

TAILORING RESPONSE TO PARTNER NEEDS AND TARGETED INTERVENTIONS DURING THE SECOND YEAR OF THE COVID-19 PANDEMIC:

**REPORT OF AN INTERNATIONAL SURVEY OF LMIC  
FACILITIES AND PERIOPERATIVE CLINICIANS ON  
RESOURCES AND PROCESSES DURING COVID-19, AND  
RECOMMENDATIONS**



## PREFACE:

# Introduction

The COVID-19 pandemic had a profound impact on surgical services and operative volume, with many facilities in high-income countries cancelling or postponing cases. In low- and middle-income countries (LMICs) where most surgical procedures are either urgent or emergent, providers do not have the same ability to close operating rooms (ORs) and repurpose clinical areas for COVID-19 care.

The surgical ecosystem includes many of the critical components that are essential for protecting healthcare workers and patients from the spread of infection. In collaboration with Lifebox, Smile Train and Jhpiego, we conducted a global survey of facilities and perioperative providers to assess the **availability of materials and safety processes** for preventing transmission of SARS-CoV-2 in the perioperative setting.

**This report presents a high-level overview of our findings and some actionable recommendations that may enhance the safety of providers during the COVID-19 pandemic.**

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## PART 1:

# Materials & Methods

A facility-level survey was distributed to contacts of Lifebox, Smile Train, and Jhpiego who work at partner hospitals. A second survey aimed at individual providers was disseminated widely through our networks and via social media. Online surveys were translated into nine languages. Responses were collected in October 2020, and all data were anonymized. Participation was voluntary, ethical approval was obtained, and data were analyzed using Stata v.15.1.

## PART 2:

# Results

We received 230 facility survey responses pertaining to the availability of materials, personal protective equipment (PPE), and processes in place to prevent transmission of the SARS-CoV-2 coronavirus. In addition, we received 539 individual responses from providers working in these settings with 507 responses from LMICs, and 32 from high-income countries (HICs), from 63 total countries. The majority of surveys were completed by surgeons, anesthesiologists or non-physician anesthesia providers. Over half of respondents in LMICs had cared for COVID-19 patients and most worked at referral hospitals with a roughly even split between private and public facilities.

| RESULTS                             |               |                |               |         |
|-------------------------------------|---------------|----------------|---------------|---------|
| Demographics                        | LMIC Facility | LMIC Providers | HIC Providers | p-value |
| Number & respondent type            | 230           | 507            | 32            |         |
| Surgery                             | 132 (57.9%)   | 187 (36.9%)    | 4 (12.5%)     | 0.03    |
| OB/ GYN                             | 7 (3.1%)      | 26 (5.1%)      | 1 (3.1%)      |         |
| Anesthesia                          | 48 (21.1%)    | 245 (48.3%)    | 25 (78.1%)    |         |
| Nursing                             | 7 (3.1%)      | 27 (5.3%)      | 1 (3.1%)      |         |
| Administrator                       | 19 (8.3%)     | 2 (0.4%)       | 0 (0.0%)      |         |
| Other                               | 15 (6.6%)     | 15 (3.0%)      | 1 (3.1%)      |         |
| Provided care for COVID-19 patients | 132 (58.1%)   | 244 (48.1%)    | 25 (78.1%)    | 0.002   |
| Hospital Level                      |               |                |               |         |
| First Level/District                | 17 (10.8%)    | 45 (8.9%)      | 1 (3.1%)      |         |
| Second Level/General                | 40 (25.5%)    | 73 (14.4%)     | 5 (15.6%)     |         |
| Third Level/Referral                | 100 (63.7%)   | 276 (54.4%)    | 22 (68.8%)    |         |
| Public                              | 69 (49.6%)    | 167 (32.9%)    | 19 (59.4%)    | 0.006   |
| Private                             | 70 (50.4%)    | 128 (25.2%)    | 3 (9.2%)      |         |

## PART 3:

# Material Resource Availability

Facilities in LMICs frequently lacked basic PPE (N95 or other respirators), viral filters on anesthesia machines, and other critical protective materials. Providers in LMICs reaffirmed these shortages, with 32% not having routine access to N95s and 41% having purchased their own. Similarly, LMIC providers often reported purchasing their own surgical masks (22%) and eye protection (37%). Pulse oximetry was widely available in operating rooms, where 88% had a pulse oximeter for each OR bed. Where there was incomplete coverage, it was in the order of <1 uncovered OR. Postanesthetic care (PACU) areas, however, suffered shortages of pulse oximetry with only 66% having a pulse oximeter for each PACU bed, and the remaining 35% having a median availability of only 2 out of 5 PACU beds.

| RESULTS                                                      |                       |                        |                            |
|--------------------------------------------------------------|-----------------------|------------------------|----------------------------|
| Perioperative Provider Survey                                | LMIC Provider         | HIC Provider           | p-value                    |
| N                                                            | 507                   | 32                     | --                         |
| <b>Personal Protective Equipment not routinely available</b> |                       |                        |                            |
| N95                                                          | 162 (32.0%)           | 4 (12.5%)              | 0.021                      |
| Surgical Mask                                                | 152 (30.0%)           | 10 (31.2%)             | 0.88                       |
| Non-sterile gloves                                           | 95 (18.7%)            | 3 (9.4%)               | 0.18                       |
| Eye protection                                               | 142 (28.0%)           | 3 (9.4%)               | 0.021                      |
| <b>Had to purchase Personal Protective Equipment</b>         |                       |                        |                            |
| N95                                                          | 210 (41.4%)           | 3 (9.4%)               | <0.001                     |
| Surgical Mask                                                | 110 (21.7%)           | 1 (3.1%)               | 0.011                      |
| Non-sterile gloves                                           | 66 (13.0%)            | 1 (3.1%)               | 0.16                       |
| Eye protection                                               | 185 (36.5%)           | 12 (37.5%)             | 1.00                       |
| <b>LMIC Facility Survey</b>                                  |                       |                        |                            |
| N=230                                                        |                       |                        |                            |
| <b>Other materials</b>                                       | <b>None Available</b> | <b>Severe Shortage</b> | <b>Moderate Shortage</b>   |
| HEPA filter                                                  | 51 (25.8%)            | 30 (15.2%)             | 31 (15.7%)                 |
| ETT                                                          | -                     | 12 (6.1%)              | 30 (15.2%)                 |
| Alcohol solution                                             | 7 (3.5%)              | 12 (6.0%)              | 15 (7.5%)                  |
| Bleach solution                                              | 8 (4.0%)              | 8 (4.0%)               | 18 (9.1%)                  |
| <b>Pulse Oximetry</b>                                        | <b>100% Coverage</b>  | <b>Meds (media)**</b>  | <b>Pulse ox (median)**</b> |
| OR Pulse Oximetry                                            | 201 (88.2%)           | 4.0 (2.0, 7.0)         | 3.5 (2.0, 6.5)             |
| PACU Pulse Oximetry                                          | 148 (65.5%)           | 5.0 (3.0, 8.0)         | 2.0 (1.0, 3.0)             |
| <i>**For those ORs without complete bed coverage</i>         |                       |                        |                            |

## Action items & recommendations:

1. Increase access to critical PPE and other protective equipment:
  - a. **High quality viral filters** (such as a HMEF- Heat and Moisture Exchanger in combination with a microbiological filter) are most critically needed (31% facilities moderate or severe shortage, 26% have none)
  - b. **N95 or other respirators** are also needed (51% facilities moderate shortage or worse, 41% of LMIC providers buying their own)
  - c. **Surgical masks** also in shortage (30% LMIC providers without routine access, 22% buying their own)
2. Strengthen supply chains including availability of information on required specifications and pricing for items such as HEPA/viral filters for provision of anesthesia, N95 respirators and surgical masks.
3. Build evidence and share guidance on proper use of high-quality viral filters (i.e. HMEF) in the perioperative and critical care setting, including placement in the circuit, duration of use, and guidance for extended or reuse and possible decontamination. Guidelines from WFSA are available [here](#)<sup>1</sup>.
4. Train providers on proper use, decontamination, reuse and placement of consumable anesthesia items such as plastic circuit tubing, endotracheal tubes, oxygen delivery tubing and viral filters.
5. Compensate for financial burden placed on LMIC providers buying their own PPE.
6. Directed donation of pulse oximeters specifically to PACUs may improve coverage.

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<sup>1</sup> <https://www.apsf.org/faq-on-anesthesia-machine-use-protection-and-decontamination-during-the-covid-19-pandemic/>

## PART 4:

# PPE Reuse

In severe shortages, which are often chronic in LMICs, PPE is frequently reused with or without decontamination between uses. Overall, reports from facilities and LMIC providers were fairly consistent, with the exception of N95s. Considerably more decontamination and reuse was occurring at provider level (43%) than recognized at facility level (19.6%). Most of these providers were using the “wait and reuse” method which can be employed at home; therefore, may not have been recognized at the facility level. A substantial number were also using inappropriate methods such as soap & water, bleach, and alcohol -which can damage the filter layer and render N95s less effective. Others were using methods such as UV-C and heat, which can be effective if performed properly. Approximately 8% of facilities and providers in LMICs reported reuse of N95s without reprocessing. Surgical masks were reused without reprocessing around 4% of the time. When decontaminated, both inappropriate methods such as soap & water, alcohol and bleach, and possibly acceptable methods such as wait & reuse and heat, were all used. Gloves were rarely reused or decontaminated.

## RESULTS

| PPE Reuse & Reprocessing                    | N              |     | N95                                                                                                                | Surgical mask                                                                                     |
|---------------------------------------------|----------------|-----|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| No reuse                                    | LMIC Providers | 507 | 191 (37.7%)                                                                                                        | 328 (64.7%)                                                                                       |
|                                             | HIC Providers  | 32  | 17 (53.1%)                                                                                                         | 27 (84.4%)                                                                                        |
| Reuse without reprocessing                  | LMIC Providers | 507 | 38 (7.5%)                                                                                                          | 18 (3.6%)                                                                                         |
|                                             | HIC Providers  | 32  | 4 (12.5%)                                                                                                          | 0 (0.0%)                                                                                          |
| Some reprocessing + common methods reported | LMIC Providers | 507 | 170 (42.6%)<br>*Facility reports 19%                                                                               | 51 (12.9%)                                                                                        |
|                                             |                |     | Method (N):<br>Wait & reuse (76),<br>UV-C (22),<br>Soap & Water (20),<br>Alcohol (16),<br>Heat (15),<br>Bleach (5) | Method (N):<br>Wait & reuse (13),<br>Heat (12),<br>Soap & Water (10),<br>Alcohol (4),<br>UV-C (4) |
|                                             | HIC Providers  | 32  | 8 (27.4%)                                                                                                          | 1 (3.6%)                                                                                          |
|                                             |                |     | Wait & reuse (4),<br>Hydrogen peroxide (1),<br>Heat (1),<br>Alcohol (1),<br>Bleach (1)                             | Wait & reuse (1)                                                                                  |

## Action items & recommendations:

1. Provide education on acceptable methods of N95 and mask decontamination as preferential practices at the facility and individual level.
2. Provide education to both facilities and providers regarding the inappropriateness of current methods for respirator and mask decontamination by explaining that alcohol, bleach, soap & water damage the filter.
3. Expand capacity at facilities for centralized methods of N95 decontamination such as UVC and heat treatment.
4. Provide guidance to providers on the “wait & reuse” method - which may be acceptable but needs to be employed correctly.

## PART 5:

# Training & Protocol Use

Some facilities lacked specific protocols and training for providers on how to minimize infectious risks from SARS-CoV-2. About 59% of providers in LMICs had received training in COVID-19 OR protocols as compared to 78% of HIC counterparts. Implementation of the COVID-19 OR protocols was also lower in LMICs (56%) than HICs (84%).

| RESULTS                                             |                       |                |               |         |
|-----------------------------------------------------|-----------------------|----------------|---------------|---------|
| Training & Protocol Use                             | LMIC Facility         | LMIC Providers | HIC Providers | p-value |
| N                                                   | 230                   | 507            | 32            |         |
| <b>Training provided on COVID-19 related topics</b> |                       |                |               |         |
| OR protocol                                         | 150 (75.4%)           | 300 (59.2%)    | 25 (78.1%)    | 0.064   |
| COVID-19 SPC                                        | 110 (55.6%)           | 229 (45.2%)    | 15 (46.9%)    | 0.84    |
| PPE                                                 | 166 (83.8%)           | 366 (72.2%)    | 27 (84.4%)    | 0.26    |
| <b>Use of COVID-19 related protocols or tools</b>   |                       |                |               |         |
|                                                     | Always or Usually Use | Routinely Use  |               |         |
| OR protocol                                         | 101 (51.8%)           | 286 (56.4%)    | 27 (84.4%)    | 0.014   |
| COVID-19 SPC                                        | 99 (51.1%)            | 177 (34.9%)    | 10 (31.2%)    | 0.49    |

### Action items & recommendations:

1. Support training on specific OR protocols and checklists for COVID-19 patients, as well as PPE and infection prevention control practices, to close remaining gaps in knowledge.
2. Each country team collaborates with the Ministry of Health to align with their guidelines developed around surgery in the COVID-19 era.
3. Support the implementation of protocols and checklists in ORs via tailoring to local context, frequent check-ins and refresher sessions as needed. Provide COVID-19 Checklist information and training in the context of WHO Surgical Safety Checklist use to enhance use of both safety tools.

## PART 6:

# Safety

Perhaps most importantly, almost twice as many providers reported feeling unsafe at work in LMICs compared to those in HICs (28% vs 16%). Analysis of qualitative data further demonstrated a significant number of providers fearful of personal infection, or infection of their colleagues, family or patients as a result of workplace exposures. The majority (68%, 299/439) of those who responded stated their biggest fear in the workplace was personal, family or colleague infection. Those who had received training in a variety of COVID-19 IPC topics and those who used the protocols and checklists they had been trained in felt much safer than those who had not.

| RESULTS                            |                |               |         |
|------------------------------------|----------------|---------------|---------|
| Perceived safety managing COVID-19 | LMIC Providers | HIC Providers | p-value |
| N                                  | 507            | 32            |         |
| Unsafe                             | 142 (28.0%)    | 5 (15.6%)     | 0.044   |
| Neutral                            | 27 (5.3%)      | 0 (0.0%)      |         |
| Safe                               | 257 (50.7%)    | 24 (75.0%)    |         |

## PART 7:

# Conclusions

In lower resourced settings, large gaps remain in critical PPE and other protective materials despite the efforts of governments and the international community. In addition, protocols and processes for maximizing the impact of such materials and employing them appropriately and effectively are widely lacking. There are some limitations to the interpretation of this study, of course. Because surveys were voluntary and distributed via social media, there may be selection bias toward those with access and frequent use of social media, and those experiencing more severe resource shortages may have been more motivated to participate in the survey. Furthermore, the number of HIC respondents was low, and while a useful comparison may not be representative of the HIC experience overall. Regardless, these findings do represent the working conditions of the partners who replied, and as such Lifebox and partners are working to close gaps in knowledge and training, while advocating for improved access to PPE. This information can help guide resource allocation and intervention design, for those working directly in or supporting the global COVID-19 response, to improve the safety of our colleagues and friends.



[Lifebox.org/covid-safety](https://lifebox.org/covid-safety)

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# PART 8:

# Visual Abstract

