Evaluation of Water, Sanitation, Hygiene, and Environmental Conditions in 27 Healthcare Facilities in Kamwenge District, Uganda

Follow Up Report
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ACRONYMS

CDC	Centers for Disease Control and Prevention
DHI	District Health Inspector
DHO	District Health Office
HAI	Healthcare-associated infection
HCF	Healthcare facility
IPC	Infection prevention and control
JMP	Joint Monitoring Programme
KAP	Knowledge, attitudes and practice
MHM	Menstrual hygiene management
NGO	Non-governmental organization
SDGs	Sustainable Development Goals
SOP	Standard operating procedure
UNICEF	United Nations International Children's Fund
WASH	Water, sanitation and hygiene
WHO	World Health Organization

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1. INTRODUCTION

1.1 Background

A recent global assessment of water, sanitation, and hygiene (WASH) in healthcare facilities (HCFs) in 78 low- and middle-income countries estimated that 50% of healthcare facilities lacked access to an improved water source, 39% had inadequate handwashing facilities, 33% lacked improved sanitation, and 39% had inadequate infectious waste disposal [1]. An evaluation of nationally representative data from six countries estimated that only 2% provided all four[1] of the required services – water, sanitation, hygiene, and waste disposal [1].

In Uganda, Joint Monitoring Programme (JMP) data from 2016 showed that countrywide, 31% of health facilities met basic standards for water, 12% of health facilities met basic standards for sanitation, and 43% met basic standards for medical waste management [2]. It is likely that rural HCFs have even more limited WASH infrastructure.

A lack of safe water, toilets, handwashing facilities, and adequate waste management poses significant health risks to patients and healthcare providers. Poor WASH conditions increase the risk of healthcare associated infections (HAI) through contaminated water, food, hands, and medical equipment. HAI in low- and middle-income countries are two to twenty times higher than in developed countries, affecting between 2% and 15% of hospital patients, and 6% to 46% of surgical patients; the cumulative incidence of surgical site infections ranges from 2.5% to 30.9% [3], [4]. The 2014 Ebola epidemic in West Africa highlighted the dangerous consequences of the lack of hand washing facilities as a first line of defense for healthcare providers [5].

In recognition of these challenges, the United Nations General Assembly included 100% coverage of WASH infrastructure for HCF in low-income countries by 2030 among the post-2015 Sustainable Development Goals (SDGs). This issue is gaining further momentum in the international community; for example, the UN Secretary General and the Director General of the World Health Organization (WHO) have both described improving WASH in HCFs as an urgent priority, and WHO and UNICEF launched a strategic plan to mobilize a global effort to provide 100% coverage of WASH infrastructure in HCFs [6].

1.2 Project partnership and implementation plan

1.2.1 Water for People

Water for People (WFP) implements an “Everyone Forever” model with the goal of having reliable access to safe water and sanitation for every community, HCF, and school. WFP is presently working in Kamwenge District in South Western Uganda to provide rainwater tanks and/or a piped water connection to HCFs, but these interventions have not been able to fully mitigate the lack of WASH infrastructure in the district. It is against this background that Water for People has partnered with Centers for Disease Control and Prevention to undertake baseline and follow up assessments to inform its Everyone Forever implementation strategy.

1.2.2 The Centers for Disease Control and Prevention

The Centers for Disease Control and Prevention (CDC) is a federal agency of the United States that conducts and supports health promotion, prevention, and preparedness activities to improve overall

[1] An improved water source, handwashing facilities, improved sanitation and adequate infectious waste disposal

public health. The CDC team has over 20 years of experience supporting WASH in rural HCFs. CDC's engagement in the project in Kamwenge District consists of:

- Conducting assessments to measure the status of water, sanitation, hygiene, and waste management in HCFs that includes health facility observations and interviews with health facility directors as well as water quality testing (*E. coli* and chlorine residual) of drinking and source water
- Providing partners with assessment results and recommendations through reports, score cards, and presentations
- Providing technical assistance to partners on program design and development as needed
- Conducting follow-up assessments after implementation to assess progress

2. METHODS

2.1 Evaluation design

CDC, Water for People, and the DHO conducted a baseline assessment of Kamwenge District health centers in March of 2017 and a follow up assessment in November 2018. At each assessed health center, CDC and partners conducted in-depth quantitative assessments and source and stored water testing for free and total chlorine residuals and *E. coli* contamination.

CDC and partners conducted a meeting in February 2019 to share the follow up assessment results with health center staff and District Health Office staff.

2.2 Project setting

The baseline assessment took place in 27 health centers in Kamwenge District, Uganda. Evaluation subjects included HCF directors or their designees.

2.3 Data collection

There were several components of the evaluation:

(1) HCF evaluation: Enumerators completed the HCF evaluation form by interviewing the health facility in-charge and conducting observations around the health facility. The evaluation form was comprised of questions about general HCF characteristics and management; water supply; sanitation facilities; hygiene infrastructure and practice; infection prevention and control (IPC) supplies and practices; and waste management infrastructure and practices. The HCF evaluation form was informed by indicators found in the Water, Sanitation, and Hygiene Facility Improvement Tool (WASH FIT) developed by WHO.

(2) Water testing: Enumerators tested free and total chlorine using HACH colorimeters on-site at each HCF. CDC staff used Compartment Bag Tests (CBTs, https://www.aquagenx.com) to determine the presence or absence of *Escherichia coli (E. coli)*.

We developed the questionnaires in English and programmed into SurveyCTO software for smartphone data collection.

2.4 Sampling

2.3.1 HCF assessments

We conducted the HCF assessment at 27 health centers. At each health center, we directed our questions to the in-charge or their designee.

2.5 Data analysis

We analyzed quantitative data using SAS version 9.4 and qualitative data using MAXQDA.

2.5.1 HCF- and district-level coverage calculations

To calculate handwashing station coverage at the HCF-level, the denominator was the total number of rooms where healthcare providers came in physical contact with patients and locations where providers handle lab specimens or medication. The numerator was the number of handwashing stations present in those rooms. To calculate drinking water coverage at the HCF-level, the denominator was the total number of waiting areas and rooms where patients spent the night or took oral medication. The numerator was the number of drinking water points present in those rooms. To calculate waste coverage at the HCF-level, the denominator was the total number of rooms where healthcare providers came in physical contact with patients, providers handled lab specimens or medication, patients spent the night, and patients took oral medication. The numerator was the number of those rooms with appropriate waste disposal—at least two segregated bins and a sharps box.

These calculations gave us the percent coverage for each HCF, but to determine district-level coverage numbers, we calculated the median HCF-level percent coverage and the range across all HCFs in the district.

2.6 Ethical considerations

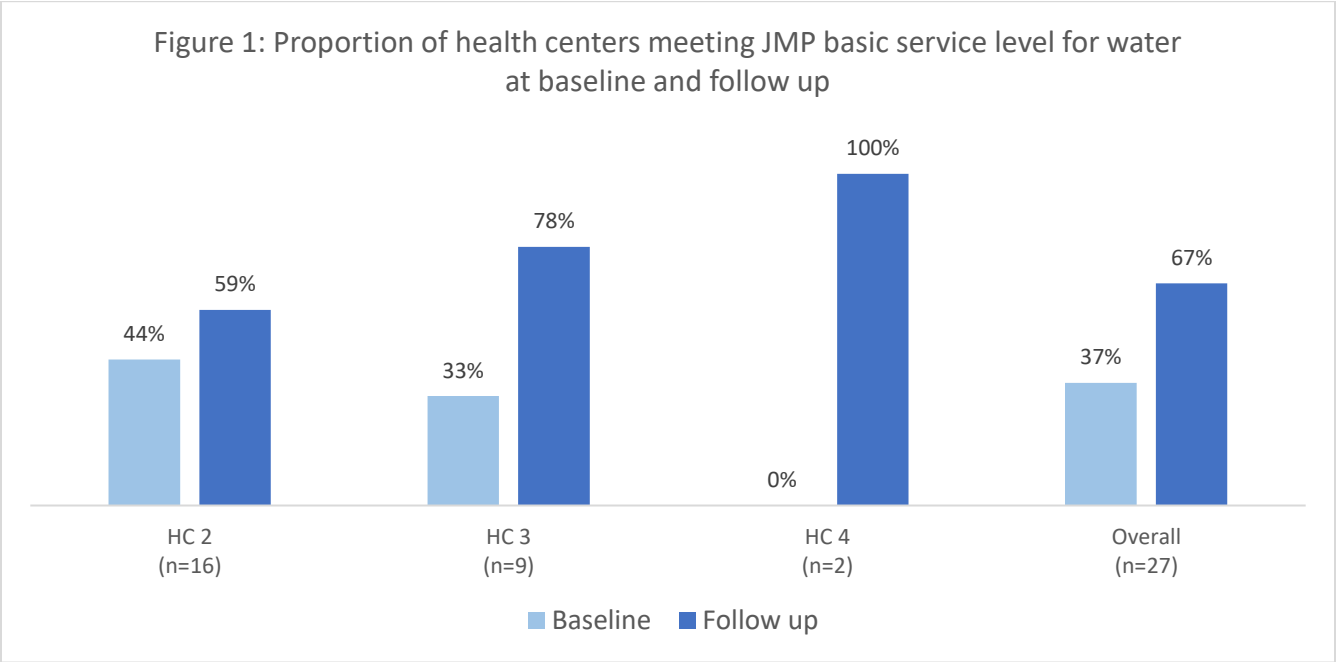
The CDC Institutional Review Board determined that this activity was non-research because it involved the evaluation of accepted public health practice. In Uganda, the evaluation protocol was approved by the Uganda Virus Research Institute and Uganda National Council of Science and Technology.

3. RESULTS

3.1 Health center characteristics

We visited 27 health centers in Kamwenge District, including 16 HC IIs, 9 HC IIIs, and 2 HC IVs. At follow up, health centers reported a monthly average of 700 outpatient consultations, 0 admissions, and 15 deliveries [Table 1]. Typically, admitted patients spent two days at health centers and women spent two days at health centers for deliveries. Patients sometimes shared beds in 27% of health centers and sometimes slept on the floor in 18% of health centers. At follow up, the majority of health centers had electricity (74%), which was an increase from 63% of health centers at baseline. Of those health centers with electricity, 30% had at least some availability at night and 29% reported interruptions. At follow up, bed linens were always or almost always provided at three health centers, and beds were sometimes re-used between patients without disinfection at six health centers [Table 2].

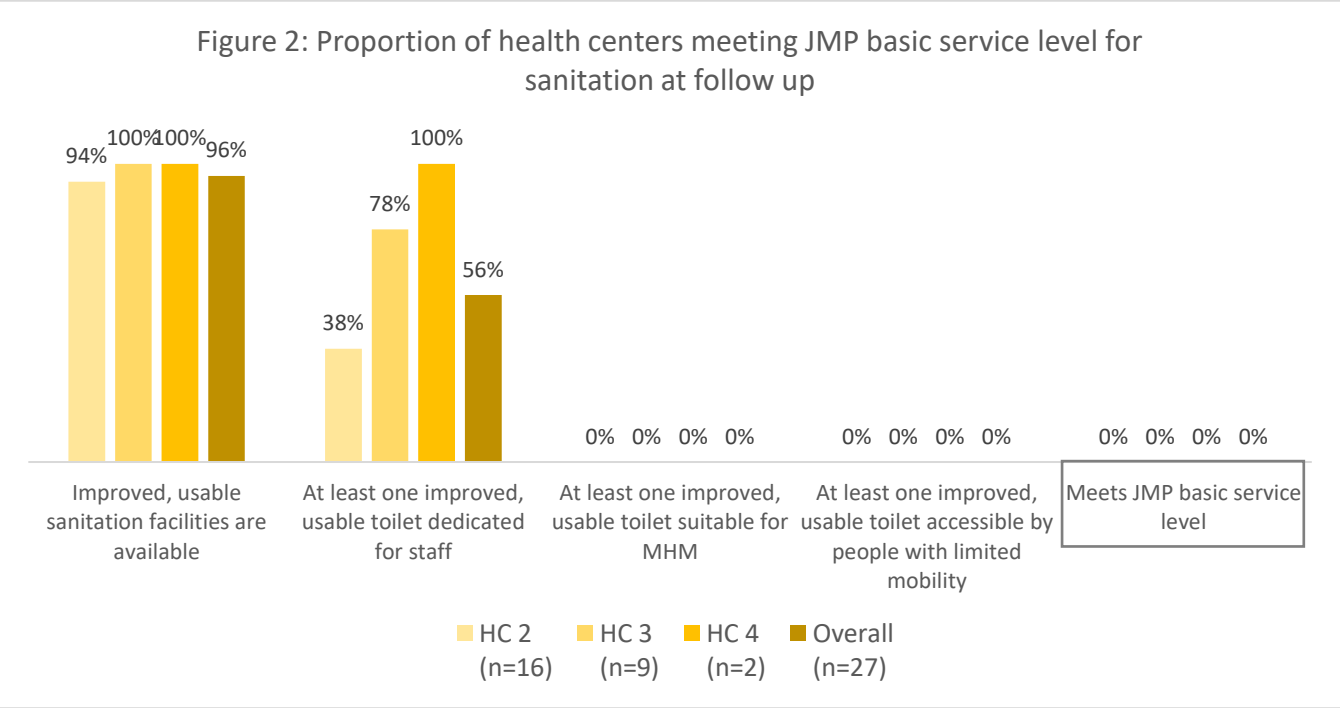
3.2 Water



The use of improved water supply increased from baseline to follow up [Table 3]. At baseline, 7% of health centers used piped water as their main water source, and at follow up this increased to 48%. Use of boreholes as the health center's main water source decreased from 26% at baseline to 11% at follow up. Use of rainwater harvesting as the health center's main water source also decreased slightly, from 30% at baseline to 22% at follow up. The accessibility of the main water source on health center premises increased from 52% to 70%. For those eight health centers that did not have on-site access to their main water source, the most common method of bringing water from the source to the health center was through someone from the health center going to get water (75%). While interruptions to water access appear to have increased from baseline to follow up (63% to 78%), seasonal shortages of water decreased from 67% to 57%. The majority of health centers (85%) used a secondary water source either only when the main source was not available (39%) or both when the main source was not available and as a supplement to the main source (52%). About half of secondary sources were located on-site at the health center. Main source water quality improved slightly from baseline to follow up; at baseline, 11 health centers had main sources that were free from *E. coli* contamination, and at follow up, 14 health centers had main sources that were free from *E. coli* contamination. Figure 1 shows the proportion of health centers that met the Joint Monitoring Programme (JMP) basic service level for water at baseline and follow up. Criteria for each category are further described in Table 9.

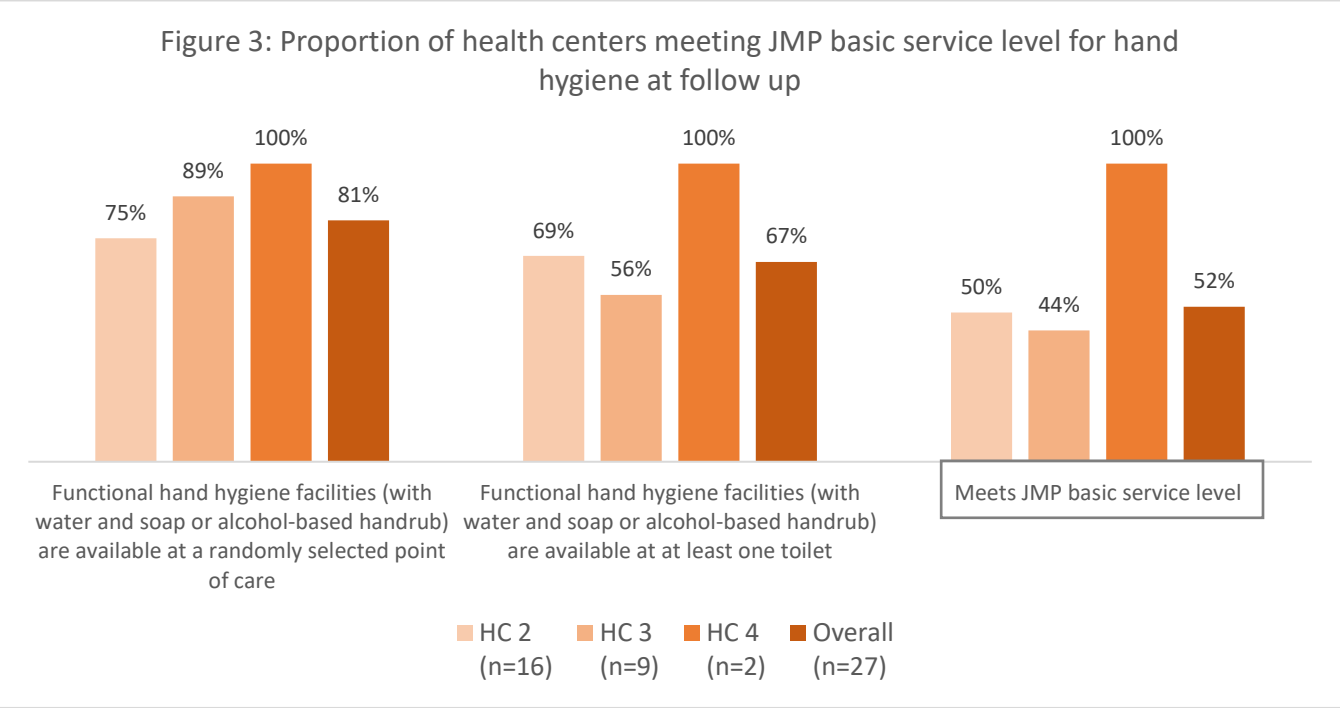
Drinking water availability increased from baseline to follow up. At baseline, drinking water was available to patients and staff at 30% of health centers [Table 4]. At follow up, drinking water was provided to patients and staff during the two weeks prior to the assessment at 96% of health centers. When considering the locations within health centers where drinking water should be present, coverage increased from 0% at baseline to 43% at follow up. At follow up, all tested drinking water containers were free from *E. coli* contamination in 81% of health centers (and 19% of health centers had at least one drinking water container contaminated with *E. coli*). At follow up, no health centers had detectable free chlorine residual in all tested drinking water containers, but 74% of health centers had detectable free chlorine residual in at least one drinking water container.

3.3 Sanitation



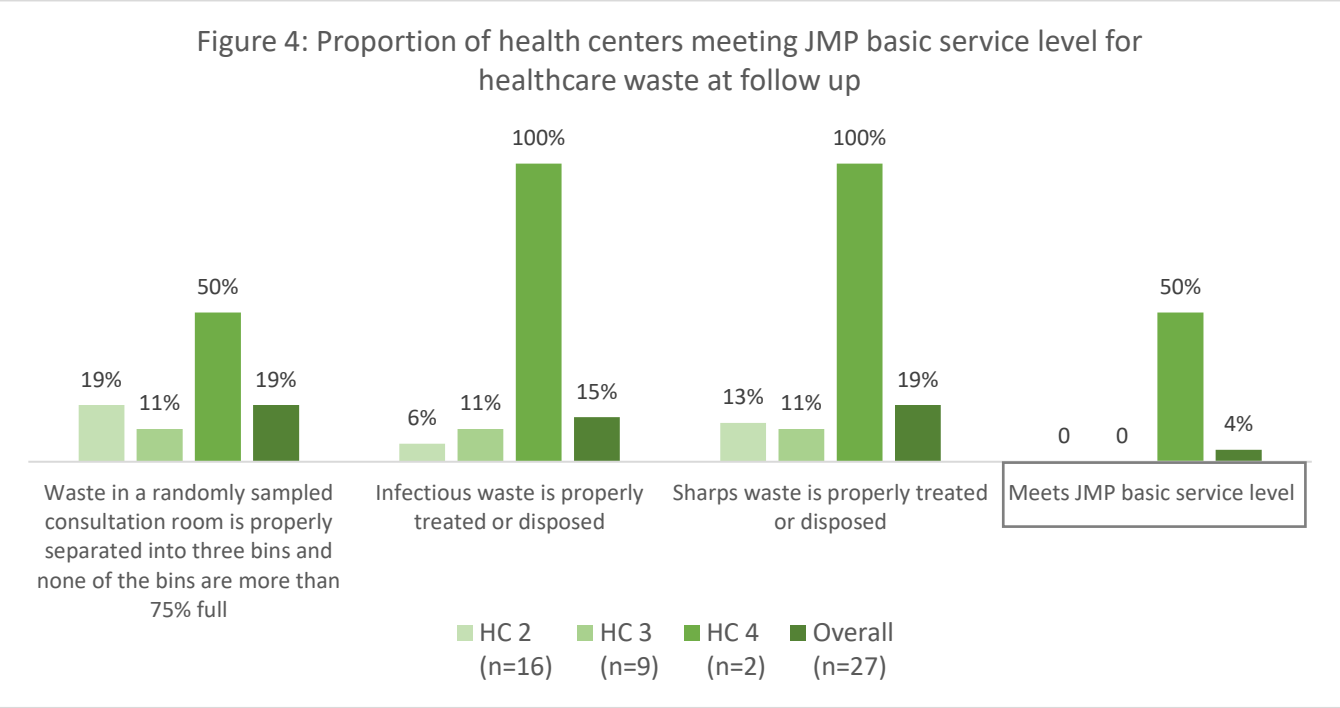
The availability of toilets (meaning either flush toilets or latrines) at health centers increased from baseline (128 toilets at 67% of health centers) to follow up (200 toilets at 100% of health centers) [Table 5]. Toilets were typically located outside the health center building but within the health center grounds (93%). The majority of toilets were ventilated pit (VIP) latrines (94%). There was an increase of the proportion of private toilets (those that can be locked from the inside and where the user cannot be seen) – 69% at baseline and 93% at follow up. At follow up, 30% of toilets were not separated by user type (staff or patients) and 65% were not separated by user sex. The overall proportion of toilets that had a functional (with soap and water) handwashing station within 5 meters of the toilet remained consistent between baseline and follow up at about 40%. At follow up, the vast majority (94%) of toilets were at least somewhat clean. At follow up, no toilets met global standards for menstrual hygiene management or accessibility to people with limited mobility, and the median number of users (including deliveries, non-deliveries, caregivers, and staff) per improved, usable (locked, functional, and private) toilet was 0 (range 0-4). Figure 2 shows the proportion of health centers (HC 2, HC 3, HC 4, and overall) that met each of the sub-requirements for the JMP sanitation basic service level, as well as the overall basic service level.

3.4 Hand hygiene



Hand hygiene supply availability continued to be an issue at some health centers – at baseline and follow up, about half of health centers reported glove stock outs [Table 6]. Additionally, respondents reported that practitioners ever reused gloves between patients in 42% of health centers at baseline, and 44% of health centers at follow up. At follow up, the majority of in-room water containers (81%) were covered containers with taps and 16% were sinks with taps [Table 7]. Considering the number of rooms that should have handwashing stations, 67% of rooms had an appropriate handwashing station with water available at follow up. When adding the requirement of the presence of soap, coverage at baseline was 25% and at follow up, 50%. At follow up, coverage of rooms with single-use hand drying materials was 0%. Coverage of rooms with an observed glove pack was 29%, and coverage of rooms where enumerators observed alcohol-based hand rub was 0%. However, at follow up, providers were reported to regularly carry hand sanitizer around with them at 37% of health centers. Regarding handwashing stations near toilets, the coverage of toilets that have a handwashing station with soap and water within 5 meters of the toilet is 75%. Figure 3 shows the proportion of health centers (HC 2, HC 3, HC 4, and overall) that met each of the sub-requirements for the JMP hand hygiene basic service level, as well as the overall basic service level.

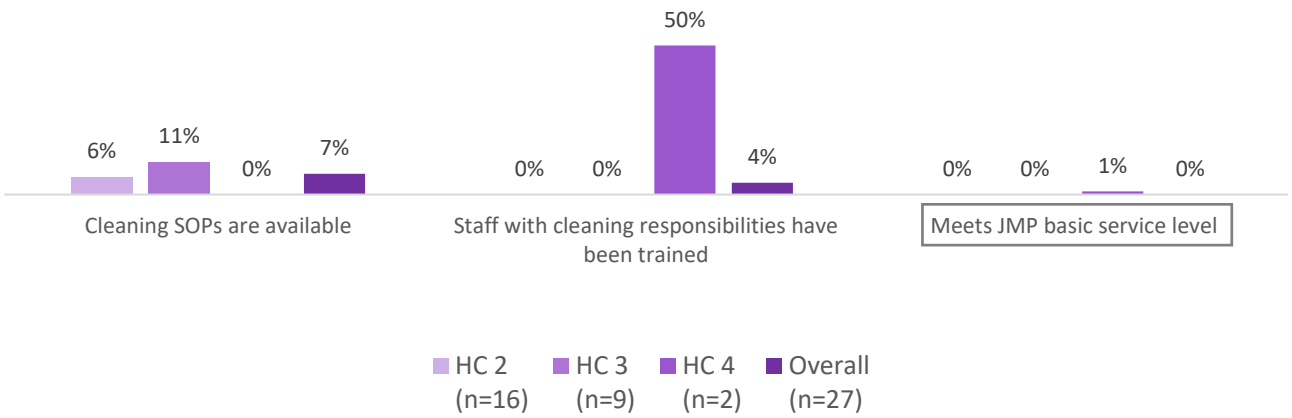
3.5 Waste management



The availability of healthcare waste management guidelines increased from baseline (41%) to follow up (74%) [Table 8]. At follow up, waste handlers used heavy-duty gloves every time they handled waste in 41% of health centers. At follow up, coverage of sharps containers in rooms where sharps are generated was 100%, coverage of rooms with at least one waste bin was 75%, and coverage of rooms with proper waste bins and separation was 33%. Coverage of rooms with adequate waste coverage, which means that rooms had two covered containers separating infectious and non-infectious waste and a sharps container, was 25%. Sharps were safely eliminated (in a lined pit with a cover, in an incinerator, or offsite) at 22% of health centers at baseline and 19% of health centers at follow up. Infectious non-sharps waste was safely eliminated at 15% of health centers both at baseline and follow up. At baseline, sharps waste was sometimes stored before disposal in 71% of health centers, and 41% of health centers at follow up. At follow up, sharps were stored in areas potentially accessible to the public in four health centers. At follow up, infectious waste was stored in a location potentially accessible to the public in three health centers. Figure 4 shows the proportion of health centers (HC 2, HC 3, HC 4, and overall) that met each of the sub-requirements for the JMP healthcare waste basic service level, as well as the overall basic service level.

3.6 Environmental cleaning

Figure 5: Proportion of health centers meeting JMP basic service level for environmental cleaning at follow up



Coverage of patient care areas with floors free of solid and liquid waste was 62% at follow up, and the coverage of patient care areas with all work surfaces free of solid and liquid waste was 50% [Table 8]. Enumerators observed that the exterior of the health centers were well-fenced in 19% at baseline and 15% at follow up, free from solid waste at 59% at baseline and 85% at follow up, free from stagnant water at 81% at baseline and 100% at follow up, free from animals at 59% at follow up, and free from animal and human feces at 67% at baseline and 100% at follow up. Figure 5 shows the proportion of health centers (HC 2, HC 3, HC 4, and overall) that met each of the sub-requirements for the JMP environmental cleaning basic service level, as well as the overall basic service level.

4. CONCLUSIONS

From baseline to follow up there was a great deal of progress made in increasing access to improved, on-site water supply, particularly for HC 3 and HC 4. Increased access to piped supply was one of the major changes that drove this increased on-site access. Seasonal water shortages remained a challenge, but storage capacity was generally very high. Water source quality remained an issue, with close to half of sources testing positive for *E. coli* at follow up. Access to drinking water increased for both patients and staff, though coverage was still limited – more than 50% of the rooms that needed drinking water stations were lacking.

Access to drinking water increased for both patients and staff, though coverage remained limited – at follow up, more than half of the rooms that still needed drinking water stations were lacking. Drinking water quality at follow up was also an issue, despite evidence of general chlorination practice at some health centers. Informal conversations during data collection revealed a misunderstanding of how frequently to treat drinking water, which CDC addressed during the February 2019 data dissemination meeting.

Toilet coverage increased from baseline to follow up, with all health centers having at least one toilet. To reach the JMP basic service level, however, health centers need toilets that are suitable for menstrual hygiene management (MHM) and toilets that are accessible to people with limited mobility, which none of the health centers did at follow up.

Handwashing station coverage improved from baseline to follow up, but at some health centers, stations are not present in every room where they should be located, and the presence of soap at handwashing stations remained a challenge, both in patient care areas and next to toilets. Single-use hand drying materials were also very uncommon. Both the supply chain for gloves and the accessibility of gloves in patient care areas were issues at some health centers.

Healthcare waste management was excellent in some patient care areas but remained a challenge in others. Safe elimination of sharps and infectious non-sharps waste was a persistent issue in many health centers, especially HC 2 and HC 3, and either larger infrastructure investments or the development of safe offsite waste disposal systems would be needed to address the issue. HC 4 practiced safe management of both sharps and infectious waste.

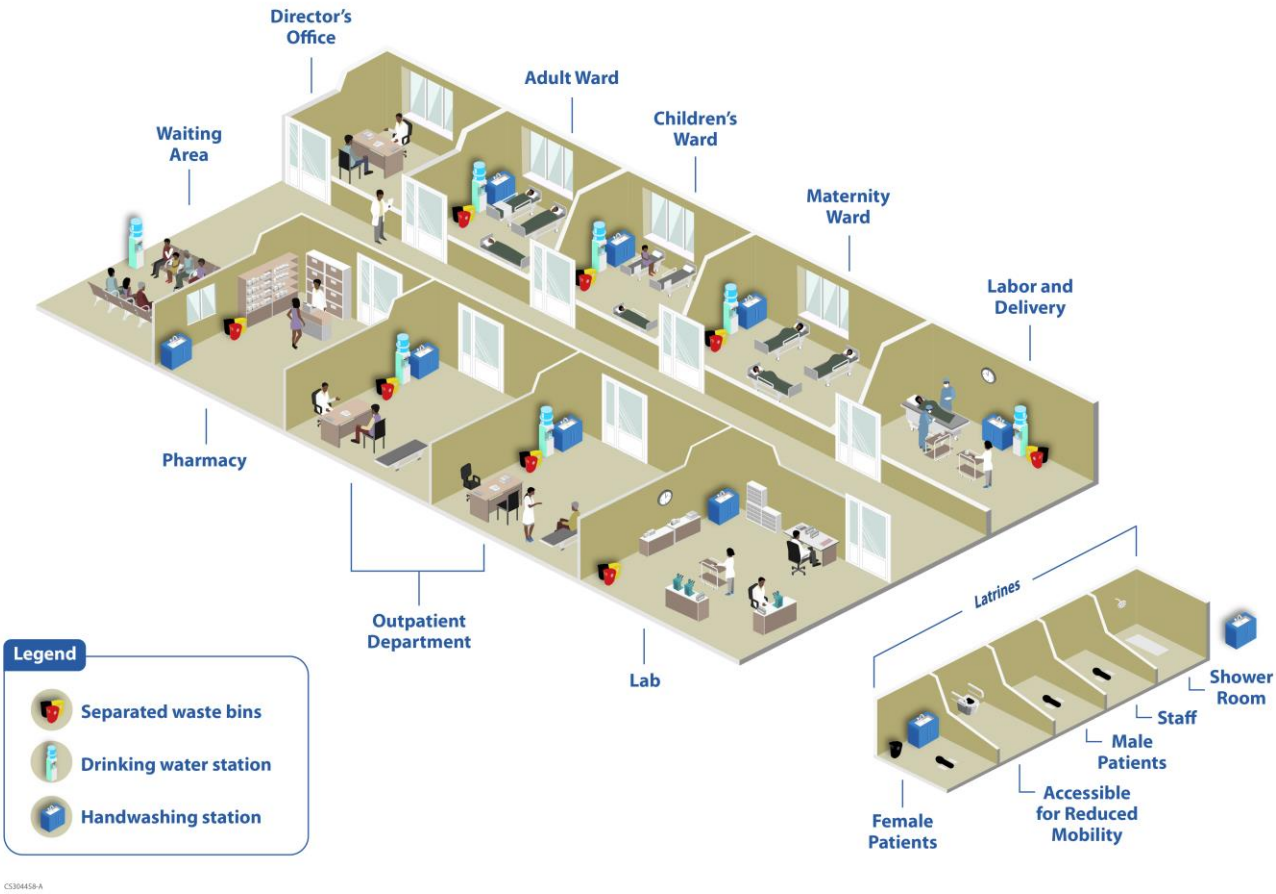
Cleanliness of floors and work surfaces, availability of cleaning SOPs, and exterior fencing were challenging at a number of health centers. It was also very common for cleaning staff to have not received formal training, which is an opportunity for improvement as they are critical members of the infection control team.

Because of differences in how indicators were measured from baseline to follow up, there were some limitations to the ability to compare exact indicators in baseline and follow up data. However, taken globally, it is clear that many WASH domains improved from baseline to follow up, though several key gaps remain.

5. RECOMMENDATIONS

We base recommendations on the goal of “full coverage” for water, sanitation, hygiene, and waste management infrastructure in healthcare facilities. Figure 2 is a pictorial representation of what full coverage might look like in an HCF, with waste bins, handwashing stations, and drinking water stations shown. Drinking water should be available in all areas where patients take oral medication, stay overnight, and wait to see healthcare providers. Handwashing stations should be available in every room where patients and health care workers interact via physical contact, in every room where medications or lab specimens are handled, and within 5 meters of latrines. Waste bins (segregated by color and type) should be present in every room where waste is generated.

While the recommendations in this report highlight the changes to practice and infrastructure that are needed in health centers in order to meet national and international standards, in order to sustain these changes, it is also critical to adjust the supporting environment (such as accountability structures, financing, capacity building, and dissemination of policies/standards).



Water

- Provide improved onsite water supply to the remaining HCFs (in the interim, increase funding allocation for bringing water to the HCF from offsite sources).
- Increase storage capacity for those HCFs that have interruptions to water supply.
- Address water quality issue. One way to do so would be by providing drinking water treatment supplies/training to address water quality issues and treating drinking water in safe storage containers (containers with lids and taps).
- Drinking water should be treated at least once every 48 hours (when using Aquatabs). Drinking water stations should be emptied completely before retreating them. The recommended chlorine residual range for drinking water is 0.2 mg/L to 2 mg/L.
- Label which sources are potable and which are not potable.
- Ensure all stakeholders agree on who has responsibility for managing water supply both at the HCF and at the district.

Sanitation

- Ensure there is at least one toilet suitable for menstrual hygiene management (private, for women only, has a bin with a lid, has soap and water for washing) accessible by female patients.

- Ensure there is at least one toilet accessible for patients with limited mobility (no stairs or steps, handrails for support, door at least 80 cm wide, door handle and seat within reach of someone in a wheelchair or on crutches).
- Conduct patient outreach for proper use of latrines, including information on recommended washing/wiping materials.
- Increase number of latrines where needed.

Handwashing

- Ensure soap is present next to all handwashing stations at all times in a secure manner.
- Provide covered handwashing stations with taps in all rooms where they are needed.
- Consider the provision of alcohol based hand sanitizer and single-use hand drying materials.
- Ensure provision of handwashing stations, including soap, next to latrines (likely by securing the handwashing station to the ground and securing the soap to the station).

Waste management

- Ensure the correct color-coded bins (clearly labeled by type of waste) are present in all necessary rooms.
- Ensure correct segregation of waste between color-coded bins, and that bins are emptied regularly.
- Ensure safe elimination of sharps waste and non-sharps infectious waste in covered, lined pits or incinerators that are inaccessible to the public.

Environment

- Fence the exterior of HCFs (to keep animal waste off of HCF grounds) and fence waste disposal areas (to prevent accidental injury or exposure to infectious waste).
- Ensure solid waste is cleared from HCF compounds regularly and that patients are aware of exactly where to dispose of their own personal waste.

Infection prevention and control

- Put infection control guidelines into place and ensure staff are systematically trained on guidelines.
- Develop cleaning protocols for cleaning staff, train cleaning staff on protocols, and provide adequate PPE for cleaning and waste handling.
- Ensure regular supplies of gloves to ensure adequate use and prevent reuse between patients.
- Train healthcare providers on: (1) hand hygiene practices (critical moments for hand hygiene), particularly focusing on invasive vs. non-invasive procedures and (2) waste segregation.
- Train cleaners on proper cleaning procedures (what to clean, when to clean it, what to clean it with) and use of personal protective equipment, among other topics (see Soapbox Collaborative's TEACH CLEAN materials).

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