

Water, sanitation and hygiene (WASH) services are essential to the provision of safe, quality care in health care facilities (HCF). However, one in four HCF lack basic water, one in five lack sanitation facilities, and two in five lack hand hygiene facilities at points of care globally. This gap in quality care disproportionately affects low- and middle-income countries; in the Least Developed Countries, 17 million women give birth in HCF with inadequate WASH every year (JMP, 2019).

With the substantial resources mobilized for advocacy, research, implementation, and interventions, experts from the WASH and health sectors met in 2016 to discuss the WASH in HCF research agenda to ensure maximizing these resources for greatest impact. Key areas requiring further research were identified, including burden of disease, costing analysis, qualitative research on hygiene behavior change, and evaluation of tools and training. To further a comprehensive strategy, efforts to propose a new strategic research agenda for WASH in HCF are underway.

To facilitate future WASH in HCF research, we summarized WASH in HCF-related resources based on the [literature review](#) conducted in December 2019, categorized by the following themes: *Conditions & Infrastructure, Monitoring, Implementation, Health Systems & Enabling Environment, Sustainability, Costing, Behaviors, Care-Seeking Behaviors & Patient Satisfaction, Healthcare-Associated Infections & Antimicrobial Resistance, Cleaners & Environmental Cleaning, Accessibility, Gender, and Enterprise*. Findings and gaps in the literature are described below to ensure that future research maximizes limited resources for the greatest impact.

<b>Conditions &amp; Infrastructure</b>	
<b>SYNTHESIS</b>	Ample research has been conducted on WASH conditions and infrastructure in HCF. Broadly, there is a lack of human and financial resources as well as WASH services, infrastructure and necessary consumable in HCF in low- and middle-income countries (LMICs). Poor monitoring, leadership, and regulation lead to poor adherence to evidence-based IPC guidelines. Additionally, the research indicates that there is a need for IPC training and refreshers among HCF staff. JMP will continue to provide an overview of basic WASH services, while further assessments and surveys conducted by countries, researchers and/or implementers can dive deeper into the indicators beyond basic services, such as water quality.
<b>GAPS</b>	There is a gap in the literature regarding the management of medical waste in LMICs, although peer-reviewed research on the topic does exist in high-income countries.
<b>Monitoring</b>	
<b>SYNTHESIS</b>	Existing monitoring includes limited data on WASH in HCF settings. The four peer-reviewed articles on monitoring WASH in HCF suggest a need for strengthened national health facility monitoring systems and WASH services and infrastructure in HCF. One study recommends the use of Health Management Information Systems (HMIS) as an entry point for

national monitoring, although annual data collection instruments may be more appropriate in LMICs (Chatterley et al., 2018).

**GAPS** Gaps in the literature demonstrate the need for a better understanding the efficacy of monitoring as WASH in HCF becomes integrated into national monitoring tools, as well as the identification of opportunities to strengthen existing monitoring systems. Better understanding not only how to link monitoring with accountability mechanisms, but how to uphold accountability mechanisms to ensure improved WASH in HCF will be required to meet the 2030 goals.

### Implementation

**SYNTHESIS** There is a good deal of research on implementation is available. Findings find that while trainings and supervisions can improve WASH services and practices, involvement from healthcare workers, long-term implementation plans and leadership and support from national and regional governments are essential to the sustainability of national level initiatives. Routine use of the tools like WASH FIT, coupled with training, supervision and infrastructure improvements can improve WASH services and practices and lead to progress towards achieving Sustainable Development Goals 3 and 6. Additional approaches like Clean Clinic Approach have been well documented.

**GAPS** Despite the quantity of research available, there is a need for national and regional intervention implementation research and more robust implementation science. Specific focus on best practices, gender responsive and climate resilient WASH in HCF, and lessons learned are needed ongoing as more WASH in HCF work is implemented. Lastly, as programs are scaled, research will be needed around factors for successful implementation.

### Health Systems & Enabling Environment

**SYNTHESIS** There is a dearth of WASH in HCF research available regarding health systems and enabling environment. A single study conducted in Malawi regarding the implementation of environmental health policies in HCF concluded that barriers to implementation included insufficient financial support, lack of human resources, poor stakeholder coordination, insufficient training of environmental health actors and incomplete reporting. Successes of the policies included the ability to connect individual HCF and environmental health actors directly to the policy making level of government (McCord et al., 2019).

**GAPS** More research is required in other regions of the world as well as a more in depth look at the barriers and levers within the health system that impact the enabling environment. Preliminary research into sustainability has

found the role of facility management crucial but further research is required to better understand the role of management (and accountability) at all levels of the health system and its impact of WASH service provision.

**Sustainability**

**SYNTHESIS** Based on the literature review, there is a lack of research regarding sustainability. The only peer reviewed article assessing a tool to assess sustainability of safe water provision in HCF in low resource settings suggests insufficient water supplies and funding for maintenance as barriers to sustainability. However, the tool was found to be successful in promoting sustainability through targeted improvements (Robb et al., 2019).

**GAPS** While this study took place in twenty hospitals in three countries, there is a need for replicate studies to assess the feasibility of the tool. Additionally, more research is necessary on the topic of sustainability of other WASH in HCF interventions in LMICs and how that links to issues like the enabling environment.

**Costing**

**SYNTHESIS** The sole cost analysis study of portable handwashing and drinking water stations found that the cost of the intervention per beneficiary justified it's use during the planning and construction of permanent infrastructure (Freedman et al., 2017). Since the 2019 literature review was released, an article was published on a budgeting framework for WASH in HCF.

**GAPS** There is a need for significant research on the cost of WASH in HCF in LMICs. Gaps in the literature include the need for costing studies focusing on long-term and more sustainable interventions, as well as studies based in varying regions. Moreover, this study focused only on water and hand hygiene, leaving a gap in costing studies related to sanitation and waste water management, as well as the cost of interventions in different levels of healthcare facilities. The development and evaluation of a tool for costing WASH in HCF may also prove valuable, as well as the cost-benefit of WASH interventions (including the savings of healthcare-associated infections due to WASH) and the impact of WASH on facility revenue.

**Behaviors**

**SYNTHESIS** Several studies related to behavior suggest that access to drinking water and the infrastructural requirements to enable handwashing was associated with improved healthcare worker use. However, barriers to use include lack of knowledge and training across studies.

**GAPS** While these seek to explain behaviors of healthcare workers specific to safe water and hygiene, there is a lack of studies related to behaviors regarding sanitation. Additionally, all of this research is specific to sub-Saharan Africa suggesting that further research in varying regions is required. Minimal research on nudges in HCF has been conducted.

**NOTE** *Studies that explicitly focused on hand hygiene amongst healthcare workers and/or infection prevention and control practices (IPC) were excluded from this literature review. IPC and hand hygiene in HCF are an entire body of existing literature, though they often overlook the role of infrastructure when assessing adherence or non-clinical settings within the HCF like the toilet. Collaboration in this space between IPC and WASH researchers is needed. Please see “[Evidence of Hand Hygiene as a Building Block for Infection Control](#)” from WHO as a starting point on hand hygiene research in HCF.*

### Care-Seeking Behaviors & Patient Satisfaction

**SYNTHESIS** Peer-reviewed literature pertaining to care-seeking behaviors and patient satisfaction conclude that poor WASH is associated with significant patient dissatisfaction. Integrating hygiene, cleanliness, and a regular supply of water into maternal and newborn health services increased patients’ perceptions of quality of care. In some cases, women were found to expect WASH installations in HCF and consider their quality when choosing HCF. Care-seeking behaviors and patient satisfaction research is specific to the female perspective, with the majority of research specifically pertaining to maternity services.

**GAPS** Further research is necessary to assess the impact of WASH on care-seeking behaviors and satisfaction of a broader population of patients. Additional research is needed on staff satisfaction with WASH services within the HCF, which could be linked to research on occupational health and safety.

### Healthcare-Associated Infections & Antimicrobial Resistance

**SYNTHESIS** The systematic review highlights the fact that few high-quality studies exist which assess the impact of WASH interventions on healthcare-associated infections (HCAI) in LMICs, specifically research around the impact of WASH service provisions. Research pertaining to HCAI suggest that hygiene interventions including cleaning, replacing, and using point of use filters for faucets and showerheads are protective against HCAI in LMICs. However, the provision of resources is not always guaranteed or enough to ensure compliance to WASH interventions. One peer-reviewed article relating to antimicrobial resistance (AMR) labeled antimicrobials as a quick fix to the fractured WASH and care infrastructures and called for long term systematic solutions (Willis et al., 2019).

**GAPS** High-quality research is required to understand how WASH in HCF interventions can support broader efforts to reduce HCAI in LMICs. Current HCAI and AMR research also neglects the threats of AMR to women and children in LMICs, specifically in maternity and neonatal units.

### Cleaners & Environmental Cleaning

**SYNTHESIS** While we know that a lack of cleaning is associated with human infection, only three peer-reviewed articles related to cleaners were included in the literature review. Research on cleaners in HCF in LMICs conclude that training healthcare workers and systems changes are needed to improve the value of the role of cleaning staff and establish improvements in environmental hygiene.

**GAPS** There is a need for peer-reviewed articles that provide evidence-based cleaning interventions, including a practical approach to systematic cleaning in hospitals. Additional research on cleaners – including responsibilities, barriers and challenges in performing their job.

### Accessibility

**SYNTHESIS** The literature review highlights the paucity of available research related to accessibility and WASH in HCF. While there were no peer-reviewed articles classified under this theme, there was one piece of published grey literature. WaterAid Cambodia developed The Participatory Management Tool for user-friendly WASH in healthcare facilities to gather perspectives and collect information. The data were used to make changes to WASH infrastructure, management and practices in HCF to meet the identified needs of users (WaterAid Cambodia, 2018).

**GAPS** There is a need for WASH in HCF accessibility research, to better understand users need, what accessible WASH looks like in different contexts, and how to retrofit existing facilities to be accessible. There is also a need for the development of current WASH in HCF standards and agreements in LMIC settings for the integration of comprehensive accessibility requirements and to provide standardization across sectors and between organizations.

### Gender

**SYNTHESIS** One peer-reviewed article was included in the literature review, suggesting that menstruating female patients require menstrual hygiene management and additional medical support during their stay at hospitals. Furthermore, inpatients and attendants suffered from unsanitary or inadequate WASH facilities and resources.

**GAPS** There is a significant need for research around gender and gender responsive/transformational WASH in HCF. To support additional gender research, there is a need for updated assessment tools for service provision in HCF, specifically WASH indicators. Identification of specific issues which impact women in HCF, focus group discussions with female patients and healthcare workers around their needs and preferences, as well as research women-centered design/best practices are all major gaps. Research should also be prioritized in different settings (hospitals vs. health centers, HCF with birthing services) as well as different cultural contexts.

### Enterprise

**SYNTEHSIS** Available peer-reviewed enterprise studies related to WASH in HCF are inadequate. One of two studies discusses membrane bioreactor technology as a reliable and tested solution for waste water management, including highly polluted wastewater from hospitals (Beier et al., 2012). The second study looks at small water enterprise and sustainability and operational expenditure (Huttinger et al., 2017).

**GAPS** Because the articles are limited to wastewater treatment and treated water, additional research is required on the topic. Further research should also include sanitation- and hygiene-related enterprises, as those enterprises come to fruition.

### Conclusion

While there is a large quantity of conditions and infrastructure and implementation research, based on the literature review only four peer-reviewed articles have been published on monitoring. Further monitoring research requires the development of a comprehensive tool for the assessment of WASH in HCF. Similar to monitoring, gender research also requires an updated assessment tool for WASH service provision in HCF.

According to the literature review, there is a dearth of studies that have been published on health systems and enabling environment, sustainability, and costing. Similarly, gender and enterprise research was limited. Additionally, no peer-reviewed accessibility studies have been published. These are critical topics that need to be researched. Research on cleaners was also limited, though there is a strong need for cleaning to become evidence-based science.

Behavior research was limited to water and hygiene, suggesting a need for further research on behaviors related to sanitation. Despite there being more care-seeking behaviors and patient satisfaction research, compared to other themes, inferences made from the research is not generalizable to broad populations as they focus on the female perspective, specifically patients who utilize maternity services. While some studies exist related to HCAI and AMR, the literature review suggests a gap in the quality of these studies.

Quite a bit of WASH in HCF in LMICs related research is available. However, it is apparent that while some themes are saturated with research, other themes like costing and sustainability require most robust research. We hope that this summary of the literature review can assist in

identifying gaps in the literature to guide future WASH in HCF related research and to ensure greatest impact.

We would also like to add that in addition to the research we've done, there are other important aspects related to WASH, including infection prevention and control (IPC), clean births and hand hygiene. Collaboration between WASH and IPC/hand hygiene researchers, as well as those researching topics including maternal and child health, quality care, patient safety, AMR, and health workforce.