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Perioperative provider safety in the pandemic: Development, implementation and evaluation of an adjunct COVID-19 Surgical Patient Checklist

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Abstract

The COVID-19 pandemic has strained surgical systems worldwide and placed healthcare providers at risk in their workplace. To protect surgical care providers caring for patients with COVID-19, in May 2020 we developed a COVID-19 Surgical Patient Checklist (C19 SPC), including online training materials, to accompany the World Health Organization Surgical Safety Checklist. In October 2020, an online survey was conducted via partner and social media networks to understand perioperative clinicians' intraoperative practice and perceptions of safety while caring for COVID-19 positive patients and gain feedback on the utility of C19 SPC. Descriptive statistics were used to characterise responses by World Bank income classification. Qualitative analysis was performed to describe respondents' perceptions of C19 SPC and recommended modifications. Respondents included 539 perioperative clinicians from 63 countries. One-third of respondents reported feeling unsafe in their workplace due to COVID-19 with significantly higher proportions in low (39.8%) and lower-middle (33.9%) than higher income countries (15.6%). The most cited concern was the risk of COVID-19 transmission to self, colleagues and family. A large proportion of respondents (65.3%) reported that they had not used C19 SPC, yet 83.8% of these respondents felt it would be useful. Of those who reported that they had used C19 SPC, 62.0% stated feeling safer in the workplace because of its use. Based on survey results, modifications were incorporated into a subsequent version. Our survey findings suggest that perioperative clinicians report feeling unsafe at work during the COVID-19 pandemic. In addition, adjunct tools such as the C19 SPC can help to improve perceived safety.

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Anaesthesia safety, checklist, COVID-19, Low- and Middle-Income Country (LMIC), surgical safety

Introduction

The strain placed on surgical systems by the COVID-19 pandemic has been profound. It has resulted in cancellations of elective operations and delays in emergency and essential surgical care in an already fragile ecosystem.[1] Surgical systems have rapidly adapted to provide ongoing access to emergency and essential surgical care, while ensuring patient and provider safety. However, the risk to frontline healthcare workers during this pandemic is substantial, and systemic, infrastructure and resource constraints pose huge challenges.[2–5]

To address some of the safety concerns imposed by the pandemic, perioperative care providers mobilised to provide guidance on operating room conduct.[6–13] Practically, introducing new guidelines during a viral pandemic is difficult. While intended to be helpful, they may add a cognitive load to already stressed clinicians. This can result in implementation of COVID-19 infection prevention practices with variable fidelity.

In the early weeks of the pandemic, Lifebox (https://lifebox.org), in collaboration with the World Federation of Societies of Anaesthesiologists (WFSA) (https://wfsahq.org) and Smile Train (https://www.smiletrain.org), developed a COVID-19 Surgical Patient Checklist (C19 SPC) (Figure 1).[14] This perioperative safety tool was designed to aid surgical teams in coordinating new behaviours when caring for COVID-19 surgical patients and meant to be used in conjunction with the World Health Organization Surgical Safety Checklist (WHO SSCL). It was developed through a consultative process that included review of available best practice evidence, recommendations by reputable international organisations and perioperative clinician consensus with feedback from partners across several high- (HIC), middle- and low-income (LIC) countries. The goal was to promote recommended practice for operating room behaviours that reduce the risk of SARS-CoV-2 transmission to perioperative care providers. The checklist also incorporated a resource page for rapid access to information on aerosol-generating procedures, mitigation strategies, personal protective equipment (PPE) use, donning and doffing, and on decontamination and reuse of anaesthesia equipment where absolutely necessary.[15–20]

The C19 SPC was disseminated through partner and social media networks beginning in May 2020. To accompany this distribution, a package of training materials was created by Lifebox and Jhpiego (Johns Hopkins Program for International Education in Gynecology and Obstetrics) (https://www.jhpiego.org) and is hosted online (https://www.lifeboxlearningnetwork.com/course?courseid=covidspc). In addition to the online training resources, from May 2020 to March 2021 Lifebox, Smile Train and Jhpiego delivered eight Training of Trainer sessions to partner institutions via Zoom. Trained trainers reported delivering an additional seven training sessions locally in person.

While consensus recommendations for theoretical adaptation of the WHO SSCL during the COVID-19 pandemic have been previously published,[21] actual implementations of these recommendations have not been studied. The aim of this evaluation was to use a structured approach to better understand perioperative clinicians' intraoperative practice and perceptions of safety while managing COVID-19 positive or suspected patients undergoing surgery. We also wanted to gain feedback on the utility of the C19 SPC to help inform future modifications.

Methods

Survey design

Institutional Review Board exemption was obtained from Boston Children's Hospital (20 July 2020). An online cross-sectional survey was created to evaluate the use of the C19 SPC by perioperative providers when caring for COVID-19 positive or suspected patients undergoing surgery. To ensure cross-disciplinary and broad geographic input and content validity, a questionnaire was developed by representatives from anaesthesia, surgery and nursing disciplines from Ethiopia, India, Cambodia, Nigeria, Rwanda, the United States and the United Kingdom. In addition to basic demographics, the questionnaire included questions on the use of the C19 SPC, associated training, most and least useful aspects of the C19 SPC, recommended modifications, and perceptions of safety during the COVID-19 pandemic. Free text responses were incorporated to obtain qualitative data regarding key concerns of survey respondents when managing COVID-19 positive patients, the impact of the C19 SPC utilisation on operating room practice, any challenges in its use and their reasoning for any changes in

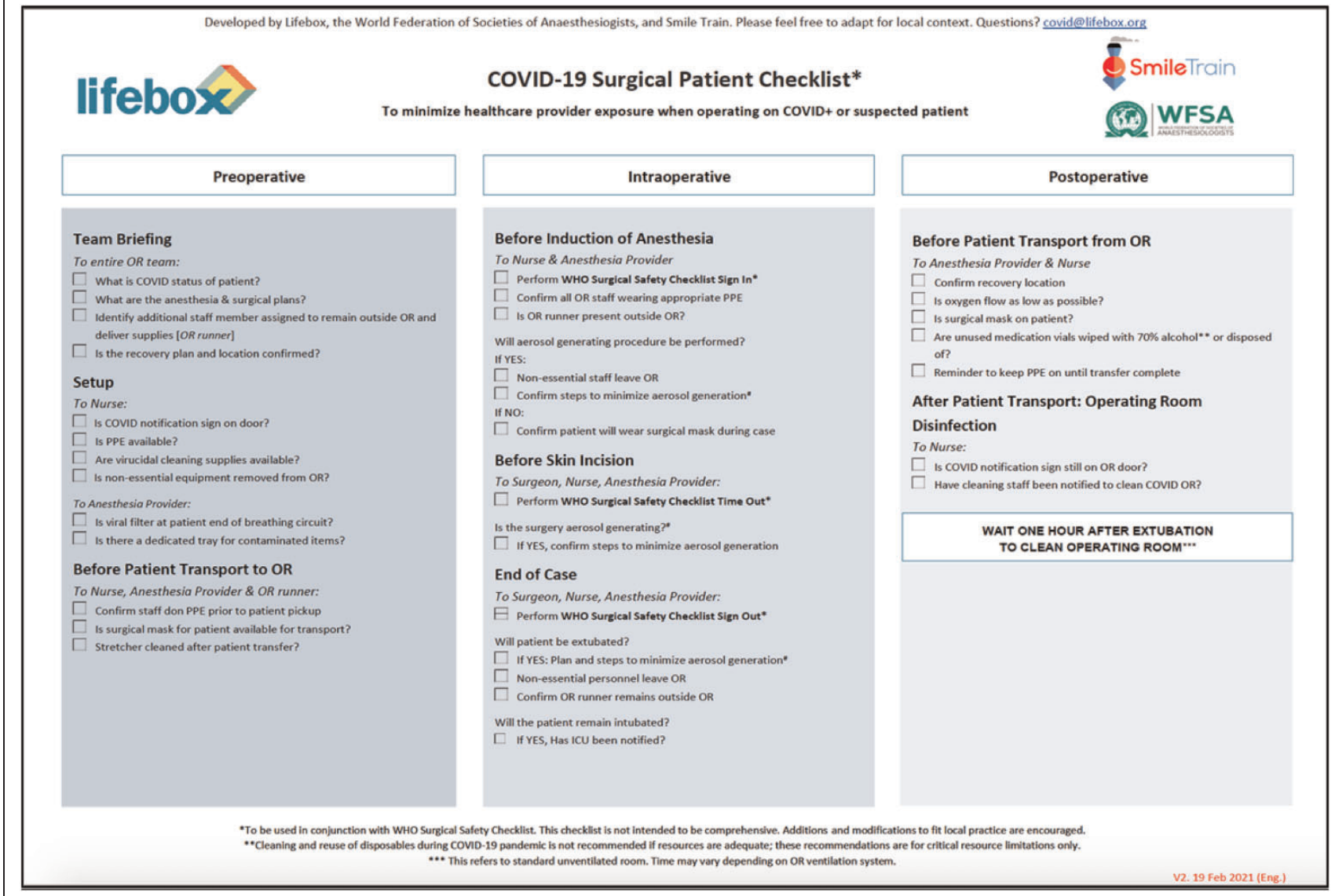
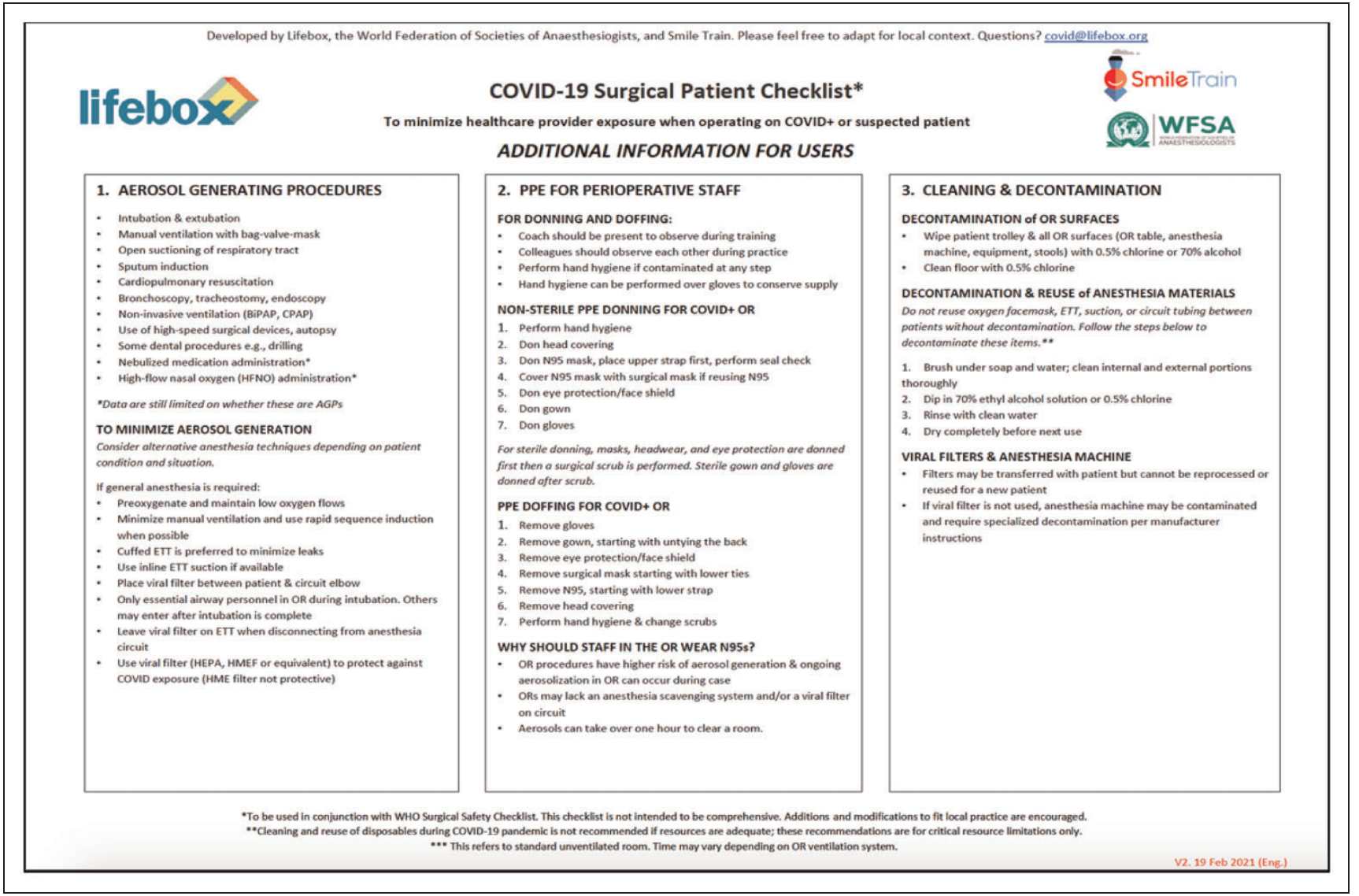


Figure 1. COVID-19 Surgical Patient Checklist, updated February 2021.



Developed by Lifebox, the World Federation of Societies of Anaesthesiogists, and Smile Train. Please feel free to adapt for local context. Questions? covid@lifebox.org

lifebox

COVID-19 Surgical Patient Checklist*

To minimize healthcare provider exposure when operating on COVID+ or suspected patient

SmileTrain

WFSA

ADDITIONAL INFORMATION FOR USERS

1. AEROSOL GENERATING PROCEDURES

- Intubation & extubation
- Manual ventilation with bag-valve-mask
- Open suctioning of respiratory tract
- Sputum induction
- Cardiopulmonary resuscitation
- Bronchoscopy, tracheostomy, endoscopy
- Non-invasive ventilation (BiPAP, CPAP)
- Use of high-speed surgical devices, autopsy
- Some dental procedures e.g., drilling
- Nebulized medication administration*
- High-flow nasal oxygen (HFNO) administration*

**Data are still limited on whether these are AGPs*

TO MINIMIZE AEROSOL GENERATION

Consider alternative anesthesia techniques depending on patient condition and situation.

If general anesthesia is required:

- Preoxygenate and maintain low oxygen flows
- Minimize manual ventilation and use rapid sequence induction when possible
- Cuffed ETT is preferred to minimize leaks
- Use inline ETT suction if available
- Place viral filter between patient & circuit elbow
- Only essential airway personnel in OR during intubation. Others may enter after intubation is complete
- Leave viral filter on ETT when disconnecting from anesthesia circuit
- Use viral filter (HEPA, HMEF or equivalent) to protect against COVID exposure (HME filter not protective)

2. PPE FOR PERIOPERATIVE STAFF

FOR DONNING AND DOFFING:

- Coach should be present to observe during training
- Colleagues should observe each other during practice
- Perform hand hygiene if contaminated at any step
- Hand hygiene can be performed over gloves to conserve supply

NON-STERILE PPE DONNING FOR COVID+ OR

1. Perform hand hygiene
2. Don head covering
3. Don N95 mask, place upper strap first, perform seal check
4. Cover N95 mask with surgical mask if reusing N95
5. Don eye protection/face shield
6. Don gown
7. Don gloves

For sterile donning, masks, headwear, and eye protection are donned first then a surgical scrub is performed. Sterile gown and gloves are donned after scrub.

PPE DOFFING FOR COVID+ OR

1. Remove gloves
2. Remove gown, starting with untying the back
3. Remove eye protection/face shield
4. Remove surgical mask starting with lower ties
5. Remove N95, starting with lower strap
6. Remove head covering
7. Perform hand hygiene & change scrubs

WHY SHOULD STAFF IN THE OR WEAR N95s?

- OR procedures have higher risk of aerosol generation & ongoing aerosolization in OR can occur during case
- ORs may lack an anesthesia scavenging system and/or a viral filter on circuit
- Aerosols can take over one hour to clear a room.

3. CLEANING & DECONTAMINATION

DECONTAMINATION of OR SURFACES

- Wipe patient trolley & all OR surfaces (OR table, anesthesia machine, equipment, stools) with 0.5% chlorine or 70% alcohol
- Clean floor with 0.5% chlorine

DECONTAMINATION & REUSE of ANESTHESIA MATERIALS

*Do not reuse oxygen facemask, ETT, suction, or circuit tubing between patients without decontamination. Follow the steps below to decontaminate these items.***

1. Brush under soap and water; clean internal and external portions thoroughly
2. Dip in 70% ethyl alcohol solution or 0.5% chlorine
3. Rinse with clean water
4. Dry completely before next use

VIRAL FILTERS & ANESTHESIA MACHINE

- Filters may be transferred with patient but cannot be reprocessed or reused for a new patient
- If viral filter is not used, anesthesia machine may be contaminated and require specialized decontamination per manufacturer instructions

*To be used in conjunction with WHO Surgical Safety Checklist. This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.
**Cleaning and reuse of disposables during COVID-19 pandemic is not recommended if resources are adequate; these recommendations are for critical resource limitations only.
*** This refers to standard unventilated room. Time may vary depending on OR ventilation system.

V2. 19 Feb 2021 (Eng.)

Figure 1. Continued.

Table 1. Participant demographics and hospital characteristics.

Factor *N*	Overall 539	Low-income 98	Lower-middle income 277	Upper-middle income 132	High-income 32	*P*-value
Demographics						
Region						<0.001
East Asia & Pacific	66 (12.2%)	0 (0.0%)	31 (11.2%)	33 (25.0%)	2 (6.2%)	
Europe & Central Asia	20 (3.7%)	0 (0.0%)	1 (0.4%)	1 (0.8%)	18 (56.2%)	
Latin America & Caribbean	127 (23.6%)	0 (0.0%)	29 (10.5%)	92 (69.7%)	6 (18.8%)	
Middle East & North Africa	2 (0.4%)	0 (0.0%)	1 (0.4%)	1 (0.8%)	0 (0.0%)	
South Asia	141 (26.2%)	3 (3.1%)	138 (49.8%)	0 (0.0%)	0 (0.0%)	
Sub-Saharan Africa	177 (32.8%)	95 (96.9%)	77 (27.8%)	5 (3.8%)	0 (0.0%)	
North America	6 (1.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	6 (18.8%)	
Profession						<0.001
Surgery	191 (35.4%)	46 (46.9%)	86 (31.0%)	55 (41.7%)	4 (12.5%)	
OB/Gyn	27 (5.1%)	15 (15.3%)	10 (3.6%)	1 (0.8%)	1 (3.1%)	
Anaesthesia	270 (50.1%)	30 (30.6%)	154 (55.6%)	61 (46.2%)	25 (78.1%)	
Nursing	28 (5.2%)	3 (3.1%)	20 (7.2%)	4 (3.0%)	1 (3.1%)	
Administrator	2 (0.4%)	1 (1.0%)	0 (0.0%)	1 (0.8%)	0 (0.0%)	
Other	16 (3.0%)	1 (1.0%)	7 (2.5%)	7 (5.3%)	1 (3.1%)	
Hospital level						0.072
First level/district	46 (8.5%)	9 (9.2%)	31 (11.2%)	5 (3.8%)	1 (3.1%)	
Second level/general	78 (14.5%)	18 (18.4%)	34 (12.3%)	21 (15.9%)	5 (15.6%)	
Third level/referral	298 (55.3%)	54 (55.1%)	136 (49.1%)	86 (65.2%)	22 (68.8%)	
Public/private						0.002
Public	186 (34.5%)	41 (41.8%)	70 (25.3%)	56 (42.4%)	19 (59.4%)	
Private	131 (24.3%)	16 (16.3%)	64 (23.1%)	48 (36.4%)	3 (9.4%)	
Hospital location						0.12
Urban	168 (31.2%)	32 (32.7%)	66 (23.8%)	57 (43.2%)	13 (40.6%)	
Semi-urban	28 (5.2%)	6 (6.1%)	13 (4.7%)	5 (3.8%)	4 (12.5%)	
Rural	14 (2.6%)	5 (5.1%)	8 (2.9%)	1 (0.8%)	0 (0.0%)	
Designated COVID-19 care centre	112 (20.8%)	16 (16.3%)	46 (16.6%)	39 (29.5%)	11 (34.4%)	0.003

N = the absolute number of respondents indicating each choice; however, the associated percentages indicate the percentage of each overall group. OB/Gyn: obstetrics and gynaecology.

perception of safety when using the C19 SPC. Suggested modifications by respondents to the C19 SPC were also requested. The full survey tool is available in online supplementary materials.

Survey administration

To receive broad geographic input, the questionnaire was translated into nine languages and an invitation to participate was distributed online via open dissemination through the Lifebox, Smile Train, Jhpiego and WFSA partner networks and social media over a one-month period in October 2020. These groups and local partners work collaboratively on initiatives to improve the safety of global surgery and anaesthesia. Their networks were used to distribute the questionnaire widely with the intention of findings being actionable in real time if training or other resource needs were identified. An individual's participation was voluntary and anonymous. The Survey Monkey website (Survey Monkey, Palo Alto, CA, USA) was used for data collection. Survey responses were collected anonymously.

Data analysis

Collected responses were exported to Microsoft Excel v.16.47 (Microsoft Corporation, Redmond, WA, USA). Quantitative data were analysed in Stata (15.1, Statacorp LLC, College Station, TX, USA) using descriptive statistics and chi-square, Kruskal–Wallis, analysis of variance and t-test where appropriate to compare groups, with alpha set at 0.05. Free-text response questions were not mandatory; however, all responses to free-text questions were included in the analysis. To identify emerging themes related to safety concerns, reasoning for altered safety perception, suggested modifications, challenges, and impact of C19 SPC utilisation, qualitative data derived from free-text responses were coded thematically by three members of the research team and a codebook inductively and

Table 2. COVID-19 Surgical Patient Checklist use and impact on perceived safety.

Factor *N*	Overall 539	Low-income 98	Lower-middle income 277	Upper-middle income 132	High-income 32	*P*-value
COVID-19 Surgical Patient Checklist						
Cared for COVID-19 patients	269 (49.9%)	40 (40.8%)	131 (47.3%)	73 (55.3%)	25 (78.1%)	0.003
Heard of COVID-19 SPC	305 (56.6%)	48 (49.0%)	168 (60.6%)	72 (54.5%)	17 (53.1%)	0.04
Training provided on COVID-19 SPC	244 (45.3%)	26 (26.5%)	124 (44.8%)	79 (59.9%)	15 (46.9%)	<0.001
Personally used COVID-19 SPC	187 (34.7%)	18 (18.4%)	104 (37.5%)	55 (41.7%)	10 (31.3%)	0.001
COVID-19 SPC adapted to local context	49 (26.2%)	3 (16.7%)	33 (31.7%)	10 (18.2%)	3 (30.0%)	0.32
Practice changed following COVID-19 SPC implementation	96 (51.3%)	11 (61.1%)	62 (59.6%)	20 (36.4%)	3 (30.0%)	0.02
Encountered difficulties implementing COVID-19 SPC	24 (12.8%)	4 (22.2%)	16 (15.4%)	4 (7.3%)	0 (0%)	0.20
First look at COVID-19 SPC appears useful	195 (83.3%)	50 (100%)	94 (86.2%)	42 (70.0%)	9 (90.0%)	0.08
Perceptions of safety						
Perceived safety caring for COVID+ or suspected patients						<0.001
Unsafe	147 (27.3%)	39 (39.8%)	94 (33.9%)	9 (6.8%)	5 (15.6%)	
Neutral	27 (5.0%)	3 (3.1%)	17 (6.1%)	7 (5.3%)	0 (0.0%)	
Safe	281 (52.1%)	40 (40.8%)	116 (41.9%)	101 (76.5%)	24 (75.0%)	
Perceived safety using COVID-19 SPC						0.23
Less safe	5 (2.7%)	1 (5.6%)	4 (3.8%)	0 (0.0%)	0 (0.0%)	
Neutral	28 (15.0%)	1 (5.6%)	13 (12.5%)	11 (20.0%)	3 (30.0%)	
Safer	116 (62.0%)	12 (66.7%)	70 (67.3%)	29 (52.7%)	5 (50.0%)	

N = the absolute number of respondents indicating each choice; however, the associated percentages indicate the percentage of each overall group. SPC: Surgical Patient Checklist.

iteratively derived. The excerpts were separated, organised and coded manually using Microsoft Excel v.16.47. Discussion among three of the authors was used to assign the initial codes and develop the coding framework. A second group of three authors applied codes from the codebook in a blinded fashion to excerpts to determine inter-rater reliability. The six authors reviewed together to reach consensus on discordantly coded excerpts until the codebook and themes were finalised.

Results

While 547 perioperative clinicians from 63 countries completed the questionnaire (Table 1) only 539 were analysed. Eight completed questionnaires were excluded from the analysis as no country was listed therefore an income group could not be assigned. The highest proportion (32.8%) were from Sub-Saharan Africa, with additional representation from Latin America and Caribbean (23.6%) and South Asia (26.2%). Most respondents were anaesthesia providers (50.1%) or surgeons (35.4%) working in tertiary (referral) hospitals (55.3%), and 20.8% of respondents reported working in designated COVID-19 facilities. When stratified by World Bank income classification, most clinicians from LICs represented Sub-Saharan Africa (96.9%), lower-middle income country respondents were primarily from South Asia (49.8%) and Sub-Saharan Africa (27.8%), and upper-middle income country respondents were mostly from Latin America & Caribbean region (69.7%). HIC respondents were predominantly from Europe (56.2%). A greater proportion of respondents from HICs worked in designated COVID-19 care centres ($P = 0.003$).

Overall, about half of respondents had cared for COVID-19 positive patients (49.9%) and were aware of the C19 SPC (56.6%) (Table 2). Nearly half (45.3%) had received training on the C19 SPC and 34.7% had personally used it. Of those, a quarter (26.2%) had

Table 3. Qualitative codebook.

Topic (# responses)	Parent code	Child code
Key concerns when managing COVID-19 positive or suspected patients for surgery (439)	COVID-19 transmission	Infection of other patients, family or colleagues
		Personal fear of contracting COVID-19
		Aerosol production and OR contamination
	Patient morbidity and mortality	Preoperative optimisation
		Patient develops COVID-related complications
	Process functionality	Lack of clear infection prevention processes
		Testing inconsistencies
		Unclear or suboptimal patient care processes
	Resource shortages	Shortage of PPE
Modifications made to COVID-19 SPC (8)	Added COVID testing results	
	Personnel roles modified	
	Added screening measures	
Mechanisms of increased perception of safety (30)	Defining roles/responsibilities	
	Improved communication and reminder of safety checks	
	Improved IPC practice	
	Reduced anxiety	
	Reduced exposure to COVID-19	
Most useful aspects of COVID-19 SPC (112)	Hospital system modifications	Confirming COVID status
		Infection prevention practice
	Individual behaviour change	Airway management
		PPE practice
		Systematic reminders
	Safety and teamwork	Enhanced awareness
		Teamwork
Changes in practice due to COVID-19 SPC utilisation (55)	Infections	Reduced infections
	Knowledge and awareness	Enhanced awareness
		Evidence-based behaviour
	Practice modification	Attention to disinfection and IPC
		Barrier measures
		Change in PPE practice
	Process management	Improved systems and protocols
		Managing personnel in OR
	Provider perception	Sense of safety/confidence
Challenges encountered when introducing COVID-19 SPC (17)	Adapting to new system and changing behaviour	
	Buy-in	Communication/awareness from team
		Lack of interest or understanding of team
		Lack of surgeon buy-in
		Not mandatory
	Identifying leadership roles	
	Overwhelmed with new protocols	
	Supplies	Lack of PPE
		Lack of viral filters

OR: operating room; SPC: Surgical Patient Checklist; PPE: personal protective equipment; IPC: infection prevention and control.

adapted the checklist to their local context and just over half (51.3%) reported a change in practice following its implementation. Few (12.8%) had encountered difficulties with implementation. Those who were unaware of the C19 SPC were asked to review it and provide feedback. Almost all respondents (83.8%) of the 234 who had not seen the C19 SPC agreed the checklist appeared useful. Half (52.1%) of respondents reported feeling safe caring for COVID-19 positive or suspected patients and 62.0% reported feeling safer using the C19 SPC.

When stratified by World Bank income classification, fewer clinicians from LICs had cared for COVID-19 positive patients ($P = 0.003$), and fewer had received training on the C19 SPC ($P < 0.001$). However, more clinicians from LICs saw practice change following implementation ($P = 0.02$). Respondents from all income groups viewing the C19 SPC for the first time agreed it appeared useful.

Respondents from LICs were more than twice as likely to report feeling unsafe at work as those in HICs (39.8% versus 15.6%, $P < 0.001$). Among the few respondents from LICs that had used the C19 SPC, 66.7% reported feeling safer, compared with 50.0% of respondents from HICs, although this difference was not statistically significant ($P = 0.23$).

Respondents were asked to report their greatest concern when managing COVID-19 positive patients. Most clinicians cited fear of personal infection with COVID-19 or transmission to family members, colleagues or other patients (Table 3). Other commonly reported fears centred on aerosol production and contamination of the operating room, the surgical patient's risk of developing complications related to COVID-19, and workplace functionality, such as unclear infection prevention and patient care protocols, and inconsistencies in patient testing. Shortages of resources such as PPE were a major concern amongst respondents, when caring for COVID-19 positive patients.

A few respondents reported making context-relevant modifications to the C19 SPC (Table 3), such as adding a prompt to review COVID-19 test results, rearranging personnel roles to align with their hospital workforce and adding symptom screening questions. Those who felt safer at work when using the checklist for surgical patients cited clearer roles and responsibilities, improved communication and safety practice and reduced anxiety as some reasons for their increased sense of safety.

The most useful reported aspects of the C19 SPC fit broadly into three themes: hospital system modifications, such as COVID-19 test confirmation and infection prevention and control (IPC) practice; individual behaviour changes, such as PPE donning and doffing and airway management; and safety and teamwork. Respondents that reported changes in practice as a result of using the C19 SPC cited improved attention to evidence-based and IPC practice and improvement in the personal protective measures taken by the team. They also reported improvements in the system and operating room protocols used as a result of using the C19 SPC, and improved personnel management, as well as a greater sense of safety and confidence at work.

Although few had encountered difficulties with implementation, some challenges were reported when introducing the C19 SPC. Themes that emerged included challenges with behaviour change, lack of buy-in from surgeons or other surgical team members, and difficulty identifying leadership roles to drive the checklist. Some respondents reported that they were overwhelmed with the number of new COVID-19 related protocols and practice. For others, the biggest challenges were simply a lack of material resources like PPE and viral filters to fulfil the C19 SPC recommendations.

Discussion

This survey of global perioperative clinicians found that many respondents feel unsafe in the workplace and that their biggest concerns are related to COVID-19 transmission to themselves, their colleagues or their family members. Findings suggest that use of the C19 SPC for perioperative care of surgical patients helped clinicians to feel safer and reportedly led to practice change in a majority of respondents who had used it. As noted by this work and others,[21–24] checklists can improve teamwork and communication, and clarify team member roles and responsibilities in the operating room–an important element of safe, multidisciplinary patient care. While rapid endorsement of checklists by numerous organisations such as societies and specialty colleges can increase awareness, distribution and uptake, the importance of adaptation to local context cannot be overemphasised.[25–28] Similarly, our survey found that over a quarter (26.2%) of respondents who had used the C19 SPC reported that they had adapted it.

The survey participants provided vital feedback on the C19 SPC components based on their practice and real world experience. However, less than half of the respondents reported that they had used the C19 SPC, highlighting a need for further dissemination and strategies to increase its use. Of the two-thirds of respondents who had not used it, a high proportion (83.8%) reported that they felt it appeared useful.

After analysis of survey results and feedback, the C19 SPC was modified to reflect recommended changes suggested by the end users (Figure 1). These changes included rewording and reorganisation for clarification, flow and role allocation, verification of COVID-19 status of patient, clarification around PPE use and updates to guidance for aerosol-generating procedures. This updated C19 SPC was made available online and modifications for the local context were encouraged as required. Notification of the updated checklist was disseminated through partner and social media networks. In addition, some of the qualitative findings of this study, particularly around implementation challenges such as institutional buy-in, assigning roles and staff being overwhelmed with COVID-19 protocols, informed updates in the C19 SPC training materials.

The recent work by Panda et al.[21] outlines consensus recommendations assembled by an international panel for theoretical adaptation of the WHO SSCL as part of a surgical team response to the COVID-19 pandemic. Elements that they recommended in their

adapted checklist include review of patient COVID-19 status, discussion of surgical and anaesthesia plans, use of safety checks around PPE use, establishment of equipment availability and specimen handling and confirmation of patient recovery location. Their recommendations also proposed a framework for hospital teams to rapidly implement this modified checklist that included the importance of support by relevant leadership, content modification to the local context, simulation-based training and frequent revision as scientific knowledge of best practice related to COVID-19 advanced.

Our work developing and implementing a C19 SPC through our partner network further supports these theoretical recommendations and underscores the importance of including provider safety measures into routine surgical care during the pandemic. Through a separate consultative process, items for inclusion in the C19 SPC included many of those recommended by Panda et al., reinforcing the key concerns of perioperative providers when managing COVID-19 positive patients. While Panda and colleagues' theoretical recommendations were to modify the WHO SSCL, the C19 SPC was developed using an alternative approach. It is meant to be used as an adjunct with the WHO SSCL and includes prompts to perform the WHO SSCL at relevant timepoints. Both approaches encourage checklist revision based on context-specific modifications. Some hospitals in our study merged the two Checklists, so that only one tool was needed in the operating room. This approach can avoid the use of additional tools that can lead to user fatigue and lack of buy-in. However, some facilities may prefer to keep them separate, as the C19 SPC is focused on protecting providers in the context of COVID-19 in the workplace whereas the WHO SSCL is aimed at patient safety.

Limitations

This study has several limitations. The survey tool was distributed to providers partnering or in communication with the groups that designed and implemented the C19 SPC. Their responses may not be representative of other perioperative clinicians working in contexts not affiliated with Lifebox, Smile Train, Jhpiego or WFSA. The inclusion of social media as a method of survey distribution, while aiming for a broad reach and mirroring the distribution of the checklist, did not enable a response rate to be measured. Furthermore, each country is experiencing waves of COVID-19 infection at different timepoints. Responses were based on the prevalence and practice environment at the time of the survey and may not reflect current perceptions of safety or infection prevention practice. As some higher-income countries are reaching vaccination of a high proportion of their populations, other lower-income, countries are experiencing the worst surges yet, highlighting the importance of continued attention to provider safety. It is worth noting that a large proportion of LIC respondents were from Sub-Saharan Africa. In addition, the survey tool did not ascertain details of checklist use such as proportional case utilisation, appropriate use or completion of individual items.

Conclusion

Adjunct surgical checklists may improve context-specific patient and healthcare worker safety. Lessons from the COVID-19 pandemic may have a broad impact on improving infection prevention and control in low- and middle-income countries.[29] In health systems facing systemic challenges compounded by shortages of material resources,[30] the C19 SPC for operating rooms is an affordable solution that may aid in both the perception and the reality of healthcare worker safety as the pandemic continues to place them at risk. Furthermore, this tool and lessons from its development and implementation may inform the response to future events in the healthcare landscape.

Author Contribution(s)

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Supplemental material

Supplemental material for this article is available online.

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