

# Impact of one-stop clinic on the clearance of COVID-19 surgical backlog

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## ABSTRACT

**Objective:** During the COVID-19 pandemic, there was a significant decrease in the number of operated elective cases due to the shutdown procedures. This situation created a substantial surgical backlog. Several visits are generally necessary before a surgical decision making and booking the surgery time. Improving patient access by creating “one-stop” clinics might help decrease the number of visits before the surgery. This study investigated the effect of one-stop clinic application as a new care model on COVID-19 surgical backlog clearance.

**Methods:** We conducted a quasi-experimental, interrupted time-series, pretest-posttest study design in the northern areas of Saudi Arabia. The study outcomes were the number of surgeries and the time elapsed from the first seen day to the booked room day.

**Results:** A total of 358 surgeries were included. Of them, 107 (29.9%) surgeries were performed before initiation of the one-stop clinic and 251 (70.1%) after initiation. The median (quartile Q1, Q3) time elapsed from the first seen day until the booked OR day post-one-stop clinic was 10 (6-17), which was significantly lower than pre-one-stop clinic 20 (11-33),  $P < 0.0001$ .

**Conclusion:** One-stop clinics shortened the period between first visit and booking in the operating room. One-stop clinics may alleviate the surgical backlog resulting from the COVID-19 crisis.

**Keywords:** COVID-19, clearance, one-stop clinic, surgical backlog

## Introduction

A coronavirus disease 2019 (COVID-19) was recently identified as a viral infection with severe acute respiratory syndrome triggered by a coronavirus 2 (SARS-CoV-2). The first pneumonia case was reported in December 2019 in Wuhan, China. The virus has spread exponentially worldwide, leading to the World Health Organization (WHO) declaring COVID-19 a public health emergency.<sup>[1]</sup> On 11<sup>th</sup> March 2020, the WHO officially reported COVID-19 as a pandemic.<sup>[2]</sup>

Soon after the WHO announced a pandemic, many countries globally took steps to contain and prevent the virus's spread. Curfews, quarantines, lockdowns, and other restrictions were put in place worldwide to control the further spread of COVID-19 infection.<sup>[3]</sup> These restrictions disturb everyday life activities and affect many sectors, including the health care system. During the COVID-19 pandemic, there was a complete shutdown of surgical services or decreased the number of elective surgeries due to the overwhelming health system with COVID-19 cases. This, in turn, created a vast surgery backlog.

The COVID Surg Collaborative Project expected canceling or delaying more than 28 million surgeries across 190 countries in the first 12 weeks of COVID-19.<sup>[3]</sup> Another study estimated the recovery time until the health care system returned to its total capacity to be between 7 and 16 months.<sup>[4]</sup> In Canada, the estimated size of elective surgical backlog during COVID-19 pandemics was 148,364 surgeries, with an average increase of 11,413 surgeries per week and 84 weeks of estimated backlog clearance time.<sup>[5]</sup>

Further, the surgical backlog during COVID-19 caused profound financial pressure and economic impact. The American Hospital Association estimated the financial impact of an average of \$50.7 billion per month in losses for America's hospitals and health systems.<sup>[6]</sup> The Canadian Medical Association estimated that an extra \$1.3 billion in funding is required to return waiting times to pre-pandemic levels.<sup>[6]</sup> These estimates would be much higher if the costs associated with hospital space limitations, restricted machinery, and other restrictions of the COVID-19 policy were applied.<sup>[6]</sup>

The COVID-19 surgical backlog has severe consequences for the recovery stage. In addition to the capacity of the health care system reduction, the anticipated demand will likely result in the creation of waitlists and potentially worsening health effects, making it critical to beginning recovery planning as soon as possible. Under the existing system, the patients seeking surgical services will be initially seen in an outpatient clinic. Several visits are generally necessary before a management decision and booking in the operating room for definitive treatment. Improving patient access by creating specific “one-stop” clinics may help reduce the number of waiting list patients, shorten the period between the first visit and surgery booking, and positively impact surgical backlog management, time utilization, and patient satisfaction.

A one-stop clinic offers consultation, a diagnosis, and a care plan in almost a single visit. The one-stop clinic contains a multidisciplinary team (consultants, nurses, imaging technicians, etc.) to accommodate patient’s needs during their visit. A one-stop clinic is not a new approach; it has been used frequently to solve surgical backlog or waiting time problems.<sup>[7-11]</sup> This approach was also projected by the National Health Service Institute for Innovation and Improvement to reduce the maximum waiting time and improve the patient experience.<sup>[12]</sup> Herein, we investigated the effect of the one-stop clinic’s application as a care model on clearance of COVID-19 surgical backlog in north areas of Saudi Arabia.

## Methodology

This is a quasi-experimental, interrupted time-series, pretest-posttest study. The study was conducted in the northern areas of Saudi Arabia. The north areas include multiple provinces: Tabuk, Ha’il, Al Jawf, and Northern Borders regions. As per 2019 statistics, the population in these regions is estimated at 2,595,762 people, representing around 7.6% of Saudi Arabia’s population.<sup>[13]</sup> In 2019, the number of government hospitals in these regions was 50 Hospitals (48 MOH hospitals and two other governmental hospitals) with 7497 beds. In these regions, the number of private hospitals was four hospitals.<sup>[14]</sup>

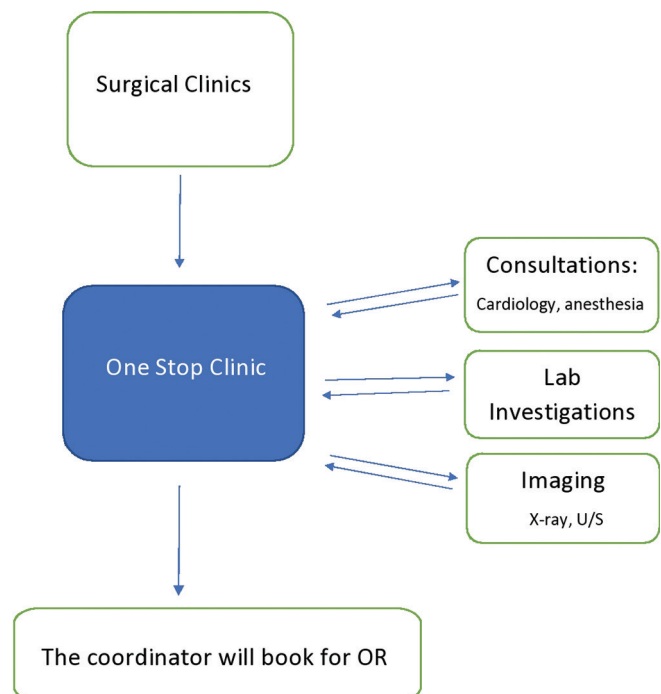
The institutional review board approved this study of King Fahad Medical City, Riyadh, Saudi Arabia, which requested qualified collaborators from each site to facilitate the data collection and validate data. Permission from the hospitals under investigation was obtained to conduct this study. Data were gathered in each hospital by each collaborator and given to the researchers for review and analysis.

The one-stop clinics’ approach was started after the OR recovery stage in August 2020, and it was conducted in four hospitals. However, the data were available for analysis pretest-posttest in one hospital and posttest only in another hospital. Patients can receive multidisciplinary consultations, diagnoses, and a care plan in almost a single visit in these clinics. To facilitate the patients’ fast service without reducing quality,

we reduced the unnecessary investigations and procedures [Figure 1]. The surgeries that operated through the one-stop clinic involved mainly general surgery, ophthalmology surgery, ENT surgery, and orthopedic surgery. Examples of these surgeries include but were not limited to cholecystectomy, adenoidectomy, nail removal, and cataracts.

The surgical backlog was defined as the number of patients waiting for their elective surgeries. Lowering the waiting time from the first seen (visit) until the OR booking will reduce the surgical backlog. To study the effect of the one-stop clinic on clearance of surgical backlog, we calculated the number of surgeries and the time elapsed from the first seen day till the booked OR day (primary outcomes). We compared the period of one-stop clinic applications from August 17, 2020 to March 11, 2021 (posttest) with the period before establishing the one-stop clinic from December 1, 2019 to March 31, 2021 (pretest). We measured the time elapsed from the first seen day to the booked OR day per site (site 1 and 2) and specialty (general surgery, ophthalmology surgery, ENT surgery, and orthopedic surgery).

The categorical variables were represented as frequency and percentage, and the continuous variables as mean ± standard deviation (SD) or median (quartile Q1, Q3). The Shapiro-Wilks test tested normality distribution. The student’s *t*-test or two-sample Wilcoxon rank-sum test was used to comparing the pretest and posttest groups of the time elapsed from the first seen day until the booked surgery. The Chi-square test or Fisher’s exact test compared the number of surgeries between the pretest and posttest groups. We calculated the 95% confidence interval, and the *P* < 0.05 was considered



**Figure 1:** Reduce unnecessary investigations and procedures

statistically significant. We constructed a run chart reporting the average of days from the first seen day until the booked OR day per month for the pretest and posttest periods. Statistical analysis was performed with Stata Statistical Software (Release 16. College Station, TX: StataCorp LLC. 2017).

## Results

We included 358 surgeries in this study. Of them, 107 (29.9%) surgeries were performed before initiation of the one-stop clinic and 251 (70.1%) after initiation. On site one, there were 280 surgeries in which 107 (38.2%) surgeries were performed before initiation of the one-stop clinic and 173 (61.8%) after initiation of the one-stop clinic. The majority of these surgeries were under general surgery 131 (46.8%), followed by ophthalmology surgery 81 (28.9%) and ENT surgery 68 (24.3%) [Table1].

However, after Comparing three months before (December 2019, January 2020, and February 2020) with 3 months after (December 2020, January 2021, and February 2021), the total number of surgeries was significantly higher in the pretest group  $P$ -value 0.0003.

The median (quartile Q1, Q3) time elapsed from the first seen day until the booked OR day post-one-stop clinic 10 (6–17) was significantly lower than pre-one-stop clinic 20 (11–33),  $P < 0.0001$  [Table 2]. Similarly, in site one, the median (quartile Q1, Q3) time elapsed from the first seen day until the booked OR day of post-one-stop clinic 12 (8–19) was significantly lower than pre-one-stop clinic 20 (11–33),  $P < 0.0001$ . Furthermore, for the subgroups, the median time elapsed from first seen day until the booked OR day was lower in ophthalmology surgeries (28 [17–50] vs. 12

**Table 1:** The number of pre-and post-one-stop clinic surgeries of site 1

Specialty	All	Pre-one-stop clinic	Post-one-stop clinic
Ophthalmology	81 (28.9%)	37 (13.2%)	44 (15.7%)
General Surgery	131 (46.8%)	31 (11.1%)	100 (35.7%)
ENT	68 (24.3%)	39 (13.9%)	29 (10.4%)
ALL	280 (100%)	107 (38.2%)	173 (61.8%)

**Table 2:** The number of surgeries pre and post-one-stop clinic in site 1. (Comparing 3 months before - December 2019, January 2020 and February 2020 - with 3 months after - December 2020, January 2021 and February 2021)

Specialty	All	Pre one-stop clinic	Post one-stop clinic	P-Value
Ophthalmology	53	34 (64.2%)	19 (35.9%)	0.0007
General Surgery	64	29 (45.3%)	35 (54.7%)	0.61
ENT	68	39 (78%)	11 (22%)	0.006
ALL	167	102 (61.1%)	65 (38.9%)	0.0003

([.5–19],  $P < 0.0001$ ), general surgeries (14 [9–21] vs. 11 [8–18],  $P$ -value 0.31) and ENT surgeries (21 [13–31] vs. 15 [10–22],  $P$ -value 0.005) after the initiation of the one-stop clinic [Table 3]. The average monthly time elapsed from the first seen day until the booked OR day pre and post-one-stop clinic are shown in [Figure 2].

## Discussion

This study investigated the effect of a one-stop clinic's application as a care model on the clearance of the COVID-19 surgical backlog. We measured the number of surgeries and the time elapsed from the 1<sup>st</sup> day seen until the booked OR day before and after the one-stop clinic initiation. Our results revealed that the time elapsed from the 1<sup>st</sup> day seen until the booked OR day was lower after initiating the one-stop clinic.

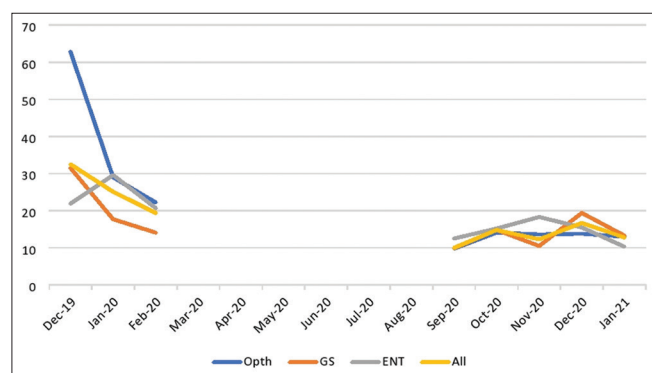
The one-stop clinic may reduce the surgical backlog during COVID-19 and limit patients' exposure to more hospital visits, which in turn may reduce infections exposures, reduce the cost, and increase patients' satisfaction.<sup>[8,15]</sup> Although the one-stop is not a new model, the studies that assess its effect on surgical backlog due to COVID-19 are limited. A one-stop clinic approach was adopted in the United Kingdom for plastic surgeries during the COVID-19 pandemic.<sup>[15,16]</sup> It showed positive outcomes, encouraging them to continue this approach with the extreme resource limitation.<sup>[15,16]</sup>

Away from the COVID-19 pandemic, several studies have advocated introducing one-stop clinics. A local national survey in the United Kingdom showed that around 95% were satisfied with and preferred the one-stop clinic approach compared to conventional service.<sup>[8]</sup> From a non-compliant mean of 80% to a compliant 95%, the one-stop clinic improved the waiting times. Besides, the capability of the department grew by 15%.<sup>[8]</sup> Javaid *et al.* described their experience in using this approach in plastic surgery. They concluded that these clinics were cost-effective and effectively reduced the burden in a routine clinic and allowed more patients with major serious problems to be seen earlier.<sup>[9]</sup> In 2011, Pérez *et al.* reported that a one-stop clinic was feasible for various procedures in a urological ambulatory clinic.<sup>[10]</sup> Similarly, Voorbrood *et al.* revealed that applying the one-stop clinic for endoscopic hernia surgery was effective, with a patient satisfaction score of 9 out of 10.<sup>[11]</sup>

Study results should be interpreted in light of their strengths and limitations. This study is from the few studies that examined the effect of implementing the one-stop clinic on the surgical backlog due to the COVID-19 pandemic. Besides, it is from the few studies that involved multiple surgical specialties. This study's limitation includes the quasi-experimental design's known weaknesses, such as lack of randomization and control group, limiting its ability to conclude causal association. In addition, this study did not control possible confounders that can affect the waiting

**Table 3:** The time elapsed from the first seen day until the booked OR day pre and post-one-stop clinic

	Pre-one-stop clinic		Post-one-stop clinic		P-value
	Number of surgeries	Time till OR booking	Number of surgeries	Time till OR booking	
M	107	20 (11–33)	251	10 (6–17)	<0.0001
Site 1					
Ophthalmology	37	28 (17–50)	44	12 (4.5–19)	<0.0001
General Surgery	31	14 (9–21)	100	11 (8–18)	0.31
ENT	39	21 (13–31)	29	15 (10–22)	0.005
Ortho	0		0		
All	107	20 (11–33)	173	12 (8–19)	<0.0001
Site 2					
Ophthalmology	0		0		
General Surgery	0		24	5.7±3.3	
ENT	0		33	7.1±5.1	
Ortho	0		21	9.5±5.9	
All	78		78	7.3±5.0	
Site 1+Site 2					
Ophthalmology	37	28 (17–50)	44	12 (4.5–19)	<0.0001
General Surgery	31	14 (9–21)	124	10 (6.5–17)	0.04
ENT	39	21 (13–31)	62	8.5 (5–17)	<0.0001
Ortho	0		21	9.47±5.9	
All	107	20 (11–33)	251	10 (6–17)	<0.0001

**Figure 2:** The time elapsed from first seen day until the booked OR day pre- and post-one-stop clinic

time for surgery, such as the availability of instrumentations, number of surgeons, number of anesthesia, bed capacity, and limitation of supplies. Further, we did not measure the patients' satisfaction and aspects of post-operative care, cost, quality of care, and outcomes. We recommend considering these measures in future researches.

## Conclusion

This study has shown that one-stop clinics might help recruit the patients on the waiting list quickly, shorten the period between first visit and booking in the operating room. After considering the limitations of this study, we recommend studying the one-stop clinic's effect on patient satisfaction and surgeries outcome.

## Authors' Declaration Statements

### Ethics approval and consent to participate

Permission from the hospitals under investigation was obtained in order to conduct this study. Data were gathered in each hospital by each collaborator and given to the researchers for review and statistical analysis. This study was ethically approved by the institutional review board of King Fahad Medical City in Riyadh, Saudi Arabia.

### Availability of data and material

All data generated and/or analyzed during this study included in this published article. The data are available from the corresponding author upon request.

### Competing interests

The authors declare no conflict of interest

### Funding statement

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## Authors' contributions

The research team designed and led the design of the study and the preparation of the article; also carried out data extraction, analysis and carried out a systematic review of the literature for

data retrieval. The final version of this manuscript was read and approved by all authors. Before submission, all listed authors have approved the manuscript, including the names and data included and the graphs. All of the writers got input and helped shape the research, review, and manuscript.

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