

## ORIGINAL ARTICLE

# Audit of Surgical Practice and Performance in COVID Crisis – Lessons for future

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## ABSTRACT

**Aim:** To evaluate the pattern of surgical emergencies and surgical care provided during COVID 19 pandemic.**Study design:** Cross-sectional Study**Place and duration of study:** Department of Surgery, CMH, Lahore from 15th March - 15 June 2020.**Methodology:** Data was collected retrospectively, of all the patients who were admitted in department of surgery over the duration of 3 months. Demographic variables, diagnosis, work up related to COVID-19, specialty of admission and surgical vs conservative management was recorded.**Results:** A total of 312 patients were included. Majority were male 216(69.2%). Most of the patients 191(61.2%) were admitted via clinic, predominantly in month of May 148(41%). COVID-19 PCR was done on 210 patients (67.3%), chest x-ray was done on 271(87.9%), HRCT chest was done on 113 patients (29.20%). Although general surgery was the busiest service line with a total patient admission of 89(43.1%), Orthopedic surgery top the operative interventions list with 85.1% of admissions underwent operative management.**Conclusion:** The current local guidelines about patient flow and management of patients in COVID crisis are practical and can be implemented. In the wake of the later waves of COVID 19 hospitals should prepare to divert their resources to high volume specialties like General and orthopedic surgery. Simple, but important procedures like arteriovenous fistula creation should only be stopped if there is shortage of manpower.**MeSH words:** Audit, COVID- 19, General Surgery, Pakistan, Vascular Surgery

## INTRODUCTION

Healthcare systems worldwide have faced remarkable challenges after advent of SARS-COV-2, and surgery as a discipline is by no means an exception<sup>1</sup>.

Surgery, whether it is emergency or elective is a crucial component of any health system, 2 and operating rooms are one of the greatest risk areas for transmission of respiratory infections because of involvement multiple staff and high transmission-risk activities like airway management all done in a closed environment. The urgency in management makes it difficult to screen a patient for serious infections including SARS COV 2.2

The COVID -19 crisis lead to a superfluous strain due to a high prevalence of disease, feared lethality of disease, high risk of transmission, restricted resources and diversion of healthcare resources to COVID -19. This combined with vague policies and SOPs greatly increases the risk of transmission<sup>1,2,3,4</sup>.

Various guidelines for surgical prioritization during this crisis were published by various bodies like British National Health Service (NHS) 5 American college of surgery (ACS)<sup>6</sup> and European Society for Medical Oncology (ESMO)<sup>7</sup>. They recommended delaying elective surgeries to an extent that it doesn't get hazardous for patient care and operating only on emergency cases with some exceptions like oncological surgery.

Pakistan's response to COVID-19 crisis was appreciated worldwide. In Army, prompt COVID-19related guidelines were issued. This also included management of surgical patients. Based on these guidelines we developed local SOPs for management of surgical patients. Present study is an audit of our practices and type of patients that we managed during initial three months of COVID -19 crisis.

On a local scale, we have developed a pathway for our hospital in this national emergency, for every patient visiting surgical clinics and emergency, to triage them not only in terms of their disease but also in terms of their COVID-19 status, to admit them in respective wards according to their COVID-19 status and manage them accordingly.

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## METHODOLOGY

After taking approval from the IRB (Institutional Review Board), (IRB # 228/2020) we retrospectively evaluated our performance in the department of Surgery at CMH Lahore against our institutional guidelines. The sample size was calculated with open EPI sample size calculator with confidence interval 95% and margin of error 5% to be 2844. After reviewing the International and Medical Directorate guidelines, we developed our own institutional guidelines. These guidelines consisted of admission policy and SOPs for operating theatres. All elective surgeries were stopped at the start of COVID – related restrictions. All patients were initially admitted in PRECOVID ward (Grey Zone), as COVID - 19 suspects and were screened by history and examination for COVID-19. Initially for some time, those with symptoms and signs suggestive of illness underwent COVID -19 PCR. Later on, with availability of more resources and compelling evidence, we screened all patients with COVID 19 PCR and Chest Xay (CXR). Only those patients requiring operative intervention underwent High Resolution CT (HRCT) scans of chest within 24hrs of operation (if that did not delay the surgical treatment). Patients were therefore divided into three broad groups as: COVID PCR negative, PCR positive (and those with PCR negative but strong suspicion on clinical/radiological basis) and those awaiting PCR report. These patients were admitted into respective wards accordingly. Three different operating areas which were physically separate were designated for patients depending on their COVID-19 status. For emergencies with either uncertain COVID status or who were PCR negative but with low probability of COVID on HRCT / Chest Xray, two operating theatres were allocated. For COVID positive patients and with strong clinical or radiological probability of COVID, even if PCR negative another set of two operating theatres and for COVID PCR and HRCT chest negative patient the main operating theatres were earmarked.

In present study, all patients who were admitted via surgical emergency and outpatient department from 15 march to 15 June were included after taking informed consent. Demographic variables like age & gender were recorded along with their diagnosis, COVID-19 status, investigative findings and respective management. Patients were further categorized into

multiple groups on basis of their mode of admission, nature of disease, surgical specialty and those requiring conservative or operative management. The pathway for triage of surgical patients is shown in figure 1. Data entry was done in SPSS version 22. Mean and SD were calculated for qualitative variables. Frequency and percentage were also calculated for the quantitative variable. The P-value  $\leq 0.05$  was considered statistically significant.

**RESULTS**

A total of 312 patients were included in the present study. Majority were male 216(69.2%). Most of the patients 191(61.2%) were admitted via clinic, predominantly in month of May 148(41%). COVID-19 PCR was done on 210 patients (67.3%), chest x-ray was done on 271(87.9%), HRCT chest was done on 113 patients (29.20%). Patients' were categorized according to their diagnosis into 28 categories as shown in Table 1.

Figure 1: Pathway for triage of COVID-19 surgical patients+

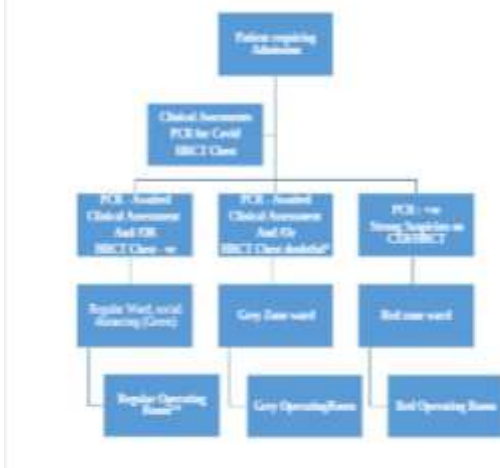
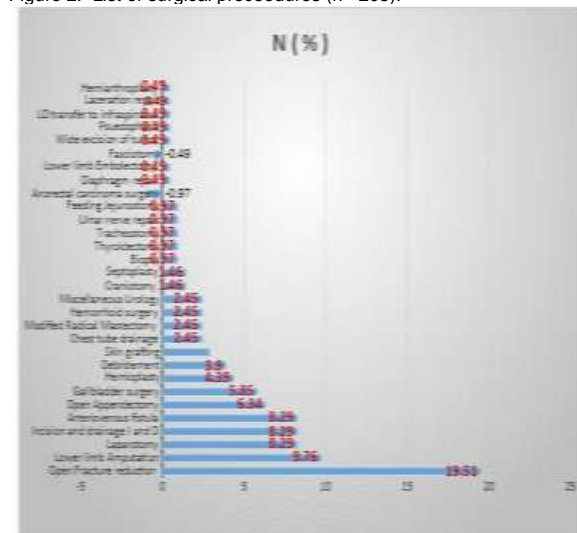


Figure 2: List of surgical procedures (n= 205).

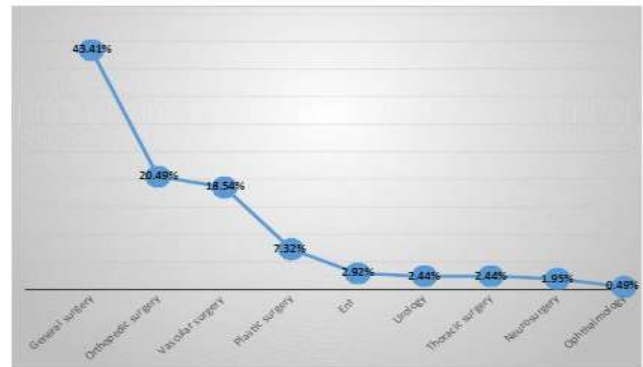


Out of 312 patients, 205 (66.1%) underwent surgical procedures. Fracture reduction (open or closed) being most common (19.5%), followed by amputations (9.76%) and exploratory laparotomies (8.2%) as shown in figure 2. Patients were further divided into their respective specialty as shown in figure 3.

We operated a total of 41 cases in the grey zone operation theatre. These were the cases in which surgery could not wait. Open appendectomy tops the list 13(6.34%) followed by wound debridements, open fracture reduction, skin graftings, ulnar nerve repair and lower limb amputations . Six (14.6%) of them turned out to be PCR positive which was statistically significant(  $p = <0.001$ ). There were seven COVID positive patients who were operated in red zone operation theatre.

Out of 271 patients who had CXR, 20(7.38%) had findings suggestive of COVID-19 ( $p= 0.019$ ). On the other hand, those surgical patients who were COVID-19 PCR positive, 9(45%) had positive CXR changes ( $p = <0.001$ ) and 20(64.5%) had positive HRCT chest findings ( $p= <0.001$ ).

Figure 3: Patient categorization according to their speciality n =205



\*Not enough to be categorized as COVID  
\*\*OR: Operating Room

Table 1: Patient categorization according to their diagnosis on admission n= 312

Fractures	47 (15.06)
Acute Gall bladder disease	27 (8.65)
Carcinomas	25 (8.01)
Diabetic foot	21 (6.73)
Other traumas (incl. but not limited to RTA/Crush injury/stab wound/gunshot wound/Blast injury/bite wound/hemothorax)	19 (6.09)
Abscess	17 (5.45)
End stage renal disease	17 (5.45)
Nonspecific pain abdomen	15 (4.81)
Hernias	13 (4.17)
Acute Appendicitis	13 (4.17)
Intestinal obstruction	11 (3.53)
Gut Perforation	10 (3.21)
Soft tissue infections	10 (3.21)
Miscellaneous	10 (3.21)
Acute Pancreatitis	9 (2.88)
Head injury	9 (2.88)
Hemorrhoids	7 (2.24)
Acute limb ischemia	4 (1.28)
Deep venous thrombosis	4 (1.28)
Chronic/critical limb ischemia	4 (1.28)
Pleural effusion/empyema	4 (1.28)
Nerve injury	3 (0.96)
Burns	3 (0.96)
Renal Calculus	3 (0.96)
Nasal pathologies	3 (0.96)
Cataracts	2 (0.64)
Osteomyelitis	2 (0.64)
Total	312

**DISCUSSION**

On March 24 2020, the American society of surgeons released guidelines for management of elective and emergency surgical cases as they expected a surge in cases in coming months<sup>9</sup>. As discussed earlier, we developed our local protocols in light of Med Dte and international guidelines. We conducted our audit from 15 March to 15 June 2020. In the early part of this period the guidelines were not fully developed and in place therefore compliance in the early months was not complete. The protocols were fully executed from the month of April. Over 3 months, we found that majority 128(41.1%) patients presented to us in May

( $p=0.04$ ), 74(57.8%), most of them were admitted from outpatient clinic ( $p=0.04$ ) with male predominance 79.8% ( $p<0.001$ ). This can be explained by the fact that at that time government of Pakistan was in middle of educating the population to avoid visiting hospitals except for chronic ailments, still they preferred to visit clinics rather emergencies, apparently to avoid crowded area. Because of the non availability of public transport, males managed to reach hospitals more than the females.

Our hospital authorities tried to identify and segregate all suspected patients. Every patient who was advised admission had his or her screening done at designated centers and waited in a grey zone ward until their COVID-19 status is clear. Initially we were not doing COVID-PCR on all patients due to resource constraints and evolving policies, but with passage of time, from March to June, we witnessed a rise in testing and we were successfully able to establish a 100% PCR testing for all patients. We found that only 31(14.76%) of the patients were PCR positive. This is supported by the low prevalence of PCR positive disease in general population. This is comparable to a study done at Noshera<sup>10</sup>.

We made a CXR essential for all admitted patients. This combined with clinical assessment and PCR was supposed to have a high yield to pick up COVID 19 patients. In March 2020, various studies were conducted to establish evidence of the diagnostic accuracy of chest x-ray (CXR) in COVID 19. Some studies conducted in UK and Italy revealed early changes of COVID-19 pneumonia on CXR<sup>11</sup>. World health organization (WHO) suggests its lower sensitivity and possibly higher specificity than chest CT for diagnosing COVID-19<sup>11</sup>. Since its easy availability and cost effectiveness, we made chest x-ray mandatory along with COVID 19 PCR as screening protocol of all patients admitted to any surgical specialties. This was in accordance with the Italian Society of Radiology (SIRM) recommendation using CXR as a first-line imaging tool<sup>12,13</sup>. Similar recommendations were given by American Society of Radiology<sup>14</sup>.

We found that 20 of 271(7.38%) had CXR findings suggestive of COVID-19 ( $p=0.019$ ). On correlating it with those who had COVID-19 PCR positive, 45% had positive CXR changes ( $p=0.00$ ). This shows that CXR was helpful in diagnosis in less than half of the study population. HRCT chest was done in 113(36.2%) of the patients, 33(29.2%) of them have positive findings most common being ground glass opacities. On correlating it with those who had COVID-19 PCR positive, 62.5% had positive HRCT chest changes ( $p<0.001$ ). This makes it far superior to CXR in assisting diagnosis of COVID. Similar results were obtained by Castiglioni T et al<sup>5</sup> This shows that HRCT chest is a more comprehensive imaging for diagnosis COVID-19 but it can be easily available at all centers and cost constraints allow us to perform it only for patients with high suspicion of COVID -19 or within 24 hours before surgical procedures with timely reporting by a consultant radiologist.

In present studies, Although general surgery was over all the most busy of all the specialties in terms of hospital admissions, orthopedic surgery team was found to have the greatest number of the operations of all surgical specialties which is comparable to China and Italy<sup>16</sup>. Most of the orthopaedic procedures were for damage control in accordance with the orthopedics trauma management algorithm proposed by Khak M et al<sup>17</sup>. 40 Out of 47, 40(85.1%) were successfully managed with open reduction. Our results are contrary to reported by Vijay et al in a recent metaanalysis where an overall non surgical management of 31.8% of fractures in Italy, China, India, UK, USA, Spain, Iran and Nepal were managed with closed reduction<sup>16</sup>.

In our audit, found that 87(27.8%) of the patients were of acute abdomen, acute gallbladder disease being most common 27(9.1%) followed by acute appendicitis 13(4.17%). We managed most of the gall bladder illness patients conservatively followed by interval cholecystectomy and only 12(5.85%) of the

patients who failed medical management or presented with unavoidable condition like empyema gallbladder or perforated gallbladder were managed with cholecystectomy and cholecystostomy. This is in accordance with ACS guidelines published in March 2020<sup>18</sup>. All patients with acute appendicitis were managed surgically<sup>17</sup>, 27(62.9%) of the intestinal obstruction were managed surgically.

In another tertiary care hospital in Pakistan, they performed a total of 61 laparotomies, most commonly performed for acute appendicitis 32(52.4%) followed by intestinal obstruction 13(21.3%) however their data does not depict how many of them received medical management first and then converted to surgery or if any of them was recovered with conservative management<sup>17</sup>. No gallbladder surgery was done<sup>19</sup>. In an Italian study only 1(8.3%) laparoscopic cholecystectomy and 7(58.3%) appendicectomies were done but they noticed an overall 87% decline in surgical emergencies presenting to their hospital in lockdown<sup>20</sup>.

Vascular surgery service was amongst the third specialty in our hospital which served the most in this pandemic. Although a major component of vascular surgery is vascular trauma, none was encountered throughout this period as opposite to 8.1% of vascular trauma encountered by Raza MW et al<sup>19</sup>. This may be because all the vascular trauma is diverted to main public sector hospitals instead of Military Hospitals. According to American Society of surgeons, none but the amputation of toe should be postponed if possible during this pandemic. 6. Out of 21 diabetic foot patients, 20(95.2%) underwent amputation all managed by vascular surgery team to share the load of orthopedics and general surgery service. These diabetic patients could be considered a collateral damage of COVID 19 pandemic as they presented so late to us that limb salvage could not be done. These patients not only missed their routine checkups to hospitals to an extent that the amputations were unavoidable.

Out of 4 acute limb ischemia, only 1(25%) was managed with embolectomy. Rest of them presented late for limb salvage. The reasons could be lack of transport, fear of COVID-19 and failure to recognize the problem by the local doctors. ACS proposed to consider postponing arteriovenous fistula and grafting expect in a patient with previous access or line complication. Jbar AA et al, in his guideline for prioritization of patients has proposed the same. Initially we withheld our access surgery practice due to unavailability of resources and local policies as most of the operation theatre staff were shifted to manage COVID wards. Despite this fact, vascular surgeons at our center consider arteriovenous fistula as a life line of patients with endstage renal disease individualize the decision of fistula surgery according to overall medical condition of the patient. As soon as the resources became available, we restarted our access surgery as day care cases in accordance with local policies. We operated all arteriovenous fistula after screening them for COVID -19. None of these patients turned out to be COVID positive. In spite of the fact that there are immunocompromised and have mandatory visits to the hemodialysis centers, none of them in our experience had COVID-19.

**Limitation:** The major limitation of our study is a single center study with limited time data. Another important limitation is exclusion of gynaecological surgeries which forms a hefty amount of all the cases presenting to our hospital.

## CONCLUSION

This pandemic is unprecedented and with experience of the first wave we can prepare for the later waves as well. Our protocols of isolation and universal screening with RT PCR and CXR/HRCT have proved to be effective and should continue. Orthopaedic and General Surgery are the leading fighters during this pandemic and should be supported by rest of surgical specialties. Simple procedures under local anaesthesia which

are crucial for the patient like AVF creation should also be facilitated.

We believe that a critical audit of our own performance will not only allow us to improve for the upcoming battle against the second wave but also will be a role model for other hospitals to help them design their own strategies.

**Conflict of interest:** None

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