]. For example, where available, core components for infection prevention and control (IPC) enable adherence to recommended IPC practices, which can reduce nosocomial infections and the emergence of antimicrobial-resistant pathogens [6]. The WHO IPC strategies include eight core components, which include 1) IPC programs, 2) IPC guidelines, 3) IPC education and training, 4) health care associated infection surveillance, 5) multimodal strategies, 6) monitoring, audit, and feedback of IPC practices, 7) workload, staffing, and bed capacity at the facility level, and 8) built environment, materials, and equipment for IPC at the facility level [7].

Quality improvement approaches, including supportive supervision, can promote adherence to IPC practices, which can be challenging in resource-limited settings, such as in most health facilities in sub-Saharan Africa [8]. Supportive supervision is a series of actions to enable employees to achieve better work outcomes. It occurs on a continuous basis and can facilitate the desired IPC outcomes in health facilities through dialogue and constructive feedback instead of through finding fault [9–11]. The Uganda Ministry of Health, the World Health Organization (WHO), and international donors have endorsed the use of supportive supervision to improve the quality of health care service delivery including IPC at health facilities in Uganda [12,13]. In this quality improvement study, we used a modified IPC assessment tool to determine if there was an association between supportive supervision activities and the availability of the WHO core components for IPC at health facilities in Southwestern Uganda.

Methodology

Study site descriptions

The study took place in public and private health facilities in Kabale, Kanungu, Rukungiri and Rubirizi districts, which are located in Southwestern Uganda. In Uganda, private facilities may be for profit (PFP) or not for profit (PNFP). Health center II facilities employ nursing staff and perform outpatient and community outreach activities at the parish level. Health center III facilities employ nurses, clinical officers, and laboratory staff; and provide basic preventative, promotive, and therapeutic care, including in some cases inpatient admission

at the sub-county level. Health center IV facilities employ nurses, doctors, and laboratory staff, and provide county-level care including medical and surgical treatments. General hospitals provide a range of services, which may be preventive, promotive, or curative; and include maternity inpatient care, surgical services, blood transfusion, laboratory, and radiographic imaging. They also provide in-service training, consultation, and operational research. National referral hospitals provide the highest level of service through comprehensive medical and surgical care [14].

Study design

We employed a comparative before and after quality improvement study design. Two WHO resident consultants with expertise in IPC and Case Management, along with the district-based Uganda Ministry of Health IPC focal person, provided supportive supervision. The district IPC focal person, typically a medical officer or nurse, has an assigned role to oversee the implementation of IPC services at all levels in the district such as health facilities, communities, and national points of entry. Supportive supervision included a baseline assessment of the WHO core components using a WHO IPC assessment tool via an open data-kit smart telephone application. The checklist was developed based on guidance from the WHO for IPC assessments in health facilities during public health emergencies such as Ebola Viral Disease outbreaks and the COVID-19 pandemic [15,16].

Follow-up assessments were recommended to occur 1–3 months after initial visits. The initial plan was to conduct follow-up visits at all health facilities that were part of the baseline assessment. Unfortunately, this became unfeasible due to the transfer of supervising officers to different work regions amid the ongoing COVID-19 pandemic. The priority for reassessment was given to health center IV facilities and hospitals due to their high patient volumes, as well as those located close to the entry points from the Democratic Republic of the Congo (DRC) as these facilities were thought to be at higher risk of receiving individuals with Ebola Virus Disease.

Following the assessments, the assessors convened a meeting with staff at each facility to provide feedback on the results. Action plans to address the identified assessment gaps included setting mutually agreed upon time frames for correction, assignment of lead personnel, sharing the assessment checklist with the staff at the facility, mentorship on the identified gaps, and a review of the universal precautions for IPC. The assessment findings and required areas to address were documented in the supervision books provided to each facility and also captured in the WHO IPC assessment tool. The person responsible for IPC at each facility received mentorship on quality improvement and the modified WHO IPC assessment tool was provided to them for weekly self-assessments. They led the quality improvement team, which consisted of the

officer-in-charge of the health facility, the heads of departments, security guards, and custodial staff.

Assessment tool

We used a modified WHO IPC assessment tool, which we previously described, to assess the core areas (Figure 1) [14]. The assessed components were listed under the following sub-headings: 1) IPC/Water Sanitation and Hygiene (WASH) organization, 2) screening and isolation, 3) hand hygiene, 4) personal protective equipment, 5) waste management, 6) environmental cleaning, and 7) instrument reprocessing. Under each sub-section, each positive response was given a point, which were combined for a maximum aggregate point score of 100. We categorized the performance of each facility using a Red, Amber, Green categorization system. A score less than 70% (Red) indicated that the practices were inadequate, a score between 70 and 85% (Amber) was intermediate, and a score greater than 85% (Green) was adequate.

Data analysis

We entered data into Microsoft Excel (Version 2016, Redmond, Washington) and then exported and analyzed them using Stata (Version 16.1 SE, College Station, Texas). We expressed the total number of health facilities for which a follow-up assessment was done in each district as a count and percentage of all the initially assessed health facilities. We summed the sub-totals for the core components and expressed them as percentages in order to assign them to the appropriate Red, Amber, or Green color scale category. We recorded frequencies and percentages for health facilities and stratified them according to ownership, district of location, and type of health facility. We categorized ownership as either government or private. Private facilities were either PFP or PNFP.

For all the core components, we established the category and overall score at the baseline IPC assessment and again at the follow-up visit using the Red, Amber, and Green scale. We compared the different categories at baseline and follow-up by using the Chi-square test or the Fisher's exact test where appropriate. As the distribution of the data was skewed, we determined the median scores as measures of central tendency for the baseline and follow-up assessments based on facility type and ownership. We compared the differences in the median aggregate IPC scores using the Wilcoxon signed-rank test as we assumed that there was no independence between the baseline and follow-up assessments. In addition, we determined the median number of days for the reassessment visits and conducted a univariate linear regression to establish the association of the number of days between the assessments and the overall IPC score at follow up. We considered P values <0.05 to imply statistical significance.

Ethical considerations

Per Uganda National Council of Science and Technology guidelines, as this was a quality improvement study that did not use patient-level data, no ethical review was required. The facility assessments were part of ongoing efforts to support IPC core capacity as part of the preparedness for Ebola Viral Disease outbreaks initiative by the Uganda Ministry of Health. The Uganda Ministry of Health and implementing partner

organizations including the WHO incorporated this initiative into their COVID-19 pandemic response. The WHO consultants communicated the intended supportive supervision activities and their benefits to multi-sectoral committees at district task force team meetings.

District task force teams are in place in every district in Uganda and comprise sub-committees to support the different pillars of epidemic emergency response including coordination and oversight, case management and IPC, surveillance and case detection, logistics management, and vaccination. The district task force team membership embraces the one health concept, is led by the resident district commissioner, and includes the district health team, district veterinary team, Uganda Wildlife Authority officers, security officers from the army, police, and prisons, as well as environmental health officers, and members of the business community [17]. The staff at the visited facilities provided verbal consent to participate in study activities and no individual data were collected during the study.

Results

The study was conducted from January 2020 through August 2020 and included initial supportive supervision visits to a convenience sample of 111 (45%) of the 244 regional health facilities of which 23 (21%) were reassessed [18]. The characteristics of the facilities based on facility type and ownership are shown in Table I. The median (interquartile range [IQR]) time between initial and follow-up assessments was 61 (43–124) days. There was no association among days between assessments and the overall IPC score at follow up (coefficient 0.07 [−0.04 to 0.07], $P=0.17$). At baseline, the most frequently available core components for the facilities included IPC and water, sanitation, and hygiene (IPC/WASH) organization for which 11 (48%) facilities achieved a score $>85\%$, and environmental cleanliness for which 13 (57%) facilities achieved a score $>85\%$. The most infrequently available core components included waste management and personal protective equipment (PPE) for which no facility achieved a score $>85\%$ at baseline. No facility scored $>85\%$ on the baseline assessment for all the core components.

At the time of follow-up assessments, the number of facilities that were in the Red ($<70\%$) category for each core component stayed the same or was decreased at each facility type (Table II). The only exception was an increase from five to six health center III facilities scoring Red ($<70\%$) for PPE. Conversely, the number of facilities that were in the Green ($>85\%$) category for each core component stayed the same or was increased at each facility type. The only exception was a decrease from four to two health center III facilities scoring Green ($>85\%$) for instrument processing. The number of facilities that were in the Red ($<70\%$) category for each core component stayed the same or decreased at government and privately owned facilities (Table III). The only exception was an increase from zero to one private facility scoring Red ($<70\%$) for PPE. Conversely, the number of facilities that were in the Green ($>85\%$) category for each core component stayed the same or was increased at government and privately owned facilities.

Across all facilities, there were statistically significant decreases in the number of facilities scoring Red ($<70\%$) for IPC/WASH organization (seven vs two, $P=0.02$), hand hygiene (nine vs three, $P=0.01$), and overall score (14 vs 10,

Question		Yes	No	Comment		
IPC/WASH Organization						
1	Are IPC guidelines available?					
2	Are staff aware of how to access the guidelines?					
3	Is there a trained focal person?					
4	Is there an IPC committee with clear TOR?					
5	Is the committee functional?					
6	Do Health Care Workers receive on the job training/mentorship on IPC?					
7	Is there a constant water supply					
8	Is safe drinking water accessible at all times?					
9	Is chlorine available?					
10	Are there instructions for chlorine mixing					
Score for questions 1-10						
RAG status				0-5	7-8	9-10
Screening and isolation						
1	Is there a screening station at the facility?					
2	Does the screening station have a single entrance?					
3	Is there a hand hygiene station with soap and water at the screening station?					
4	Is there a designated screener on duty at the screening station?					
5	Is there a designated isolation are for the suspected cases of EVD/or other infectious diseases?					
6	If yes, is this separated from other patient areas?					
7	Is this a permanent structure?					
8	Are Health Care Workers trained on initial management of suspected cases?					
Score for questions 1-8						
RAG status				0-5	6	7-8
Hand hygiene						
1	Are functional hand washing stations available at entrance and all clinical areas?					
2	Are there hand washing posters at all hand hygiene stations?					
3	Does the facility have a system in place for monitoring staff compliance with hand hygiene?					
4	If yes, are the results recorded and fed back?					

Figure 1. Modified WHO Infection Prevention and Control Assessment Framework tool used to assess for core components of the World Health Organization Infection Prevention and Control strategies in health facilities in Southwestern Uganda.

$P=0.04$); and increases in the number of facilities scoring Green (>85%) for IPC/WASH organization (11 vs 19, $P=0.004$) and screening and isolation (three vs nine, $P=0.03$). There was a non-statistically significant increase from zero to three health facilities that scored Green (>85%) for overall score

($P=0.08$). These were all private facilities and included two hospitals and one health center IV facility.

There was an increase in the median (interquartile range [IQR]) overall score from baseline to follow-up assessment for all facilities (Table IV). Follow-up scores for health center II and

5	Is soap available at all hand hygiene stations?			
6	Do Health Care Workers know about the 5 moments of hand hygiene?			
7	Is alcohol based hand rub available at the point of care			
Score for questions 1-7				
RAG status				0-4 5 6-7
Personal protection equipment				
1	Does the facility have sufficient and appropriate PPE available and readily accessible to staff?			
2	Is there monitoring of Health Center Workers to ensure with PPE standard precautions?			
3	If yes, are the results recorded and fed back?			
4	Does the facility have pre-positioned full sets of comprehensive PPE?			
5	Is there a stock ordering system in place?			
6	Is there safe storage off the floor?			
Score for questions 1-6				
RAG status				0-3 4 5
Waste management				
1	Are puncture proof resistant sharps containers available in every clinical area?			
2	Are all sharps containers filled to three quarter way before disposal?			
3	Are Health Center Workers aware of actions to take following exposure to blood or body fluids?			
4	Is other medical waste segregated in color coded bin liners?			
5	Waste segregation posters are clearly displayed above all waste bins?			
6	Does the facility have a burn pit or incinerator which is fenced and gated?			
7	Is there a placenta pit which is fenced?			
8	Are waste handlers trained on managing the infectious waste?			
9	Are all staff and waste handlers vaccinated against hepatitis B?			
Score for questions 1-9				
RAG status				0-6 7 8-9
Environmental cleaning				
1	Is the environment clean and tidy?			
2	Is there a regular cleaning schedule for clinical areas by mopping?			

Figure 1. (continued).

III facilities were similar to or lower than baseline scores at health center IV facilities and hospitals. Statistically significant increases in the median [IQR] overall scores were found within health center II (58 [54–65] vs 69 [68–70], $P=0.03$) and health

center IV (75 [60–79] vs 81 [78–83], $P=0.03$) facilities, across all government facilities (65 [54–72] vs 74 [68–78], $P=0.0007$), and for the aggregate of all evaluated facilities (65 [54–72] vs 75 [68–73], $P=0.0001$).

3	Are there posters displayed in clinical areas for handling blood and body fluid spills?			
4	Do staff have knowledge regarding usage of cleaning materials			
5	Do all mattresses have intact waterproof covers that can be easily cleaned?			
Score for questions 1-5				
RAG status				0-3 4 5
Instrument cleaning				
1	Is there a dedicated space for cleaning medical devices?			
2	Do you have the 3-bucket system for cleaning medical devices?			
3	Is there a means to sterilize critical medical devices, e.g. forceps and scissors?			
4	Is there clear separation of clean and contaminated medical equipment?			
5	Is there safe storage of decontaminated medical equipment off the floor and covered?			
Score for questions 1-5				
RAG status				0-3 4 5

Figure 1. (continued).

Discussion

In this before and after quality improvement study, we found that supportive supervision activities were associated with increased availability of IPC core components at health facilities in Southwestern Uganda. Increased total IPC core component scores occurred at all types of government and privately owned facilities. However, the follow-up scores at health center II and III facilities were similar or lower than the baseline scores at health center IV facilities and hospitals. Across all health facilities, there was statistically significant improvement in the availability of the core components as shown by the decreases in the number of facilities scoring Red (<70%) for IPC/WASH organization, hand hygiene, and overall score; and increases in the number of facilities scoring Green (>85%) for IPC/WASH organization, screening and isolation. PPE and waste management were the least available IPC core components at baseline. PPE was the only IPC core component for which there was not a decrease in facilities scoring Red (<70%) at the time of follow-up.

According to WHO guidance, supportive supervision is a process of helping staff to continuously improve their work performance. It is carried out in a respectful and non-authoritarian way with a focus on using supervisory visits as an opportunity to improve the knowledge and skills of health staff [19]. Supportive supervision has previously been evaluated in healthcare settings in sub-Saharan Africa with mixed outcomes [20]. However, there are examples of supportive supervision improving clinical quality, efficiency, job satisfaction, and supervisory relationship [21]. Although we identified an association between supportive supervision and

improved presence of the WHO core components in health facilities in Southwestern Uganda, our study did not evaluate which of these factors may have contributed to the improved presence of IPC core components at follow-up.

The finding that an improvement in total IPC core component score availability occurred at all types of government and privately owned facilities suggests that the supportive supervision intervention was applicable across all facilities irrespective of ownership. However, follow-up scores at health center II and III facilities were similar or lower than the baseline scores at health center IV facilities and hospitals. This gap may be due to government and implementing partners prioritizing support to higher-level facilities over lower-level health facilities. This prioritization may be misdirected since health center II and III facilities are the most accessible health facilities to patients in the community in Uganda [22]. It is possible that the greater human resources and service load at the higher-level facilities enables them to advocate and receive greater support for the WHO IPC core components in comparison to the lower-level facilities [23]. The relatively larger number of personnel available at higher level facilities also allows the establishment of IPC committees, which are important to oversee the implementation of the required IPC activities. In contrast, the limited personnel available at lower level health facilities may have less time to dedicate to continuous quality improvement activities including those for IPC.

The statistically significant decreases in the number of facilities scoring Red (<70%) for IPC/WASH organization, hand hygiene, and overall score; and increases in the number of facilities scoring Green (>85%) for IPC/WASH organization,

Table 1
Characteristics of health care facilities in Southwestern Uganda for which a baseline and follow-up assessment visit was conducted

District	Health facilities assessed at baseline, <i>N</i>	Health facilities re-assessed, <i>N</i> (%)
Kabale		
Government	10	2 (20)
Private not for profit	2	—
Private for profit	1	—
Subtotal	13	2 (15)
Kanungu		
Government	21	7 (33)
Private not for profit	9	1 (11)
Private for profit	3	—
Subtotal	33	8 (24)
Rubirizi		
Government	10	7 (70)
Private not for profit	3	—
Private for profit	2	—
Subtotal	15	7 (47)
Rukungiri		
Government	32	3 (9)
Private not for profit	14	3 (21)
Private for profit	4	—
Subtotal	50	6 (12)
Total	111	23 (21)

screening, and isolation may be attributed to the permanent nature of hand washing stations, isolation and screening areas, etc. In contrast, PPE was the least available IPC core component at baseline and was the only IPC core component for which there was not a decrease for facilities scoring Red (<70%) at the time of follow-up. Although efforts were made to provide PPE at all the facilities, most of the PPE is a single-use commodity for which consumption is based on patient volumes. This leads to increased costs of the commodities resulting from the frequent stock out of supplies [24]. In addition, delivery of supplies to health facilities from the government of Uganda occurs in two-month cycles. Accordingly, unlike IPC/WASH organization components, which are more permanent fixtures, it is possible for PPE supplies to become exhausted before a subsequent delivery cycle.

Health facilities performed poorly in the core component of waste management availability. Waste management requires that there is an infrastructure available to accommodate the different steps of generation, segregation, collection, transportation, storage, treatment, and final disposal, some of which were absent at the facilities [25]. Some of the supplies for supporting the steps, such as the color-coded bin-liners for waste segregation and paper board safety boxes for collecting sharps, are single-use items, which are easily depleted and are restocked at unpredictable intervals due to funding and supply chain challenges. In addition, proper waste management requires PPE at the different steps, which is also often lacking.

Consistent with our findings, studies in similar settings in the DRC and Tanzania have demonstrated improvement in IPC

compliance after baseline assessments with targeted interventions to address the identified areas for improvement before repeat assessments were conducted [8,26]. However, unlike our study, these studies did not conduct assessments of the availability of core components for IPC and involved additional training for the staff, IPC kit donation, or refurbishment of infrastructure. Other interventions at health facilities to address additional aspects of quality health care such as better service delivery with reduced patient waiting time for those accessing health facilities, better patient satisfaction, and staff motivation also led to improved performance [27].

Our supportive supervision intervention included the involvement of the leadership and staff at the assessed health facilities, and reminding stakeholders of the IPC components [28]. Oversight of the allocation of resources at rural health facilities is provided by health unit management committees, which ensure the rational and appropriate use of resources at health facilities [29,30]. Along with supportive supervision, continuous quality improvement efforts are also in place in health facilities in Uganda [31]. The quality and quantity of health service delivery at health facilities can be improved through additional funding support for reproductive, maternal, and child health as well as universal health coverage. Performance-based or results-based financing can be provided by the Ministry of Health using funds from a World Bank grant once a facility has been able to meet preset quality improvement targets in different areas such as ante-natal care, safe delivery, comprehensive emergency obstetric care, essential delivery and post-natal care services, and post-abort care and family planning [2]. IPC infrastructure is one of the areas of assessment that is considered for results-based financing in Ugandan health facilities. Supportive supervision activities are important as they assist in the achievement of IPC infrastructural goals, which can lead to further support through results-based financing.

Our study had several limitations. The overall improvement in the availability of the core components of IPC at the health facilities could have been a result of interventions other than supportive supervision that occurred during the same period. For example, while Ebola preparedness and COVID-19 response activities enhanced capacities to prevent Ebola and subsequently mitigate COVID-19, no data are available regarding their impact on the availability of essential components IPC at the assessed health facilities or on the acceptability of IPC interventions by the staff at the health facilities [32,33]. Similarly, we are unaware of the significant investment of human or material resources that were deployed to the health facilities during the interval between baseline and follow-up visits. Our study was prone to selection bias as we could only perform follow-up assessments at 23 of the 111 initially assessed health facilities, and these evaluations were carried out at varying time intervals with a focus on prioritizing high-volume health facilities and those near the DRC border. The follow-up assessments reflected actual practice in the field and represented the reality of implementing supportive supervision activities to improve the IPC practice in low income countries. However, the supportive supervision visits provided an opportunity for the supervisors to have face-to-face interactions with the different

Table II
IPC baseline and follow-up assessment scores stratified by type of health care facility in Southwestern Uganda

Core component	Red (<70%)			Amber (70–85%)			Green (>85%)		
	Baseline	Follow-up	P value	Baseline	Follow-up	P value	Baseline	Follow-up	P value
IPC/WASH organization^a									
Hospital	0	0		1	0		2	3	
Health center IV	1	0		0	0		5	6	
Health center III	3	2		1	0		4	6	
Health center II	3	0		3	2		0	4	
Subtotal	7	2	0.02*	5	2	0.18	11	19	0.004*
Screening and isolation									
Hospital	0	0		1	1		2	2	
Health center IV	2	1		3	0		1	5	
Health center III	4	3		4	3		0	2	
Health center II	0	0		6	6		0	0	
Subtotal	6	4	0.16	14	10	0.10	3	9	0.03*
Hand hygiene									
Hospital	1	0		1	1		1	2	
Health center IV	2	1		4	5		0	0	
Health center III	4	2		4	5		0	1	
Health center II	2	0		4	6		0	0	
Subtotal	9	3	0.01*	13	17	0.10	1	3	0.16
Personal protective equipment									
Hospital	1	0		2	2		0	1	
Health center IV	2	2		4	4		0	0	
Health center III	5	6		3	2		0	0	
Health center II	3	3		3	3		0	0	
Subtotal	11	11	1.00	12	11	0.74	0	1	0.32
Waste management									
Hospital	0	0		3	2		0	1	
Health center IV	2	2		4	4		0	0	
Health center III	3	3		5	5		0	0	
Health center II	4	1		2	5		0	0	
Subtotal	9	6	0.08	14	16	0.32	0	1	0.31
Environmental cleaning									
Hospital	0	0		0	0		3	3	
Health center IV	2	1		1	1		3	4	
Health center III	2	1		3	1		3	6	
Health center II	0	0		2	2		4	4	
Subtotal	4	2	0.31	6	4	0.47	13	17	0.10
Instrument processing									
Hospital	0	0		0	0		3	3	
Health center IV	0	0		3	1		3	5	
Health center III	3	3		1	3		4	2	
Health center II	6	5		0	0		0	1	
Subtotal	9	8	0.65	4	4	1.00	10	11	0.71
Overall score									
Hospital	0	0		3	1		0	2	
Health center IV	2	1		4	4		0	1	
Health center III	6	3		2	5		0	0	
Health center II	6	6		0	0		0	0	
Subtotal	14	10	0.04*	9	10	0.71	0	3	0.08

Asterisks in Table signify statistical significance.

^a WASH, water, sanitation, and hygiene.

stakeholders at the facilities. This enabled them to provide timely feedback and guidance on addressing the identified gaps and to assess for improvement in the different core areas on reassessment. The availability of the core components of IPC at the health facilities is also dependent on support from

other stakeholders such as the Ministry of Health and implementing partner organizations [14]. The contribution of these stakeholders to the observed improvements was not assessed. Despite these limitations, we identified through a large sample of health facilities in Southwestern Uganda that supportive

Table III
IPC baseline and follow-up assessment scores stratified by type of health care facility ownership in Southwestern Uganda

Core component	Red (<70%)			Amber (70–85%)			Green (>85%)		
	Baseline	Follow-up	<i>P</i> value	Baseline	Follow-up	<i>P</i> value	Baseline	Follow-up	<i>P</i> value
IPC/WASH organization									
Government	7	2		5	2		7	12	
Private	0	0		0	0		4	4	
Subtotal	7	2	0.02*	5	2	0.18	11	16	0.004*
Screening and isolation									
Government	6	4		12	8		1	7	
Private	0	0		2	2		2	2	
Subtotal	6	4	0.16	14	10	0.10	3	9	0.03*
Hand hygiene									
Government	9	3		10	15		0	1	
Private	0	0		3	2		1	2	
Subtotal	9	3	0.01*	13	17	0.10	1	3	0.16
Personal protective equipment									
Government	11	10		8	9		0	0	
Private	0	1		4	2		0	1	
Subtotal	11	11	1.00	12	11	0.74	0	1	0.32
Waste management									
Government	9	6		10	13		0	0	
Private	0	0		4	3		0	1	
Subtotal	9	6	0.08	14	16	0.32	0	1	0.31
Environmental cleaning									
Government	4	2		6	4		9	13	
Private	0	0		0	0		4	4	
Subtotal	4	2	0.31	6	4	0.47	13	17	0.10
Instrument processing									
Government	9	8		4	4		6	7	
Private	0	0		0	0		4	4	
Subtotal	9	8	0.65	4	4	1.00	10	11	0.71
Overall score									
Government	14	10		5	9		0	0	
Private	0	0		4	1		0	3	
Subtotal	14	10	0.04*	9	10	0.71	0	3	0.08

Asterisks in Table signify statistical significance.

Table IV
Median overall score and changes according to health care facility type and ownership in Southwestern Uganda

	Baseline median (IQR)	Follow-up median (IQR)	<i>P</i> value
Facility type			
Hospital	72 (72–75)	87 (86–88)	0.3
Health Center IV	75 (60–79)	81 (78–83)	0.03*
Health Center III	65 (55–70)	74 (67–77)	0.1
Health Center II	58 (54–65)	69 (68–70)	0.03*
All	65 (54–72)	75 (68–83)	0.0001*
Facility ownership			
Government	65 (54–72)	74 (68–78)	0.0007*
Private	72 (72–78)	87 (85–90)	0.1

Asterisks in Table signify statistical significance.

supervision was associated with improved availability of the core components of IPC over time in Southwestern Uganda. An additional strength of this study is that it was embedded within the existing healthcare system in Southwestern Uganda

and therefore gives pragmatic insight into quality improvement in the field.

Conclusion

We found that supportive supervision activities were associated with improved availability of the core components of IPC at health facilities in Southwestern Uganda. However, due to the limited sample of reassessed health facilities and possible confounding, there could be other explanations for these findings. Further follow-up assessment visits and a stepped wedge study design for the intervention with inclusion of all the health facilities could verify these positive findings. The availability of PPE and waste management was poor during both visits and should be prioritized in these health care facilities in Southwestern Uganda.

Acknowledgements

The WHO provided support to the consultants who conducted the supportive supervision activities. This manuscript is

dedicated to the memory of Florence Waiswa who provided supportive supervisory assessments for this work and died during the COVID-19 pandemic in Uganda. The WHO country office provided funding support and assessment guidelines for the supportive supervision visits to the visited health facilities. We also thank the district health teams and all the staff at the assessed health facilities as well as the partner organizations that were supporting IPC activities in the region during the study period.

Conflict of interest statement

None.

Funding

None.

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