





Pattern of Perioperative Surgical Patient Care, Equipment Handling and Operating Room Management During COVID-19 Pandemic at Jimma Medical Center

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Background: The nature of COVID-19 transmission creates significant risks in surgical departments owing to the close contact of medical staff with patients, the limited physical environment of the operating room and recovery room, the possibility of shared surgical equipment and challenges in the delivery of surgical care in all surgical departments. Globally, studies have reported that the effects of the pandemic on surgical departments are profound, potentially long-lasting and extensive. To manage these effects, different local guidelines and recommendations have been developed, with potential differences in their effectiveness and implementation. Therefore, harmonized and effective national/international guidelines for specific surgical departments during perioperative periods are pertinent to curtail the infection, and will inevitably need to be adapted for consistent and sustainable implementation by all medical staff. The pattern of surgical patient care during the COVID-19 pandemic at Jimma Medical Center (JMC), Ethiopia, has not been explored yet. The present study aimed to describe the pattern of perioperative surgical patient care, equipment handling and operating room management during the COVID-19 pandemic at JMC.

Methods: A cross-sectional study was conducted to describe the pattern of perioperative surgical patient care, equipment handling and operating room management during the COVID-19 pandemic at JMC, using five-point Likert scales (0, not at all; 1, rarely; 2, sometimes; 3, most of the time; 4, frequently). A total of 90 respondents [35 patients (five patients from each of seven surgical departments) and 55 healthcare providers (six professionals from each of nine units, including the center of sterility room and anesthesia)] who were available during the study period, selected by a convenience sampling technique with multistage clustering, participated in the study. Data were collected using a structured questionnaire via direct observation and face-to-face interviews with patients undergoing surgery, healthcare providers and hospital administrators, against the standard surgical patient care guidelines. The collected data were manually checked for missing values and outliers, cleared, entered into EpiData (v4.3.1) and exported to SPSS (v22) for analysis. The mean score of practice was compared among different disciplines by applying the unpaired *t*-test. The findings of the study were reported using tables and narration. A *p*-value of less than 0.05 was declared as statistically significant.

Results: Despite the surgical care practice having changed during the COVID-19 pandemic in all service domains, it is not implemented consistently among different surgical departments owing to different barriers (lack of training on the updated guidelines and financial constraints). The majority of surgical staff were implementing the use of preventive measures against COVID-19, while they were practiced less among patients. The guidelines for surgical practice during the preoperative phase were well applied, especially screening patients by different methods and the application of telemedicine to reduce physical contacts. But, against guidelines, elective patients were planned and underwent surgery, especially in the general surgery department. The implementation of recommended guidelines in the center of sterility room in handling surgical equipment was not very different before and during the pandemic. The extent of practice for anesthesia care, operating room management and postoperative care in the recovery room also changed, and the guidelines were sometimes applied.

Conclusion and Recommendations: Although perioperative surgical care practice differed before and during the pandemic, the standard guidelines were inconsistently implemented among surgical departments. The implementation of recommended guidelines in the center of sterility room in handling surgical equipment was not very different before and during the pandemic. Thus, the authors developed safe surgical care guidelines throughout the different domains (infection prevention and PPE use; preoperative care, intraoperative care, operating room management, anesthesia care, equipment handling process and postoperative care) for all disciplines and shared them with all staff. We recommend that all surgical staff should access these guidelines and strictly adhere to them for surgical service during the pandemic.

Keywords: perioperative surgical patient care, equipment handling, operating room management, COVID-19 pandemic

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has caused tragic events by disrupting people's lives, social welfare and the global economy.^{1,2} The burden of COVID-19 is critical and devastating in healthcare institutions, and carries a significant risk of disease transmission to the healthcare team and cross-contamination to patients.³⁻⁹

In general, the pandemic has overwhelmed health systems and presented unprecedented challenges to medical staff globally. Surgical departments are the cornerstone of every health system, contributing to public health in both elective and emergency situations. They are very vulnerable to the spread of the disease and the main source of viral transmission to individuals, both surgical staff and patients, and likely to their attendants, and of contamination of the community at large.¹⁰⁻¹²

The nature of COVID-19 transmission creates significant risks in surgical departments, including obstetric care, owing to the close contact of medical staff with patients, the limited physical environment of the operating theatre and recovery room, and the possibility of shared surgical equipment, especially aerosol-generating equipment/procedures such as surgical sets, airway devices and electrosurgery equipment. The pandemic also presents challenges to the practices in the surgical department, especially to ENT surgery, maxillofacial surgery and anesthesia care providers, as they share a high viral load.¹³⁻¹⁷

Epidemic statistics from Wuhan, China, and Italy revealed that the disease infected about 3.8–20% of health workers, with an overall mortality rate of 0.6%.¹⁸⁻²⁰

Globally, studies have reported that the effects of the pandemic on surgical departments have been profound, potentially long-lasting and extensive, and have had a collateral health effect on the delivery of surgical care to millions of patients as a result of the near-universal disruption and cancellation of surgical services.²¹⁻²⁸

To manage these effects, different local guidelines and recommendations have been developed to control the disease, which may create differences in the local conditions relating to the extent of COVID-19 infections within the type of practice/hospital system, the availability of effective personal protective equipment (PPE) and other supplies, the physical configuration of workspaces, practice economics, local rules and regulations, and other constraints (eg, economic).

Thus, harmonized and effective national/international guidelines for specific surgical streams during perioperative periods are pertinent to curtail the infection, and will inevitably need to be adapted for consistent and sustainable implementation by all medical staff. The ultimate goal of the adapted guidelines and recommendations is to provide the right and optimal decisions, to maximize the benefits to both medical staff and patients, as well as to improve patient outcomes and minimize the burden of the disease on the healthcare systems through the wise use of resources, routine screening for the disease prior to surgical intervention, and focusing on emergency treatment while postponing non-priority treatments, especially in resource-constrained countries.

The standard guidelines and recommendations for perioperative surgical patient care during a pandemic equivocally enable and alert medical staff and health institutions to prepare for a pandemic and familiarize themselves with standard guidelines to manage the surgical space/environment, staff and supplies, so that optimum care is provided to patients through the domains of infection prevention measures, equipment handling, use of PPE and patient preparation, which can be implemented to reduce disease transmission in the hospital and in the community at large. The extent of surgical patient care during the COVID-19 pandemic at Jimma Medical Center (JMC) has not been explored yet. Therefore, the present study aimed to describe the extent of perioperative surgical patient care, equipment handling and operating room

(OR) management during the COVID-19 pandemic at JMC, compared with standard guidelines, and to suggest adaptations for implementation.

Materials and Methods

An institution-based cross-sectional study was conducted at JMC, located in Jimma zone, Oromia region, southwest Ethiopia, at a distance of 350 km from the capital of the country, Addis Ababa. The hospital provides health services to millions of people living in the catchment area.

The pattern of current hospital practice in perioperative (preoperative, intraoperative and postoperative) surgical patient care was assessed using five-point Likert scales (0, not at all; 1, rarely; 2, sometimes; 3, most of the time; 4, frequently) in terms of seven domains (A, infection prevention and PPE;²⁹ B, patient preparation/preoperative phase;^{30,31} C, intraoperative phase;³² D, equipment handling process and status of CSR;³³ E, operating room management;³⁴ F, anesthesia care;³⁵ and G, recovery room/ICU care in the postoperative phase³⁶) at JMC in seven surgical departments (A, ophthalmology; B, ENT/maxillofacial surgery; C, orthopedics; D, general surgery; E, gynecology/obstetrics; F, pediatrics; and G, neurosurgery). A total of 90 respondents [35 patients (five patients from each of the seven surgical departments) and 55 healthcare providers (six professionals from each of the nine units, including the center of sterility room and anesthesia)] who were available during the study period, selected by a convenience sampling technique with multistage clustering, participated in the study. Data were collected using a structured questionnaire ([Supplementary Annex 1](#)) via direct observation and a face-to-face interview approach (with patients undergoing surgery, healthcare providers and hospital administrators), against the developed checklists for the standard surgical patient care guidelines/recommendations set by different organizations.^{11,37–48}

A letter of ethical clearance was obtained from the research ethical committee/institutional review board of Jimma University (IHRPGR/152/2021). Letters of support were also collected from JMC. Oral and written consent was obtained from all participants and their information was handled confidentially ([Supplementary Annex 2](#)). All protocols for COVID-19-preventive measures were maintained during data collection. The participants were informed about the purpose of the study, in accordance with the Declaration of Helsinki. The collected data were manually checked for missing values and outliers, cleared, entered into EpiData version 4.3.1 and finally exported to SPSS version 22 for further analysis. The findings of the study were reported using tables and narration. The mean score of surgical care practice was compared among different disciplines by applying the unpaired *t*-test. A *p*-value of less than 0.05 was declared as statistically significant.

Results

Extent of Surgical Care Practice in the Domain of Infection Prevention and Personal Protective Equipment Use Status During COVID-19 Pandemic in JMC

The implementation of COVID-19-preventive measures was higher among surgical staff compared to patients undergoing surgery, as detailed in [Table 1](#) for different surgical departments.

Status of Surgical Care Practice in the Patient Preparation/Preoperative Phase During COVID-19 Pandemic in JMC

Even though the extent of preoperative patient care differed before and during the COVID-19 pandemic, there was variation among surgical disciplines. The preoperative care implemented during the pandemic included the application of telemedicine to reduce physical contacts, screening for COVID-19 by different methods, isolation of high-risk patients in the ward and the use of PPE according to the patient status during preoperative evaluations. The practice of following preoperative guidelines (especially isolation of risky patients on the ward and screening for COVID-19) was satisfactory in the general surgery and gynecology/obstetrics departments, with mean scores of 3.6 for each (where they performed most of the time), as seen in [Table 2](#).

Table 1 Extent of Surgical Care Practice in the Domain of Infection Prevention and Personal Protective Equipment Use (Implementation Level of COVID-19 Preventive Measures) During COVID-19 Pandemic in JMC

Variables	Respondent	Mean of 5-Point Likert Scales for Practice/Implementation Among Disciplines							
		Ophthalmology	ENT/ Maxillofacial Surgery	Orthopedics	General Surgery	Gynecology/ Obstetrics	Pediatrics	Neurosurgery	p
Hand washing/sanitizer use	Patient	2.1	2.0	2.0	1.7	2.0	1.8	2.0	0.52
	Staff	2.8	2.8	3.0	2.7	3.0	2.8	3.0	0.62
Social distancing	Patient	2.1	2.0	2.0	1.7	2.0	1.4	2.0	0.91
	Staff	2.4	2.8	3.0	2.0	2.6	2.2	3.0	0.82
PPE use	Patient	2.1	2.0	2.0	1.7	2.0	1.4	2.0	0.81
	Staff	2.6	3.0	3.0	3.0	3.0	2.6	3.0	0.74
Avoid touching face	Patient	2.1	2.0	2.0	1.7	2.0	1.6	2.0	0.31
	Staff	2.7	2.7	3.0	3.0	3.1	2.6	3.0	0.28

Table 2 Status of Surgical Care Practice During the Patient Preparation/Preoperative Phase in JMC

Variables	Mean of 5-Point Likert Scales for Practice/Implementation Among Disciplines							
	Ophthalmology	ENT/ Maxillofacial Surgery	Orthopedics	General Surgery	Gynecology/ Obstetrics	Pediatrics	Neurosurgery	p
Application of telemedicine	1.6	0.7	2.0	2.3	1.6	1.8	1.5	0.78
Isolation of risky patients in different ward	2.0	2.3	2.0	3.0	3.6	2.6	2.0	0.89
Screening for COVID-19	2.3	1.8	2.0	2.7	3.6	2.2	2.0	0.78
Screening by PCR	2.6	1.7	2.0	2.7	3.0	2.6	2.0	0.93
Screening by risk stratification	2.3	2.0	2.0	2.7	3.0	2.6	2.0	0.75
Screening by measuring BT	2.4	2.2	2.0	2.7	3.6	2.8	2.0	0.78
Elective patients planned for surgery	2.0	2.2	3.0	3.3	3.7	2.8	0.5	1.00

Level of Surgical Care Practice in the Intraoperative Phase During COVID-19 Pandemic in JMC

Different preoperative patient care guidelines/recommendations were implemented during the COVID-19 pandemic. For instance, patients wore a face mask when they were transferred to the OR, and differences were observed in the techniques of donning/doffing, scrubbing, disinfecting, cautery usage and PPE use, according to patient status, etc (Table 3).

Status of Equipment Handling in the Center of Sterility Room During COVID-19 Pandemic in JMC

The extent of implementation of equipment handling guidelines/recommendations was very low (not at all practiced or rarely practiced) in the center of sterility room of JMC, as the staff working in the area raised multiple barriers (especially claiming that there was no up-to-date information/training on the guidelines), as detailed in Table 4.

Status of Operating Room Management Practice During COVID-19 Pandemic in JMC

Different OR management guidelines/recommendations were implemented during the COVID-19 pandemic, for instance, limiting the number of OR attendees and differences in OR cleaning patterns after the patient had been transferred. The level of implementation of the guideline that recommends having separate OR entry and exit showed statistically significant differences among surgical departments, and was lacking in the ophthalmology OR (Table 5).

Status of Anesthesia Care Practice During COVID-19 Pandemic in JMC

Different anesthesia care practice guidelines/recommendations were implemented during the COVID-19 pandemic at different levels of practice, as shown in Table 6.

Table 3 Level of Surgical Care Practice During the Intraoperative Phase in JMC

Variables	Mean of 5-Point Likert Scales for Practice/Implementation Among Disciplines							
	Ophthalmology	ENT/ Maxillofacial Surgery	Orthopedics	General Surgery	Gynecology/ Obstetrics	Pediatrics	Neurosurgery	p
Patient wears face mask in OR	2.1	1.5	3.0	1.3	2.9	2.0	2.0	0.22
Proper scrubbing technique	1.4	2.0	2.0	2.0	3.0	2.2	2.0	0.50
Proper donning/doffing	1.4	1.0	3.0	1.0	1.7	1.2	2.0	0.44
Proper disinfection of surgery skin site	1.4	2.0	3.0	3.0	3.0	2.6	2.0	0.52
Proper draping technique	1.4	2.0	2.0	2.0	2.0	2.0	2.0	0.14
Proper cautery use	0.0	1.0	1.0	1.3	1.0	1.0	0.5	0.32
Liberal suctioning	0.0	0.5	1.0	2.0	2.0	2.0	1.0	0.32
Proper PPE use for high-/low-risk patients	1.6	2.0	3.0	3.0	2.4	2.2	2.0	0.71

Table 4 Status of Equipment Handling in the Center of Sterility Room During COVID-19 Pandemic in JMC

Variables	Mean of 5-Point Likert Scales for Practice/Implementation
Equipment handling (cleaning/sterilization technique) differs during COVID-19	0.5
Equipment handling (cleaning/sterilization technique) differs for low-/high-risk patients	0.5
Equipment handling (cleaning/sterilization) applied separately for low-/high-risk patients	0.3
Staff of CSR informed about patient status before equipment handling	0.2

Extent of Postoperative Care Practice in the Recovery Room During COVID-19 Pandemic in JMC

Different postoperative safe practice guidelines/recommendations were implemented during the COVID-19 pandemic, for instance, limiting the number of OR attendees and differences in the OR cleaning patterns after the patient had been transferred (Table 7).

Discussion

The COVID-19 pandemic has led to an unprecedented number of infections and deaths in recent years and continues to present a colossal challenge to healthcare systems. The situation is especially bad in surgical departments, where there is a higher risk of transmission owing to the close contact with patients and the use of procedures that generate aerosols.^{22,49,50}

Table 5 Status of Operating Room Management Practice During COVID-19 Pandemic in JMC

Variables	Mean of 5-Point Likert Scales for Practice/Implementation Among Disciplines							
	Ophthalmology	ENT/ Maxillofacial Surgery	Orthopedics	General Surgery	Gynecology/ Obstetrics	Pediatrics	Neurosurgery	p
Separate OR entry and exit	0.1	4.0	4.0	4.0	4.0	4.0	4.0	0.03
OR ventilation/ ambient temperature adjustment	1.8	1.0	1.0	1.0	1.0	1.0	1.0	0.15
Staff wait 20 minutes to enter OR after intubation	0.5	1.0	1.0	1.3	1.0	1.0	1.0	0.38
Adequate turnover time between cases	1.0	1.0	1.0	2.0	1.0	1.0	1.0	1.00
Cleaners wait 20 minutes to clean after patient transferred	0.5	1.0	1.0	2.0	1.0	1.0	1.0	0.38
Minimum number of OR attendees	1.8	2.0	2.0	1.3	2.0	1.4	3.0	0.31
Staff restricted in OR during intubation/ extubation	0.5	1.0	0.5	1.3	1.0	1.2	0.5	0.89
High-risk staff restricted from attending OR	0.5	0.5	0.5	0.5	1.0	0.9	0.5	0.57
Proper disinfection/ cleaning of OR equipment	0.5	2.2	3.0	2.6	2.6	2.6	2.0	0.14

Table 6 Status of Anesthesia Care Practice During COVID-19 Pandemic in JMC

Variables	Mean of 5-Point Likert Scales for Practice/ Implementation
Patient covered with transparent plastic sheet during intubation	1.3
Intubation performed with strict care and with fewer staff in OR	1.5
Patient transferred to recovery fully awake	2.3
Regional anesthesia preferred	2.5
High-quality heat and moisture exchange filter use	2.1
Adequate preoxygenation with 100% oxygen for 5–10 minutes	2.0
Rapid sequence induction applied	1.8
Avoidance of aerosol-generating processes applied	1.8
Proper disinfection of equipment	1.8

Therefore, it is important to triage patients effectively, using preferred practices and recommendations set by expert panels, so that genuine emergencies can be tackled effectively and efficiently without facilitating disease transmission.^{32,34}

Table 7 Extent of Postoperative Care Practice in the Recovery Room During COVID-19 Pandemic in JMC

Variables	Mean of 5-Point Likert Scales for Practice/Implementation Among Disciplines							
	Ophthalmology	ENT/ Maxillofacial Surgery	Orthopedics	General Surgery	Gynecology/ Obstetrics	Pediatrics	Neurosurgery	p
Separate RR for low-/high-risk patients for COVID-19	0.5	1.0	1.0	1.0	1.0	1.0	1.0	0.14
RR staff informed about the patient status	0.5	2.0	2.0	2.0	2.0	2.4	2.0	0.28
Proper use of PPE in RR	1.5	2.0	2.0	2.0	2.0	2.0	2.0	0.14

The current study revealed that the majority of surgical staff were implementing preventive measures against COVID-19 most of the time, while they were less well practiced among patients. The guidelines for surgical practice during the preoperative phase were well applied, especially screening patients by different methods and the application of telemedicine to reduce physical contacts. But, against the guidelines, elective patients were planned and underwent surgery, especially in the general surgery department.

The implementation of recommended guidelines in the center of sterility room in handling surgical equipment was not very different before and during the pandemic. The extent of practice for anesthesia care, operating room management and postoperative care in the recovery room had changed, and the guidelines were sometimes applied.

Limitation of the Study

The study lacks a comparison of the extent of perioperative surgical care practice during the pandemic among healthcare professionals. It simply describes the extent of perioperative surgical care practice among different surgical departments by taking a convenience sample of patients and professionals. The provided responses thus relate to the pattern of practice in the specific surgical departments, not that of the individual respondents.

Conclusion and Recommendations

Despite the differences in perioperative surgical care practice before and during the pandemic, the standard guidelines/recommendations were inconsistently implemented among the surgical departments. The safe surgical guidelines were not strictly developed and implemented in the hospital and the level of the practice varied for different domains among the surgical departments. The implementation of the recommended guidelines in the center of sterility room in handling surgical equipment was not very different before and during the pandemic.

Therefore, the authors developed safe surgical care guidelines throughout different domains (infection prevention and PPE use; preoperative care, intraoperative care, operating room management, anesthesia care, equipment handling process and postoperative care) for all disciplines and shared them with all staff. Thus, we recommend that all surgical staff should access these guidelines/recommendations and strictly adhere to them during surgical service.

It is also recommended that awareness of the disease and its preventive measures should be raised in patients, and that such information should be communicated frequently.

Data Sharing Statement

The authors confirm that the data used for the study are available within the article, and any other required data and materials will be provided by the corresponding author of the study.

Ethics Approval and Consent to Participate

A letter of ethical clearance was obtained from the research ethical committee/institutional review board of Jimma University (IHRPGR/152/2021). The participants were informed about the purpose of the study, in accordance with the Declaration of Helsinki. Letters of support were also collected from JMC. Oral and written consent was obtained from all participants and their information was handled confidentially. All protocols of COVID-19 preventive measures were maintained during data collection. The procedures in this study were conducted in accordance with the ethical standards of the committee responsible for human experimentation in accordance with the Declaration of Helsinki.

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Disclosure

The authors report no conflicts of interest in relation to this work.

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