Protecting healthcare workers and patients is critical to reduce the spread of the disease. In this brief we highlight three urgent actions:

1. Distribution of infection prevention and control (IPC) policies and guidelines to all health facilities;
2. Manufacturing and distribution of IPC supplies to health facilities; and
3. Mass media hand hygiene behavior change campaigns for health workers and the general population.

Leading epidemiological models show that, even with draconian suppression measures, COVID-19 rapidly overwhelms healthcare systems. As more patients are hospitalized, healthcare workers at the frontline of delivering care are at the greatest risk of contagion. Worse, if infection prevention and control (IPC) systems are

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In China’s Wuhan city, where COVID-19 was first reported, an overwhelmed healthcare system contributed to a fatality rate of 5.8% versus 0.7% in the rest of the country, in spite of considerable centralized support to increase the city’s healthcare capacity.\(^2\) Italy’s healthcare workers are facing high rates of infection at 5 times that of the general population. Similar levels were reported for Hubei’s province, where Wuhan city is located.\(^3\) In short, healthcare workers are disproportionately affected.

Those are the grim statistics for high-income and high-capacity countries. In low- and middle-income countries, the problem might be worse. In Africa, only a few countries have put in place national policies on safe healthcare practices and monitoring systems.\(^7\) By the end of the last Ebola epidemic, the rate of infection among healthcare workers was 21 to 32 times that of the general population in the most affected countries. These were low-income countries in West Africa, with systems unprepared to face such an outbreak.\(^8\) In the current pandemic, this could further overwhelm health care systems in regions such as Africa or the Eastern Mediterranean, reporting among the lowest healthcare worker densities worldwide at 2 and 5 per 1000 people, or 14% and 33%, respectively, of those available in Europe.\(^9\) The source of vulnerabilities in low- and middle-income countries are not well studied, but a study by Bedoya et al. (2017) contributes to our understanding of such vulnerabilities through the largest data collection effort on IPC practices and patient safety in primary care settings in any low- and middle-income country.\(^10\)

To understand their results, it is helpful to think of a patient journey through a primary care visit. They will first see a nurse, who must wash his/her hands before the examination. The nurse will then go through the examination, and will have to disinfect the thermometer with an alcohol-based solution. To conduct an invasive procedure, for instance, attending to an open wound, the nurse must wear personal protective equipment (PPE) such as gloves, and segregate infectious waste into appropriate containers. If the patient requires an injection or a blood draw, additional practices will be required. In IPC terminology, every action by a healthcare worker that should trigger an IPC action (washing hands, wearing gloves, segregating waste appropriately) is called an “indication.” If the healthcare worker does not complete this action, it is recorded as a “violation.” Building on WHO work, Bedoya et al. (2017) developed and deployed an observation tool that tracked 14,328 patients, recording and assessing 106,464 indications through their patient journeys in 935 facilities in Kenya.\(^11\)

IPC’s Vulnerabilities in Two Figures

The analysis reveals a high ratio of IPC violations per indication across different procedures (Figure 1). There are an average of 5.1 safety violations out of 75 indications triggering a safety action during outpatient visits. Safety violations rapidly increase with the number of procedures per visit (examination, blood draws and injections). IPC standard provisions assume that each person is potentially infected or colonized with a pathogen that could be transmitted. Therefore, the importance of these violations

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\(^{2}\) IPC is "a scientific approach and practical solution designed to prevent harm caused by infection to patients and health workers. It is grounded in infectious diseases, epidemiology, social science and health system strengthening, which have been designed to reduce the spread of infections in healthcare settings." World Health Organization. Infection Prevention and Control. https://www.who.int/gpsc/ipc/en/. [cited 20 March 2020].

\(^{3}\) As Peter Piot, co-discoverer of Ebola, stated: “Clinics that failed to observe this [safe injection practices] and other rules of hygiene functioned as catalysts in all additional Ebola outbreaks.” Their mistakes, “drastically sped up the spread of the virus, or made the spread possible in the first place.”


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\(^{11}\) The study uses direct observation of patients interacting with healthcare workers in all facilities of three regions in Kenya. Compliance with IPC practices to prevent harm caused by infection to patients and healthcare workers were assessed including hand hygiene, use of gloves, disinfection of reusable devices such as thermometers, segregation of infectious waste, and injection and blood draw safety.
depends on the risk of the pathogens being transmitted from one surface to another in that setting. In a pandemic of a highly infectious disease like COVID-19, these violations become a significant means of transmission.

On average Bedoya et al. assess compliance with 20 IPC practices at only 32%, with notable successes in some domains and failures in others. Most troublingly, compliance with hand hygiene, the cornerstone of IPC—and a critical practice to fight COVID-19’s spread—was assessed at only 2%, the lowest level across all practices (Figure 2). Yet, safe practices in injections and blood draws (IBD) were followed for 87% of indications. Knowledge, supplies and practices are aligned in IBD; most likely this is associated with an increased HIV risk and intensive campaigns to prevent its transmission.

We now turn to three areas of IPC with significant constraints that are critical to prepare for the current pandemic. The domains analyzed here are by no means comprehensive. IPC health facility preparedness resources for COVID-19 are available in the WHO’s Coronavirus disease (COVID-19) technical guidance.

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12 The virus is surrounded by oily lipid molecules, which break apart on contact with soap.
1. **Immediate Provision of IPC Policies and Procedures to Health Facilities:** The WHO guidance includes, among others, triage assessment for early identification of cases among patients in admission, and safe operating procedures such as hand hygiene, disinfection, and use of appropriate personal protective equipment (PPE). What we learned in low-capacity contexts like Kenya is that triage assessment is weak and only 12% of facilities have skilled staff for coding patients at first point of contact and isolating those with suspected infections. Further, standard operating procedures on key IPC practices are absent overall with only 2% of facilities with a hygiene protocol and 5% with IPC guidelines. As a result, immediate provision of information and support to health facilities on minimum IPC requirements for IPC policies and protocols during the pandemic is critical.

2. **Manufacturing and Provision of Critical IPC Supplies to Health Facilities:** The WHO recommends essential IPC supplies for safe practices, such as hand hygiene, disinfection and sterilization, and PPE for healthcare workers, including standard (gloves, gowns, masks) and specialized PPE like N95 masks and eye protection (e.g., goggles or face shields) for certain procedures. In Kenya, minimum supplies for hand hygiene were available in 70% of facilities—either running water and soap or alcohol-based hand-rub—but only 5% reported the stricter complete set including single-use towels, which is recommended to maximize the effectiveness of hand hygiene. For outpatient services, 72% of facilities had gowns, 84% had gloves, 47% had disinfectant available, and only 15% of facilities had face masks. The number of facilities without important supplies in key departments, such as admission and outpatient services, point to suboptimal capacity to protect healthcare workers and patients in the absence of a crisis. This is severely exacerbated during the pandemic—when potential infected patients must also wear a mask—and contributes to the spread of the disease, as well as to increased infection and potential death of health workers. Based on the shortages reported in high-capacity countries such as the US and Italy, **countries must redirect manufacturing capacity towards the production and delivery of needed supplies.** Supplies are critical to protect healthcare workers and patients, and reduce the spread of the disease. This requires tracking the number of healthcare workers and patient loads, infection rates, stocks and demand, as well as planning for the production and provision of timely, efficient access to the supplies required to fight the spread of the disease.

3. **Mass Media Hand Hygiene Behavior Change Campaigns:** There is real progress in some domains in IPC practice in Kenya, particularly in injections and blood draw safety with compliance reaching 100% for the action of “using new needles and syringes for injections and blood sampling.” However, as Figure 3 shows, some basic practices like hand hygiene compliance remain extremely low even with availability of required supplies (3.2%) and supplies and knowledge (4.2%). Gaps are reported across several domains. This problem is common to many countries. Appropriate hand hygiene was performed in less than 1% of birth deliveries in a study in India. In Australia 44% of healthcare workers performed hand hygiene before a national intervention. How to engender behavior change—particularly hand hygiene—remains the single biggest challenge for patient safety and IPC everywhere, and of paramount importance in the pandemic. Improving hand hygiene practices in the whole population is also urgently required. Currently, there is no robust evidence of the impact of individual or packaged interventions recommended by the WHO (alcohol-based hand rubbing, education, reminders, performance feedback, and managerial support) on behavior and infections. **Mass media behavioral campaigns or edutainment (short for “entertainment education”) delivered by professional mass media producers and distributors should be considered to impact behavioral change in the short- and long-term.** These campaigns have been proven highly effective, for example, to change behavior and health outcomes outside of healthcare settings for campaigns targeting HIV prevention in

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15 According to Kenya National IPC Guidelines supplies include running water (in a sink or from a bucket with a tap or a bucket with a pitcher), soap (either bar or liquid soap), and availability of single-use towels. The standards set by the WHO and CDC are water, soap, and single-use towel or alcohol-based handrub. The study uses the more lenient indicator without single towels based on the main tools from the WHO and CDC. World Health Organization. **WHO Guidelines on Hand Hygiene in Health Care.** World Health Organization, 2009. https://www.who.int/gpsc/5may/tools/9789241597906/en/. [cited 20 March 2020]. Centers for Disease Control and Prevention. **Guideline for Infection Prevention for Outpatient Settings: Minimum Expectations for Safe Care.** Atlanta, USA: CDC. 2014; 18–33. https://www.cdc.gov/hai/sets/ outpatient/outpatient-care-guidelines.html. [cited 20 March 2020].


17 Figures related to availability of gowns, gloves, disinfectant, and face masks are from the Kenya Patient Safety Impact Evaluation Endline Survey, 2018.
SUPPORTING HEALTH FACILITIES IMPROVE INFECTION PREVENTION AND CONTROL TO FIGHT THE COVID-19 PANDEMIC

Surveillance, prevention, and control measures. Surveillance and response measures to support IPC are often missing in low-resource settings and critical to fight the pandemic. South Korea’s successful initial handling of the COVID-19 outbreak is in part due to strengthened surveillance and infection control response systems to contain the 2015 MERS outbreak and continued incidence of MERS cases thereafter. South Korea’s COVID-19 surveillance and infection control response includes early patient detection with rapid expansion of screening clinics and testing.

The systems for prevention and control of infections that are critical for a well-functioning health system are indispensable during a pandemic of a highly infectious disease such as COVID-19. In the past, unprepared health systems across the world, even in high-income countries, contributed to disease transmission during the epidemics of Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). These episodes led some to improve their infection surveillance, prevention, and control measures.

Notes: Estimates are based on data from facilities in 3 countries—Kakamega, Kilifi and Meru—and for which healthcare workers’ compliance, knowledge, and supplies were all non-missing (88,814 indications of the 106,464 indications). When conditioned on supplies, hand hygiene is conditioned on availability of running water and soap or an alcohol-based handrub solution.

Source: Bedoya et al. (2017)

Figure. 3. IPC knowledge-supplies-practice gap: Hand hygiene, Kenya

Percent of healthcare workers that comply with practice, know the practice, and have access to the required supplies

| Knowledge | 43.0% |
| Supplies | 70.0% |
| Compliance | 2.4% |
| Compliance (if supplies) | 3.2% |
| Compliance (if supplies and knowledge) | 4.2% |


They also recommend the designation of an infection control staff member at each healthcare institution to ensure infection prevention measures are reinforced and monitored. Singapore and Hong Kong, which faced SARS outbreaks in the past have also had success in controlling the initial spread of the virus. Their basic tactics at health facilities rely on wearing regular PPE for each patient (surgical masks and gloves), performing appropriate hand hygiene and disinfecting surfaces after each patient. They only use more specialized PPE (N95 masks, face protectors, goggles and gowns) for potential infected cases when procedures that could aerosolize respiratory secretions. They also rely on appropriate triage of suspected cases and social distancing in health facilities to limit exposure of healthcare workers. Learning from countries that have invested in IPC and surveillance systems such as South Korea, Singapore and Hong Kong is essential to protect healthcare workers and patients, reduce risk at health facilities, and help slow down community spread. Providing significant support to low-capacity countries to strengthen their vulnerable systems is of primary importance to reduce the potentially devastating consequences they may face and as a protective action to limit the spread of COVID-19 worldwide.


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28 “Level D” refers to whole-body suits (including a full-length gown, goggles, N95 mask, gloves, shoe covers, and other components) that were defined in response to the 2015 outbreak of MERS in South Korea. Choi, JS, Kim, KM. Crisis prevention and management by infection control nurses during the Middle East respiratory coronavirus outbreak in Korea. American Journal of Infection Control. 2016;44(480–1). https://doi.org/10.1016/j.ajic.2015.10.032