




Invited Review Paper

Role of cleaners in establishing and maintaining essential environmental conditions in healthcare facilities in Malawi

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ABSTRACT

Healthcare facility (HCF) cleaners play an important role in preventing healthcare-acquired infections and promoting a safe and clean healthcare environment. There is little evidence describing cleaner roles in HCFs in low-income countries and factors facilitating and constraining their roles and responsibilities. We analyzed qualitative and quantitative data from 57 in-depth interviews with cleaners in 44 government-run HCFs in Malawi. Cleaner constraints included inadequate training on infection prevention and control (IPC), personal protective equipment (PPE), hand hygiene, and waste management; insufficient PPE and hand hygiene resources; assignment of tasks that are unrelated to core responsibilities and their job description; risk of work-related injuries; and disrespect and stigma from medical staff, patients, and guardians. Facilitators included the positive collaboration and communication with medical staff, high job satisfaction, and a positive working attitude. We recommend the provision of more robust IPC, PPE, hand hygiene, and waste management training (including orientation and refresher). PPE resources must be made available to ensure HCF cleanliness and to keep cleaners, staff, patients, and guardians safe. Clearly defined job descriptions for cleaners will clarify their roles, describe bounds of their work, and ensure cleaners are viewed as essential frontline workers who ensure the safety of staff and patients.

Key words: cleaners, infection prevention and control, Malawi, water, sanitation and hygiene (WASH), healthcare facilities

HIGHLIGHTS

- Little evidence describing cleaner roles in healthcare facilities in Malawi.
- Limited training on IPC, PPE, hand hygiene, and waste management.
- Cleaners assigned tasks beyond their roles and disrespected.
- Cleaners have high job satisfaction and positive attitude.
- Improved training and job descriptions would enable a safe healthcare environment.

ABBREVIATIONS

AMR	antimicrobial resistance
DEHO	District Environmental Health Official
DHO	District Health Official
EH	environmental health
EHOs	Environmental Health Officials
EHS	environmental health services

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ESCOM	Electricity Supply Corporation of Malawi Limited
HAI	healthcare-acquired infection
HCF	healthcare facilities
HCW	healthcare worker
IPC	infection prevention and control
JCE	Junior Certificate of Education
JMP	Joint Monitoring Programme
LMICs	low- and middle-income countries
MoH	Ministry of Health
MoHP	Ministry of Health and Population
MSCE	Malawi Secondary Certificate of Education
NGO	non-government organization
ODP	outpatient department
PPE	personal protective equipment
SDGs	Sustainable Development Goals
SEIPS	Systems Engineering Initiative for Patient Safety
SOPs	standard operating procedures
TB	tuberculosis
UNICEF	United Nations International Children's Emergency Fund
WASH	water, sanitation, and hygiene
WHO	World Health Organization.

1. INTRODUCTION

A safe healthcare environment is necessary to protect patient, staff, and visitor health and prevent healthcare-acquired infections (HAIs). Elements of a safe healthcare environment include access to safe and sufficient water, adequate and accessible toilets for both staff and patients, proper ventilation, appropriate hygiene practices, adequate management of healthcare waste, and clean laundry and surfaces (Adams *et al.* 2008). Additionally, reliable energy services are important to safeguard the quality of healthcare services and ensure the regular functioning of environmental health (EH) conditions (Adams *et al.* 2008; Reuland *et al.* 2019). These elements are essential to protect health and lay the foundation for a hygienic culture at healthcare facilities (HCFs).

According to the 2018 Joint Monitoring Programme (JMP) of the World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) baseline assessment of water, sanitation, and hygiene (WASH) in HCFs in low- and middle-income countries (LMICs), 26% lack access to basic water services, 22% lack basic sanitation, 16% lack handwashing facilities, 40% do not follow proper waste segregation procedures, and 60% lack reliable electricity (WHO & UNICEF 2015; Cronk & Bartram 2018). While these statistics describe some elements of a safe healthcare environment, little is reported about cleanliness and cleaning procedures (WHO & UNICEF 2015). In 2020, WHO and UNICEF published a report that proposed actions for improvement and generated internationally comparable estimates for standardized WASH indicators that included environmental cleaning (WHO & UNICEF 2020). Despite these advancements, there are still large data gaps regarding environmental cleaning, the availability of cleaning policies and protocols, and infection prevention and control (IPC) training for cleaners.

The combination of poor conditions coupled with unhygienic cleaning practices contributes to inadequate IPC and the spread of antimicrobial resistance (AMR) in HCF (Graham *et al.* 2016). Poor cleaning procedures can increase the risk of HAIs, as 15% of all hospitalized patient in LMICs are estimated to acquire an infection during their stay in a healthcare facility. Additionally, an estimated 60–80% of HAIs are caused by unsafe EH conditions and inadequate healthcare worker (HCW) hygiene (Weinstein 1991; Allegranzi *et al.* 2011; CDC 2014). Yet adequate conditions are essential to achieve national and international policy targets such as the Sustainable Development Goals (SDGs), where Goal 3 aims to achieve improvements in health and well-being, and SDG 6 aims to achieve universal access to WASH by 2030 (United Nations General Assembly 2018).

Cleaners are the primary personnel responsible for ensuring safe health conditions for patients and staff, yet there is little evidence describing their roles and responsibilities in HCFs. Cleaners, which sometimes include maintenance staff and sanitation workers, are responsible for sweeping, dusting, mopping, disinfecting doors, floors, and surfaces, disposing of and treating infectious and noninfectious healthcare waste, and cleaning sanitation facilities (Messing 1998; Cross *et al.* 2019). While cleaners are the frontline workers in ensuring a safe healthcare environment and preventing the spread of HAIs, they are rarely highlighted in research studies or included in the IPC guidelines. In fact, cleaners have been continuously

overlooked as a key stakeholder among healthcare professionals as they have been omitted from key documents like the *Essential Environmental Health Standards in Health Care*, indicating wider institutional neglect (WHO 2008; Marmot *et al.* 2013; Cross *et al.* 2019). They often obtain inadequate training, receive low pay, lack cleaning supplies and personal protective equipment (PPE), and experience stigma from patients and staff (Cross *et al.* 2019). A recent study presented five areas for consideration to enhance the role of cleaners within existing initiatives, and this paper aims to provide data on the constraints and facilitators cleaning staff experience in HCFs within the context of Malawi (Storr *et al.* 2021).

To better understand the role of cleaners in promoting clean HCFs, we conducted a qualitative and quantitative study collecting data on WASH and EH conditions from 57 cleaners in 44 government-run HCFs in Malawi. Cleaners either held the title of ward attendant (responsible for cleaning the interior wards) or grounds laborer (responsible for cleaning the exterior grounds). Thirty-eight ward attendants and 19 grounds laborers were included in this study. A qualitative inductive method, based on the perceptions of cleaners, was used to better understand their primary duties. The results describe EH conditions within HCFs, cleaner characteristics, and factors affecting the ability of cleaners to carry out their roles and responsibilities.

2. METHODS

2.1. Study setting

Malawi, located in Southern Africa and landlocked by Zambia, Tanzania, and Mozambique, has a population of 18.5 million people. Malawi has three regions; an estimated 14 million people (80% of the population) live in the Central and Southern regions and the remaining four and a half million (20%) live in the Northern region.

In Malawi, there are several types of HCFs, which are categorized based on their catchment population size and the types of services they provide. In 2017, there were 1,060 private and government-run HCFs in Malawi (MoH 2017). Just over half of HCFs (52%) offer all basic patient services including curative care for sick children, child growth monitoring, child vaccination, any modern method of family planning, antenatal care, and services for sexually transmitted infections. However, the availability of these basic services is much higher in government facilities (81%) than in private facilities (8%) (MoH & ICF International 2014). The Malawian healthcare system is organized in three tiers: primary, secondary, and tertiary levels that are linked through a referral system. The HCF types in this study, in decreasing order of size and service provision, include three central hospitals, 14 district hospitals, 15 health centers, and 13 health posts or dispensaries. They were distributed by the region as follows: 10 facilities in the Northern region; 16 in the Central; and 19 in the Southern region. The different HCF types are shown by the region of Malawi in Figure 1.

2.2. Study sample

Qualitative and quantitative data were collected in 44 government-run HCFs in Malawi with surveys and interviews with five different actors, including HCWs, administrators, patients, environmental health officials (EHOs), and cleaners. This paper only analyzes qualitative and quantitative data collected on 57 cleaners. Table 1 shows the distribution of HCF types by region. To ensure that the sample represented the geographic area of each sub-national region, a spatial clustering approach was used to select 14 of Malawi's 28 districts; HCFs were subsequently selected within each district. The districts were chosen to ensure that the number of districts in each of the three regions corresponded with the relative population. There is one district hospital in each district, and thus 14 district hospitals were included in the study. Additionally, UNC Project Malawi¹ staff, along with representatives from the Environmental Department of Malawi's Ministry of Health (MoH), selected a health center and a health post or dispensary within each district that could be reached by car in 1 day.

2.3. Qualitative data overview

A qualitative interview guide was developed by the Water Institute at UNC, the Malawian MoH, and UNC Project Malawi. Data were collected using a structured questionnaire that featured questions relating to personal experiences, perceptions, events, and knowledge of EH conditions (Guest *et al.* 2017). UNC Project Malawi staff translated the final survey responses from Chichewa to English, as most of the cleaner interviews were conducted in Chichewa. This interview guide can be located in Supplementary Material (SI1). Experienced field researchers collected data in the dry season (June to August 2017). All cleaners

¹ UNC Project Malawi is an institution in collaboration with the Malawian Ministry of Health (MoH) and the University of North Carolina at Chapel Hill. Largely, they aid in the development and design of programs to control the spread of HIV and sexually transmitted diseases (STDs) (UNC Project Malawi n.d.). UNC Project Malawi strives to help strengthen health systems in Malawi and continues to be instrumental in research pertaining to WASH in HCFs.

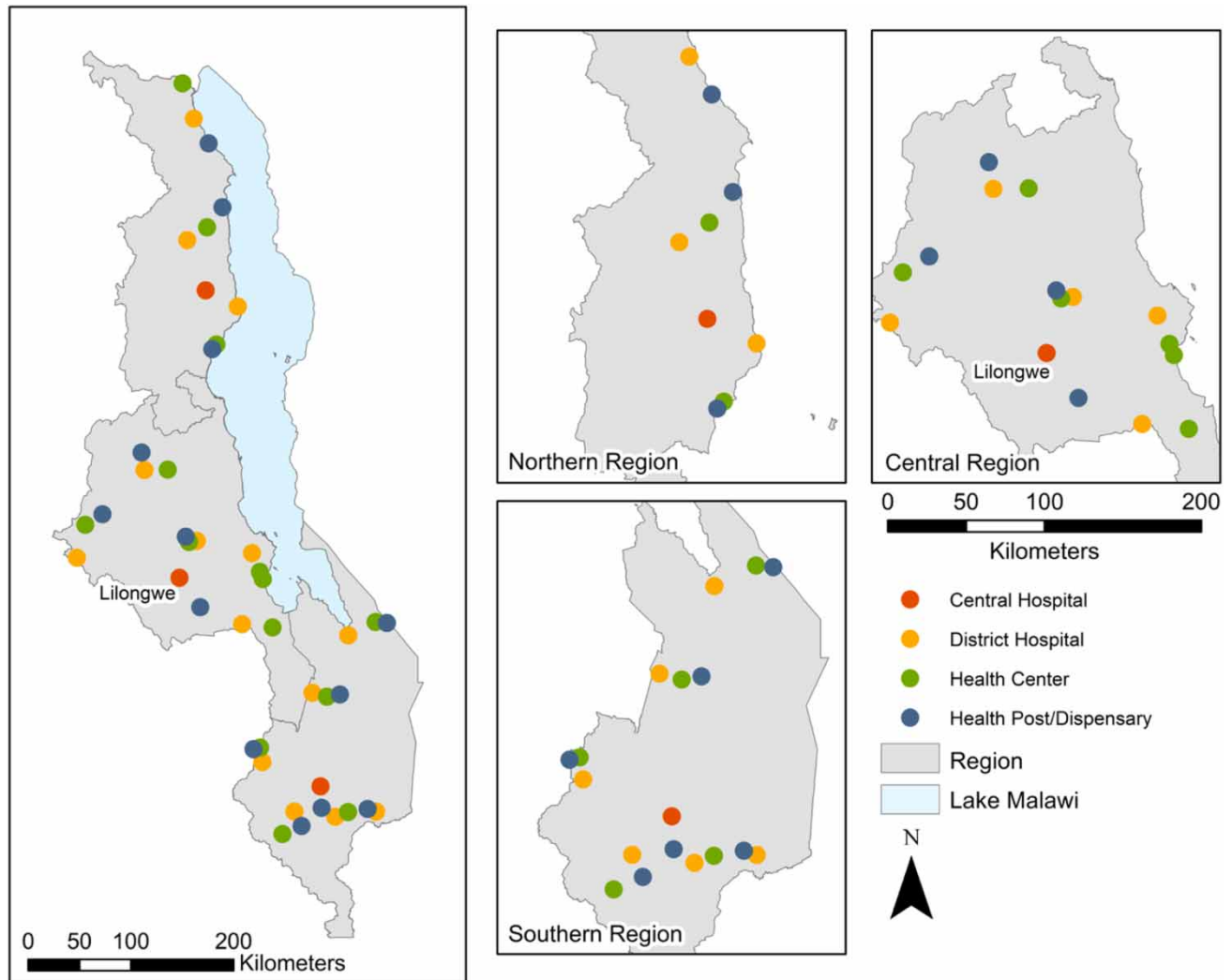


Figure 1 | HCFs assessed by the facility type and the region in Malawi.

Table 1 | Number of HCFs surveyed, organized by the facility type and the sub-national region in Malawi

Sub-national region	Central hospital	District hospital	Health center	Health post/dispensary	Total
<i>n</i> (%)	3 (%)	14 (%)	14 (%)	13 (%)	44 (%)
Northern	1 (33.3)	3 (21.4)	3 (21.4)	3 (23.1)	10 (22.7)
Central	1 (33.3)	5 (35.7)	6 (42.9)	4 (30.8)	16 (36.3)
Southern	1 (33.3)	6 (42.9)	5 (35.7)	6 (46.2)	18 (41.0)

were assured of confidentiality and provided verbal and written consent to be interviewed, and interviews were recorded in either English or Chichewa. Fifty-seven cleaners (29 males, 28 females) participated in interviews in 44 HCFs.

At least one cleaner interview was conducted in each facility. Each facility visit began with a meeting with the District Environmental Health Officer (DEHO), the HCF administrator, or another facility leader to explain the purpose of the research. Interviews and surveys were conducted with ward attendants and grounds laborers who had been working at the facility for at least 1 year to ensure that each had sufficient knowledge and familiarity with facility conditions. UNC Project Malawi staff interviewed the participants and ensured that questions were asked appropriately and respectfully. Field

researchers took field notes daily; these were compiled and used to identify research themes and to develop the codebook for qualitative data analysis.

2.4. Qualitative analysis

Translated cleaner transcripts were uploaded to Dedoose, a qualitative data analysis software, to code and organize the qualitative data (Dedoose, Los Angeles, CA, USA). A coding team met weekly to identify themes from the dataset to determine how codes were applied in different contexts. To ensure that codes were applied appropriately and consistently, coding was conducted using a two-stage process. The first stage included the development of a preliminary codebook (written in English), where codes were deductively determined based on field notes taken by the data collectors. Additional codes inductively emerged from cleaner responses during the first stage of coding. The final codebook included 255 codes, which were used for the second stage of coding. All transcripts were reviewed by two different researchers to ensure that all coding was conducted consistently and reliably.

Once the coding was completed, qualitative tools within Dedoose were used to identify emerging themes. Code co-occurrences relating to EH conditions were analyzed to identify major themes. All excerpts that included EH conditions were categorized into major themes and were organized in an Excel spreadsheet.

2.5. Qualitative thematic analysis and organization: SEIPS model

We applied the Systems Engineering Initiative for Patient Safety (SEIPS) model to *organize* the coded results (Carayon *et al.* 2006; Holden *et al.* 2013). This model was first created to assess the work system, processes, and outcomes in healthcare. Instead of focusing on patients as this model suggests, we centered the model on cleaners and highlighted their working system and the elements of person, organization, tools and technology, tasks, and environment (Figure 2). Our data were not coded to correspond with the SEIPS model, but rather representative themes from cleaners were taken from the surveys and categorized based on these elements. Table 2 shows the elements that were included in each work system and process components discussed by cleaners.

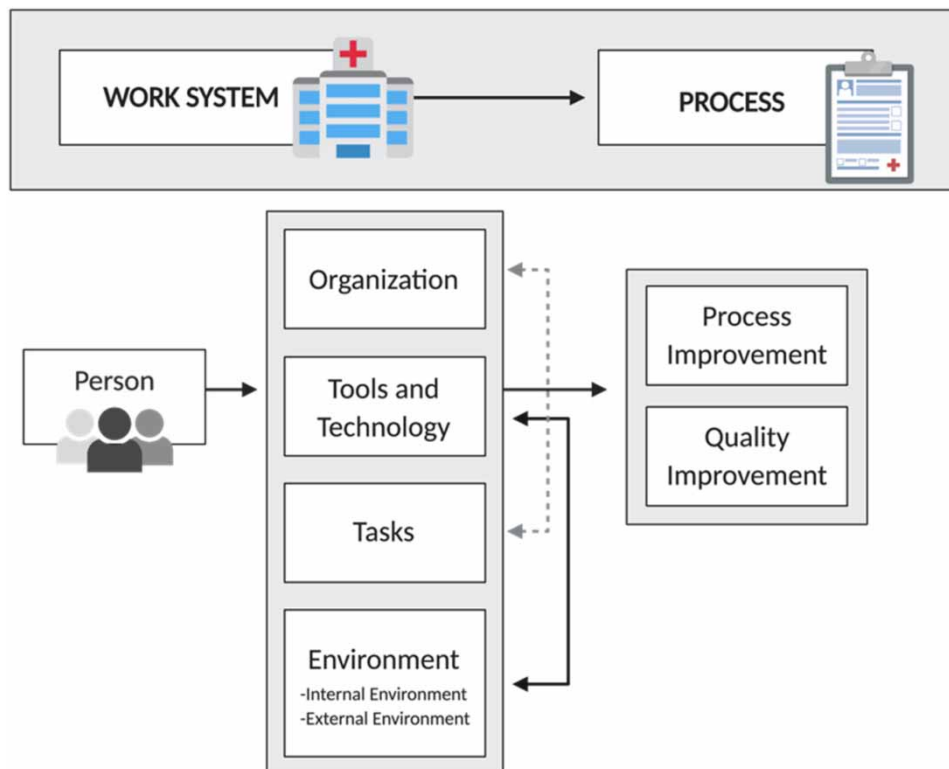


Figure 2 | The SEIPS model adapted from Carayon *et al.* (2006) and Holden *et al.* (2013). Components of the SEIPS work system can often influence and interact with each other and are represented by dashed lines.

3. RESULTS

3.1. Summary of cleaner characteristics

The average duration of the 57 recorded interviews with cleaners was just under 39 min, totaling nearly 38 h of recorded material (2,258 min). This section summarizes cleaner contract types, work experience, and education. Table 3 shows characteristics by cleaner type, region, HCF type, working experience, and highest level of education obtained.

3.1.1. Contract type, work experience, and education

Within all HCF types, all ward attendants worked on permanent contracts that ensured job security until retirement. Twelve (63%) grounds laborers worked on permanent contracts and seven (37%) were temporary contracted employees with

Table 2 | Components and elements of the work system and process from the SEIPS model in relation to cleaners in HCFs (Carayon *et al.* 2006)

Models	Components	Element discussed by cleaners
Work system	Person	Education, training (initial and refresher)
	Organization	Staff communication, record-keeping, social relationships, staff interaction and attitudes, and staff incentives
	Tools and technology	Availability of supplies and resources (including PPE and cleaning materials)
	Tasks	Roles and responsibilities, excess tasks, work-related stress and pressures
	Environment	Physical environment
	- Internal environment	- Layout, lighting, hot water availability, work-related injuries
	- External environment	- Use and operation of HCF equipment
Process	Process improvement	HCF accessibility
	Quality improvement	WASH reporting and response

Table 3 | Cleaner characteristics by the cleaner type, the region of Malawi, HCF type, gender, average working experience and highest level of education obtained

Cleaners by region	Central hospital	District hospital	Health center	Health post/dispensary	Total	Average experience by gender (years)		Highest level of education obtained by gender	
						Male	Female	Male	Female
Northern									
Ward attendants	1 (14)	3 (12)	2 (12)	2 (29)	8 (14)	3	6	MSCE	Form 4
Grounds laborers	1 (14)	3 (12)	0 (0)	1 (14)	5 (9)	9	7	JCE	Form 4
Central									
Ward attendants	3 (43)	4 (15)	7 (41)	2 (29)	16 (28)	11	10	MSCE	Form 4
Grounds laborers	0 (0)	5 (19)	0 (0)	0 (0)	5 (9)	9	0	MSCE	0
Southern									
Ward attendants	1 (14)	6 (23)	5 (29)	2 (29)	14 (25)	4	6	MSCE	MSCE
Grounds laborers	1 (14)	5 (19)	3 (18)	0 (0)	9 (16)	7	2	MSCE	JCE
Total	7	26	17	7	57	-	-	-	-

The bold values indicate the totals.

contracts renewed every 3 months. Both ward attendants and grounds laborers worked at their respective HCF for a median of 5 years (range 1–32 years).

All but one cleaner ($n=56$, 98%) had completed primary school and received a Junior Certificate of Education (JCE). There was a range of educational certifications between ward attendants and grounds laborers varying from completing Standard 8 to receiving their Malawi Secondary Certificate of Education (MSCE).

3.1.2. Roles and responsibilities

Roles and responsibilities differed minimally by cleaner type and did not differ by the HCF type, sub-national region, or gender. Both cleaner types reported similar roles of sweeping, mopping, disinfecting, disposing of HCF waste (including general, infectious and noninfectious wastes), and cleaning and maintaining the sanitation facilities (Figure 3). When disaggregated by gender, we found that male ward attendants had attained higher education levels than females and reported performing more physically demanding excess tasks such as stocking supplies, compared to females who reported performing more administrative duties.

3.1.3. IPC practices

Cleaners mentioned performing many tasks related to IPC and reported that hand hygiene, the appropriate use of PPE, the safe management of healthcare waste, and overall environmental cleanliness were important IPC practices. There were three more characteristics that the WHO includes in ‘safe IPC practices’ which include equipment sterilization, safe handling of linen, and the prevention of sharps injuries (WHO 2016).

3.1.4. Facilitating and constraining factors for EH

The main facilitators reported included positive collaboration with medical staff, high job satisfaction, and a hard-working attitude. We found that cleaner constraints included inadequate training on IPC and waste management; insufficient PPE and hand hygiene resources; performing tasks unrelated to their core responsibilities; risk of work-related injuries; occasional disrespect from medical staff and patients; and lack of work incentives.

3.2. Qualitative thematic analysis results: SEIPS model

Summarized below are the representative excerpts from qualitative interviews with cleaners which are organized by themes within each SEIPS work system component. Each section reports the factors that facilitated and constrained safe EH standards in HCFs. All representative quotations can be found in supplementary material (SI2). Sections either address all

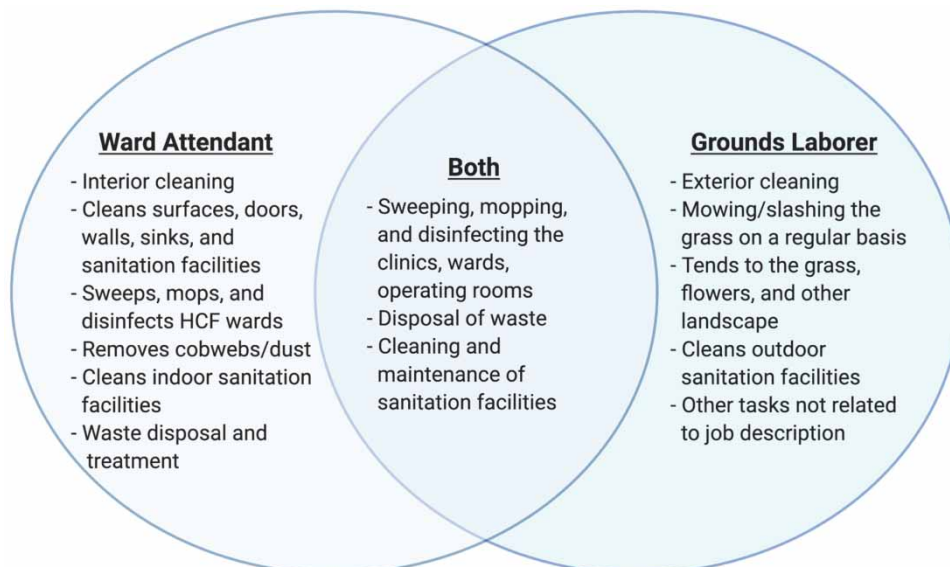


Figure 3 | Similarities and differences of roles and responsibilities reported by a cleaner type.

cleaners ($n=57$, 100%), or individually as ward attendants ($n=38$, 67%) or grounds laborers ($n=19$, 33%). Additional thematic analysis is available in the Supplementary Material (SI3).

3.2.1. Person

The themes affecting ward attendants and grounds laborers in the person component include insufficient training on IPC, hand hygiene, PPE, and the use and operation of HCF equipment, including the operation of incinerators and waste pits.

3.2.1.1. IPC and hand hygiene training. Most ward attendants ($n=29$, 76%) and grounds laborers ($n=10$, 53%) received a 1-day IPC orientation training that included the proper use of PPE and was provided by current cleaning staff members or nurses. In some cases, PPE training was absent where some ward attendants ($n=7$, 18%) and grounds laborers ($n=10$, 53%) were hired and given PPE without receiving any training or instruction (SI2, quotation 1).

Refresher training regarding hand hygiene practices was also inadequate. Only 15 (39%) ward attendants and seven (37%) grounds laborers received hand hygiene training, and of that one ward attendant (2%) received hand hygiene refresher training in the months following orientation. If training did occur, it was unlikely that the entire cleaning staff could participate. For example, a grounds laborer at a central hospital reported, *'what happens here is that when [trainings] happen, they just pick a few people to participate.'* Many ward attendants ($n=29$, 76%) and grounds laborers ($n=13$, 68%) reported that medical staff, including doctors and nurses, did not check to ensure that cleaners complied with effective hand hygiene practices.

3.2.1.2. PPE training. Most ward attendants ($n=29$, 76%) and grounds laborers ($n=16$, 84%) reported that insufficient funds prevented routine provision of PPE and PPE orientation training. Similarly, a few ward attendants ($n=5$, 13%) reported that a lack of funds greatly reduced the amount of refresher training offered. Therefore, supervisors would provide PPE to cleaners with no prior knowledge of PPE or cleaning procedures (SI2, quotation 3). In one case, a health center ward attendant expressed concern about personal safety, stating *'...it is very important for us to know these things [protective precautions] because being in a hospital there are lots of patients with different kinds of disease and if care is not taken it is easy for us to risk our lives.'*

3.2.2. Organization

The themes affecting the organization of the working environment include the lack of consistent cleaning practices, schedules, and records; insufficient staff interaction and communication; the lack of rewards and incentives provided to cleaners; and the disrespect of cleaners by clinical staff.

3.2.2.1. Insufficient cleaning record-keeping. All cleaners ($n=57$, 100%) reported inconsistent record-keeping of cleaning procedures and practices. At one HCF, regular reports on cleaning practices existed at one point in time but went missing shortly thereafter. Without adequate record-keeping, some cleaners ($n=16$, 28%) irregularly cleaned the HCF (SI2, quotation 7). Despite these irregularities, most cleaners ($n=30$, 53%) stated that cleaning occurred twice during their shift.

Most cleaners ($n=33$, 58%) followed IPC mopping procedures to prevent the transmission of disease (SI, quotation 8). However, other cleaning procedures, such as disinfecting sanitation facilities, did not take place due to insufficient resources, such as chlorine. One ward attendant at a health center stated, *'there is no major [IPC] procedure due to lack of resources which are supposed to be used when cleaning.'*

3.2.2.2. Staff communication. Communication between medical, non-medical, and cleaning staff consisted of face-to-face interaction, meetings/appointments, and using mobile phones, switchboards, and posted memos. Most cleaners ($n=43$, 75%) reported that face-to-face communication took place when discussing non-urgent matters, such as scheduling, and that this communication met their needs. However, some cleaners ($n=12$, 21%) reported that miscommunications regarding cleaning assignments took place when they had questions regarding their roles and responsibilities, lacked cleaning materials, wanted to report low inventories, or needed to connect with a nurse or a supervisor.

Challenges were reported regarding mobile phone communication. Most cleaners ($n=27$, 47%) reported that mobile phones were the primary means of communicating with the medical staff. However, some cleaners ($n=26$, 46%) reported challenges regarding a lack of airtime (prepaid phone minutes). Five (9%) cleaners personally paid for their phone but often lacked the funds required to ensure enough airtime to meet the communication demands of their job (SI2, quotation 9). Some cleaners

($n=11$, 19%) reported electricity cuts and frequent blackouts due to the poor services of the Electricity Supply Corporation of Malawi Limited (ESCOM) or inadequate solar technology at the facility. Extended periods of power outages prevented switchboards and mobile phones from functioning reliably, leading to reduced communication throughout the day and especially at night (SI2, quotation 10). Five (9%) cleaners relied on the energy supply of the HCF to charge their phone prior to starting their shift. In one HCF, the combination of unreliable energy supply, high frequency of blackouts, lack of airtime, and poorly functioning cellular network was reported to have made phone communication impossible.

3.2.3. Tools and technology

The themes of tools and technology affecting cleaners include insufficient PPE, cleaning materials, and hand hygiene resources.

3.2.3.1. Lack of PPE resources. Most cleaners ($n=51$, 89%) reported that the lack of PPE resources including gloves, aprons, goggles, and gumboots were the primary constraints to achieving HCF cleanliness. When asked what PPE was available, 50 cleaners (88%) reported that examination gloves and aprons were always available. Most cleaners ($n=42$, 75%) were concerned with the poor condition of their gumboots (SI2, quotation 17). In one case, cleaners were instructed to purchase their own gumboots, with a grounds laborer at a district hospital reporting, *'We also can't find gumboots and we are told that everyone should buy their own protective shoes because the government does not have money to buy these things.'* When asked why PPE was unavailable, some cleaners ($n=21$, 37%) reported that funds were insufficient to replenish the items in a timely manner (SI2, quotation 18). Materials were frequently unavailable in the quantities required to maintain HCF cleanliness.

3.2.3.2. Risks and injuries related to the lack of PPE. Because of insufficient PPE, most cleaners ($n=40$, 70%) reported experiencing work-related injuries, largely from sharp sticks as a result of absent waste bin liners and inadequate waste segregation. Most cleaners ($n=42$, 75%) were concerned with the risk of disease transmission as their gumboots were in poor shape. One ward attendant at a health center stated, *'...it's because we need to protect our feet for example if during delivery blood spills on the floor.'* Where gumboots were not available, a few cleaners ($n=5$, 9%) either bought or provided their own shoes to clean facilities and to dispose of medical waste. In one case, the lack of protective shoe covers created the risk of disease transmission into the home. For example, one health center ward attendant noted, *'... we just use our own shoes that we have brought from home, that is not right because we can transfer infections to our homes because we go into the toilets with these shoes and we go home and step on the mats we sleep on so I just feel we just transfer infections, and I feel we might have already contracted [disease].'*

3.2.3.3. Availability of cleaning materials. Missing cleaning materials, such as soap and chlorine, affect the overall cleanliness of the HCF. Some cleaners reported that chlorine ($n=22$, 39%) was unavailable and that hygienic conditions within HCFs were substandard (SI2, quotation 19). In one case, a grounds laborer at a district hospital suggested that staff should take better care of the cleaning materials available, as this could encourage staff to think about the long-term care and maintenance of these items: *'I think sometimes we don't take care of the materials when they are available, and we only get to use them for a short while without thinking about the next time the things will be available again. So, we have to take care of the tools so that they can be used for a long time. That can help us use the materials for a long time.'*

In situations where soap and chlorine were unavailable, three (5%) cleaners borrowed materials from other wards (SI2, quotation 20). Cleaners frequently asked nurses and in-charge supervisors to provide additional chlorine when needed. Both nurses and in-charge supervisors shared the resources with cleaners when these items were available; however, materials such as examination and heavy-duty gloves were not always supplied.

Five (9%) cleaners improvised cleaning materials (either buckets or mops) with available but substandard materials. For example, one cleaner made a mop using an old blanket (SI2, quotation 22). Materials for practicing safe waste segregation and disposal were scarce; this prompted cleaners to use leftover paper as bin liners. In addition, one cleaner collected empty prescription bottles, sold them in the market, and used the money to buy mops (SI2, quotation 23).

3.2.3.4. Lack of sterilization and waste transportation materials. Wheelbarrows and sterilization equipment were lacking in a few ($n=9$, 16%) HCFs. Cleaners used wheelbarrows to transport both infectious and noninfectious waste to either waste pits

or an incinerator. Three (5%) cleaners lacked wheelbarrows and instead had to use buckets, bins, or their hands to dispose of waste (SI2, quotation 21). Some equipment such as sterilizers and autoclaves was not operational in a few HCFs ($n=6$, 11%) because fuel and electricity were unavailable. Additionally, some health centers and health posts/dispensaries did not have sterilization equipment. One dispensary ward attendant reported that, *'we don't sterilize the equipment because they stopped sending us gas which is used to sterilize the equipment.'*

3.2.3.5. Insufficient hand hygiene resources. Some cleaners reported that resources necessary to practice hand hygiene were inadequate, including hand soap ($n=24$, 42%) and access to hand drying materials ($n=37$, 65%) such as disposable or single-use paper towels (SI2, quotation 24). In these situations, cleaners either air dried their hands or wiped them on their clothes. For example, a ward attendant at a district hospital reported, *'...if one brought their own [towel] then after washing hands, they drain them by shaking, let them stand in the sun a little then dry with the handkerchief.'* In one case, the limited availability of water, hand soap, and drying materials made it impossible to practice effective hand hygiene (SI2, quotation 25).

3.2.4. Tasks

Ward attendants and grounds laborers were often asked to perform additional tasks not included in their job description, which sometimes caused work-related stress.

3.2.4.1. Excess tasks. Twenty-six (26/38, 68%) ward attendants and nine (9/19, 47%) grounds laborers were required to perform tasks that were outside of their job description. The most frequent tasks reported by ward attendants included conducting tuberculosis (TB) and malaria tests ($n=13$, 34%), delivering samples to the laboratory ($n=10$, 26%), packing and unpacking supplies ($n=3$, 8%), assisting with wound care ($n=3$, 8%), distributing prescription medication ($n=3$, 8%), and working at the register in the outpatient department (OPD) ($n=2$, 5%). Grounds laborers reported packing and unpacking supplies ($n=6$, 32%) and delivering blood samples to the laboratory ($n=5$, 26%).

When asked if additional training was needed to perform these excess tasks, one ward attendant reported that additional training was not provided, but they were still expected to conduct these tasks (SI2, quotation 26). Due to staff shortages at smaller HCFs (including health centers, health posts, and dispensaries), a few ward attendants ($n=13$, 34%) and grounds laborers ($n=5$, 26%) reported that they were overworked.

3.2.4.2. Work-related stress. Most cleaners ($n=48$, 84%) reported that they worked hard and conducted their tasks smoothly and without excess stress. However, a few cleaners ($n=9$, 16%) reported that, as a result of becoming frustrated with long patient wait times, patients and guardians caused cleaners to experience stress. The limited availability of nurses and doctors and high patient volumes caused ward attendants to feel unsure how to handle situations when patients and guardians complained. For example, one ward attendant at a health center reported, *'... sometimes when a patient comes, they may not find a doctor. So, problems arise that the doctor is out of [the] office so they start complaining that the doctor will not attend to them. But the doctor may be busy. We are not doctors so we cannot attend to them and it leaves us stranded on what to do.'*

3.2.5. Environment

The constraints within the internal environment experienced by both ward attendants and grounds laborers include the absence of hot water, poor facility workspace design, and a lack of sufficient lighting. The barriers in the external environment include the insufficient and unsafe use and operation of equipment necessary to ensure effective EH standards.

3.2.5.1. Internal environment – sanitation facility conditions. Without adequate PPE and cleaning materials, most cleaners ($n=33$, 58%) found that it is difficult to establish and maintain clean toilets and pit latrines. A few cleaners ($n=7$, 12%) had insufficient sanitation access to clean the facilities because their HCF had few toilets and bathrooms available due to unhygienic conditions; in these cases, facilities were reported to be dirty, blocked, or broken.

Some cleaners ($n=25$, 44%) commented that the toilets did not preserve their dignity because the condition of the toilet was poor and did not provide privacy. For example, a district hospital grounds laborer states, *'...when you are in the toilet someone can see you from outside because there are no doors.'* In addition, some cleaners ($n=26$, 89%) felt that there were risks of infections from the sanitation facilities and did not feel comfortable using them (SI2, quotation 30).

3.2.5.2. External environment – insufficient HCF infrastructure. Ward attendants and grounds laborers operate waste pits and incinerators, dispose of sharps boxes, and clean sanitation facilities as a part of their daily roles and responsibilities. Almost all cleaners (55, 96%) reported that maintenance had not been conducted on either waste pits or incinerators since they were installed. Some ward attendants ($n=17$, 45%) and grounds laborers ($n=7$, 37%) expressed concerns about the condition of the incinerator (SI2, quotation 33). Over time some cleaners reported that incinerators cracked or began to crumble, leaving cleaners susceptible to injury. A grounds laborer at a district hospital reported, ‘...at the incinerator we use paraffin. We sprinkle paraffin and light it up. The problem is that our incinerator cracked and so it is not really safe.’ Some incinerators were also missing parts such as doors and covers, contributing to unsafe operation of waste disposal.

Other concerns included dangerous methods of waste disposal, including the use of waste pits and placenta pits (a waste pit that allows pathological waste to degrade naturally). Some grounds laborers ($n=9$, 47%) stated that the main concern associated with poor waste disposal practices was the absence or collapse of waste pits (SI2, quotation 34). The utilization and operation of placenta pits also posed safety concerns for cleaners as a few ward attendants ($n=5$, 13%) reported slipping and falling hazards. For example, a ward attendant at a health center said ‘...it is a big pit and the top part was made in such a way that it is slippery so once we throw anything they go where no one can access them.’ Eight ward attendants (21%) expressed concerns over improper waste removal and incineration. The remnants of partially incinerated waste create hazards as children (and in some cases dogs) can find and transport items back to their homes. For example, a health center ward attendant noted, ‘... there are a couple of us that just throw [waste] any how because they do not care, and as a result, if you were to go around, you will find that there is waste from the bin because children surrounding this health facility pick items from the bins and take them to their homes.’

3.2.6. Process improvement – insufficient access to rooms and wards

To achieve the highest level of cleanliness in the HCF, cleaners need to be able to clean rooms and surfaces. Almost all cleaners ($n=55$, 96%) had no problems with access to wards and rooms that needed cleaning; however, a few ward attendants ($n=2$, 5%) were unable to clean their assigned wards and offices because they could not access the rooms. It was reported that since some medical staff distrust the employees and patients, they lock their office and ward doors. As one health post ward attendant reported, this action prevents cleaners from doing their jobs effectively: ‘we are not able to meet the standards because I don’t clean other rooms like the doctor’s office. When he is not around, he locks the door all the time. So, I don’t clean the office daily until he comes back from where he went.’

3.2.7. Quality improvement – EH reporting and response

When materials or equipment were lacking, cleaners reported that they asked the in-charge supervisor or district health official (DHO) to replenish resources. Most cleaners ($n=33$, 58%) reported that the in-charge supervisor responded slowly or delayed remedying the situation. It was reported that a few supervisors (10, 18%) did not relay cleaners’ concerns because of limited district funding and the assumption that resources and materials would not be made available (SI2, quotation 35). One dispensary ward attendant explained that he reported a lack of supplies to a non-government organization (NGO) instead of the DHO because the response is quicker and shows results, ‘...it depends on who we report the challenge to at the time... If we take the issue to [NGO] it doesn’t take much time but if we take it to district it takes long.’ Some cleaners ($n=22$, 39%) found that district officials responded more rapidly when water services were unavailable than they did to other issues, as the perceived urgency and demand for water within the HCF warranted quick action by the maintenance teams that could fix the issue in 1–2 days (SI2, quotation 36).

4. DISCUSSION

4.1. Overview

We used qualitative data from 57 cleaner interviews in 44 government-run HCFs in Malawi to understand cleaners’ roles and responsibilities, determine current EH conditions, and identify the factors that facilitate or constrain their tasks. This study found more constraints than facilitators, which aligns with the results of other studies.

4.2. Facilitators

Most cleaners reported enjoying their job and the role they played in the HCF. They felt pride in their work and exhibited a hard-working attitude in ensuring that the HCF was safe for all who visited. Most cleaners reported smooth and positive communication with other members of the HCF staff and that members of the cleaning staff got along well.

4.3. Constraints

Most cleaners reported inadequate IPC, hand hygiene, PPE, HCF equipment, waste management, and energy training. Cleaners that did experience training reported receiving a 1-day orientation which covered basic information on hand hygiene, IPC, and PPE practices. The orientation often did not cover chlorine dilution. Refresher trainings, which usually occur in the months following orientation, were reported as infrequent or absent. As a result, cleaners experienced fear of work-related health diseases and injuries as the training and PPE required to protect them were often unavailable. Cleaners' reports of insufficient training and limited availability of PPE and cleaning resources were consistent with similar studies from other LMICs (Hopman *et al.* 2016). A study conducted by the Soapbox Collaborative found that across India, Bangladesh, and The Gambia, less than one-third of the HCFs provided formal training to their cleaning staff (Cross *et al.* 2019). Consistent, reliable training of cleaning staff in IPC procedures has the potential to limit the transmission of disease and reduce HAIs (Allegranzi & Pittet 2009). One study found, with the introduction of training and ensuring the appropriate type of cleaning materials, the reduction of contamination on hospital mattresses to those comparable in a high-income setting (Hopman *et al.* 2016).

Incentives for cleaners were rarely available in all HCFs. Most cleaners reported that incentives were a thing of the past, where often times they would have friendly competitions with cleaners in different wards to determine who could clean the facility most effectively, with the winner receiving a badge or flag for their ward. Nowadays, budget cuts have eliminated such programs. Non-monetary incentives have been shown to not only increase staff motivation but also represent meaningful steps towards improving health behaviors and outcomes (Carmichael *et al.* 2019).

PPE was available in most HCFs but not in the quantities required for cleaners to do their job effectively. Most cleaners reported the availability of examination gloves and chlorine, and the unavailability of gumboots, aprons, heavy-duty gloves, mops, and oftentimes hand drying materials. The lack of these materials made their daily roles and responsibilities difficult as they would either have to improvise materials or work without necessary resources. The absence of PPE exposes not only cleaners, but also their families to potential disease as cleaners bring their own clothing and shoes to and from work.

The specific roles and responsibilities of cleaners are poorly defined as most cleaners lack official job descriptions. This results in cleaners performing tasks that would fall outside of common cleaning tasks, including conducting TB and malaria tests, delivering samples to the laboratory, packing and unpacking supplies, assisting with wound care, distributing prescription medication, and working at the OPD register.

A few cleaners mentioned experiencing disrespect from other HCF staff, including nurses, doctors, and administrative personnel. In a few cases, cleaners were not given access to certain offices because the HCF staff did not trust them to be alone. Additionally, many patients and guardians disregarded and acted rudely towards cleaners during their visit. Stigmatization and disrespect of cleaners has been apparent in most HCF settings, as cleaning has been seen as 'unclean' or 'polluting' work throughout history (Sharma *et al.* 2016). A study from Québec showed that cleaners experience disrespect in which their occupation is seen as 'undemanding' and as 'easy work' (Messing 1998). As cleaners are often underpaid and have poor working conditions, they often fall to the bottom of the hierarchy and have low status within HCFs (Cross *et al.* 2019).

5. RECOMMENDATIONS

Our recommendations to improve EH services and work conditions for cleaners in HCFs are broken down into three categories which include the provision of training and supplies and establishing institutional support (Figure 4).

Progressive improvement requires the provision of trainings, including orientation and refresher training on IPC, PPE, hand hygiene, waste management, and energy services. In 2018, the Ministry of Health and Population (MoHP) finalized an EH policy that identifies targets for EH in HCFs and includes training guidelines, which is a success unto itself; however, full implementation is unlikely due to the lack of funding and the fact that current funds prioritize curative services (Population 2016; Reuland *et al.* 2019). To provide training the engagement of cleaners within the community and the HCF must take place. The EH policy in Malawi calls for retraining of all EH and non-EH officials, which should include cleaners, as well as nurses, doctors, managers, DHOs, and IPC committee members. By including cleaners in EH policies and acknowledging their role within the HCF, they can be involved in preventing the spread of HAIs and be included as a key player and stakeholder. In doing so, there can be a strengthened coordination to improve data collection and analysis to highlight the neglect of cleaners and their vital importance in reducing HAIs and ensuring IPC.

However, to ensure adequate work conditions for cleaners, the stigmatization surrounding their profession must be addressed. The introduction of a multimodal training strategy, which includes elements of system change, education,

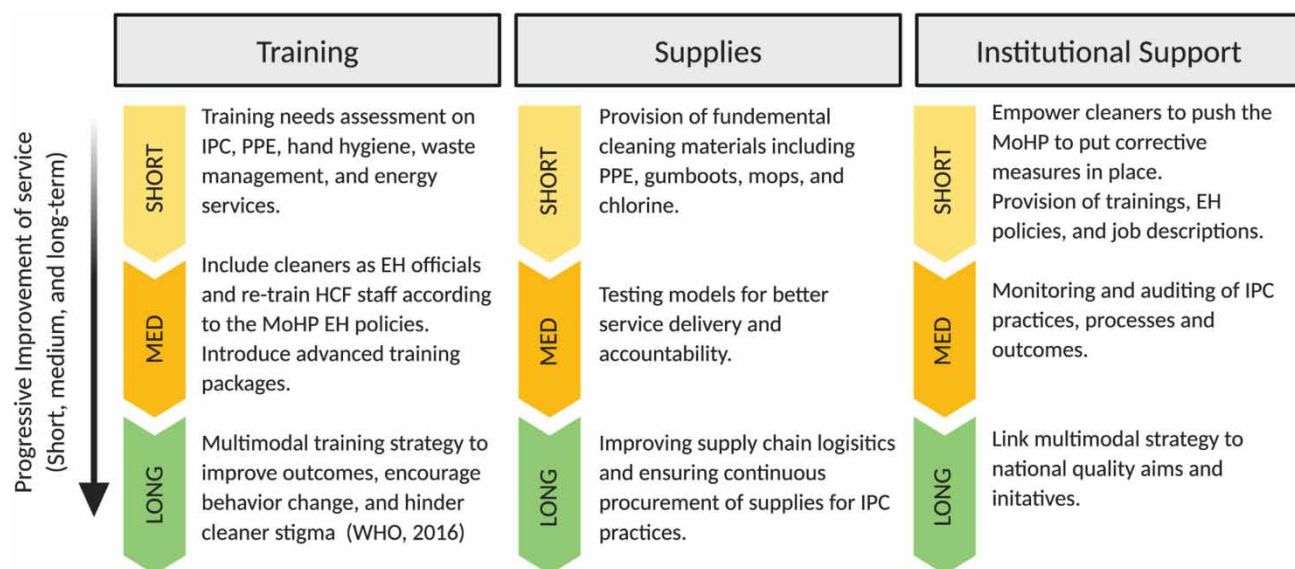


Figure 4 | Recommendations for progressive improvement for cleaners in HCFs. Short term ranges from 0 to 1 year, medium term from 1 to 5 years, and long term from 5 to 10 years.

monitoring of infrastructures, communication within the workplace, and cultural changes could be the first step in working towards changing the behavior and general disregard for cleaners (WHO 2016).

Increasing access and availability to PPE is an important step in protecting cleaners and improving both their morale and performance. To improve the procurement of supplies, models for better service delivery and accountability must be tested and evaluated. These models must focus on the operation and logistics of the HCF, the involvement of government officials, and supply chain logistics. Additional mechanisms for tracking the lifecycle of inventory use must be put in place to achieve consistent, readily available supplies for cleaners.

Inadequate institutional support is a hurdle limiting progressive improvement. We recommend that HCF administrators develop and provide job descriptions for cleaners that clearly define their roles and responsibilities, educational requirements, required work experience, and compensation/benefits. In doing so, cleaners can understand their role and importance in the HCF along with better understanding if certain tasks fall outside of their job description. Additionally, the MoHP should develop specific environmental cleaning policies that list and describe the required frequency and type of cleaning for different purposes, including how cleaning should be performed and recorded, and who is responsible for doing the cleaning (WHO 2016). The MoHP does not have to develop these standard operating procedures (SOPs) from scratch but rather can develop policies based on documentation and training programs already in existence such as *Best Practices for Environmental Cleaning in Healthcare Facilities: in Resource-Limited Settings* and formal training packages, such as The TEACH CLEAN Package (<https://www.lshtm.ac.uk/research/centres/march-centre/soapbox-collaborative/teach-clean>), that address IPC and WASH standards (CDC & ICAN 2020).

This action requires the collaboration of professionals at all HCF levels to develop SOPs at regional and local levels to specify the tools and materials that would be used in the process. The result would immediately allow cleaning staff to work within their known boundaries, limiting excess tasks or stressors.

The increase of cleaner salaries or the incentivization of their work in conjunction with improved monitoring of IPC practices could lead to higher motivation and improved performance. Incentives could also be provided in the form of training and provision of cleaning supplies and PPE. A long-term recommendation would link the multimodal strategy to national quality aims and initiatives surrounding the role of cleaners and IPC procedures. If the MoHP were to establish a budget, we recommend starting with smaller HCFs before moving to district and central hospitals, as smaller HCFs would offer an opportunity to rapidly test how best to provide and monitor the provision of supplies, training, and institutional support.

To estimate the cost of implementing these recommendations and enhancing environmental health services (EHS) within HCFs, introducing a model for costing and planning should be considered. In 2020, a ten-step model was proposed to guide budgeting for EHS in HCFs (Anderson *et al.* 2020). The next step of this research would involve using the model to estimate a

budget associated with EH services at different HCF types, starting at smaller HCFs and moving up to district and central hospitals. Using this model, which comprises 10 steps in three phases such as planning, data collection, and synthesis, stakeholders would be able to identify data gaps and choose an approach that best fits their needs.

These recommendations apply to Malawi and could be contextualized to other settings. Overall, the biggest constraint facing cleaners is the lack of formal, participatory, and practical training on IPC, PPE, and hand hygiene. Training is essential in ensuring a safe and clean healthcare environment and in establishing sustainable continuity of services. The healthcare environment is innately linked to WASH and IPC, and there is a clear need to empower these forgotten actors by creating awareness among key stakeholders, by providing cleaners with the necessary trainings and supplies, and by addressing institutional hurdles. In doing so, we can move closer to reducing HAIs in HCFs and ensuring a cleaner and safer healthcare environment for all who visit.

6. LIMITATIONS

All data included in this study were collected from HCFs within Malawi, and the results therefore may not be generalizable to other contexts. Because of the sampling approach used in this study, HCFs located in remote areas were likely to have been undersampled. Therefore, the study sample may not be representative of all HCFs in Malawi. This sampling and data collection method also limited the amount of time spent at each HCF, potentially limiting opportunities for probing questions.

Respondent recall bias may have affected data reliability. Data quality was likely affected by both the memory of the participants and their familiarity with EH systems in the facility. Response bias may have led some cleaners or HCWs to under-report deficiencies in their own practices or capabilities. It is also possible that interviewer bias influenced some responses.

Due to limited human resources in the field, some transcripts were translated and transcribed by the same researchers who conducted the interview. Human error within the coding process is a possibility. Weekly coding meetings were held to standardize the coding process and a two-stage coding process was used to improve code reliability, but it is possible that inter-enumerator disagreement affected results.

All data were collected during the dry season, so seasonal variations in the EH conditions, cleaner responsibilities, and satisfaction were likely not detected.

7. CONCLUSIONS

Cleaners play a crucial role in maintaining EH conditions and limiting the spread of both HAIs and AMR in HCFs yet experience the highest risk of injury. In Malawi, cleaners experience inadequate training on IPC, PPE, hand hygiene, and waste management. They receive insufficient PPE and hand hygiene resources, and are assigned tasks that are unrelated to their core responsibilities and job description. They often have a risk of or obtain work-related injuries (i.e., sharps sticks), and experience disrespect and stigma from medical staff, patients, and guardians. Despite these constraints, cleaners collaborate and communicate well with medical staff, experience high job satisfaction, and exhibit a positive working attitude in the workplace.

It is time that the healthcare community realizes the importance of these neglected healthcare heroes and works to improve and provide more robust IPC, PPE, hand hygiene, and waste management trainings (including orientation and refresher). Additionally, HCF administrators should work towards developing and providing job descriptions for cleaners that clearly define their roles and responsibilities and compensation/benefits. In doing so, cleaners can understand their role and importance in the HCF along with better understanding if certain tasks fall outside of their job description. Cleaners cannot successfully do their jobs without the materials, resources, and knowledge they require. Therefore, the provision of these materials, along with enhanced supply chain management, such as the introduction of mechanisms to record and monitor inventory supplies, will lay the groundwork for improvement. These actions will enable cleaners to not only become valued members of the HCF workforce, but also allow them to be viewed as important, essential frontline workers fighting against HAIs and AMR to ensure the safety of all patients and staff.

ACKNOWLEDGEMENTS

The authors thank members of UNC Project Malawi and the Malawi Ministry of Health and Population for their in-country organization and guidance. We thank Tasila Zuzu, Chrissie Chilima, and Pearson Mmodzi who transcribed the interviews. We thank Rachel Beardsley, Kirsten Miner, Raymond Tu, and Hemali Oza for their contributions to coding and data analysis.

We thank Lydia Abebe and Jamie Bartram for their assistance with funding acquisition, design of the data collection instruments, and management of field data collection.

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval and all relevant research permits were received from the University of North Carolina at Chapel Hill's Office of Human Research Ethics (approved non-biomedical research, project no. 16-1682) and the Malawi Health Sciences Research Committee (approval no. UNCPM 21908).

FUNDING

This project was made possible with funding from P&G Children's Safe Drinking Water Program, the Wallace Genetic Foundation, and the Office for Undergraduate Research at UNC-Chapel Hill.

DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

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First received 25 October 2021; accepted in revised form 21 January 2022. Available online 3 February 2022