



# Orthopedic Department of Education Center and Service Provide During Coronavirus Disease-2019 Pandemic: An Experience from Single-Center Hospital

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## Abstract

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**BACKGROUND:** In the global pandemic of the 2019 coronavirus disease (COVID-19), many countries have reported a decrease in visits to hospitals, and health-care systems around the world are reshaping health protocols. Health service and education in orthopedics are also affected although not at the frontline in dealing COVID-19.

**METHODS:** The data from this study collected from several official databases, including the Indonesian Ministry of Health, Central Java provincial government, general hospital, and orthopedic surgery cases.

**RESULTS:** Pandemic COVID-19 started in March 2020 in Indonesia. Surakarta has become one of the epicenters. Health services in the orthopedic department also experienced a decrease cases on all divisions (outpatient clinics, emergency rooms, and inpatients). Mann-Whitney non-parametric comparative test showed significance result in p value operation of orthopedic cases and inpatients ( $p = 0.016$  and  $p = 0.016$ ;  $p < 0.05$ ), meanwhile, outpatient visits did not show significance result with  $p = 0.0509$  ( $p > 0.05$ ). The decrease in the number of cases being treated in the orthopedic service also has an impact on education and training programs. The digital era is one of the choices in the field of education. However, digital resources cannot substitute for direct patient exposure.

**CONCLUSION:** The average number of orthopedic patients during the pandemic period from January to December 2020 decreased compared to visits in the same period in 2019 so that orthopedic services at tertiary and academic referral hospitals experienced a significant decrease in cases. The education and services department must adapt to the policy on educational activities for residents and medical students. The education department and hospital institutions restructured and reorganized resident doctors to continue providing services. The digital era is an option that supports the education process during a pandemic.

## Background

Coronavirus disease (COVID-19) is an infectious disease that occurs due to the acute respiratory tract infection due to coronavirus-2 severe acute respiratory syndrome coronavirus 2. Indonesia has become one of the most impacted countries by pandemic COVID-19. The first case was found in March 2, 2020, and immediately increased dramatically. The World Health Organization (WHO) declared COVID-19 as an epidemic in early March 2020. Due to those declaration, the President of Indonesia also signed Government Regulation No. 21/2020 to implement large-scale social restrictions to control the spread of the disease in March 2020 [1], [2], [3], [4].

The restrictions include banning closing schools, non-public service office, mass gatherings, restricting public transportation, and restricting non-essential businesses. The Ministry of Health also appointed certain hospitals as referral hospitals for dealing with

developing infectious diseases. Dr. Moewardi General Academic Hospital has been appointed to cover the pandemic in Central Java province [5].

Dr. Moewardi Regional General Hospital is located in the province of Central Java, a type A hospital in Indonesia, and designated by the government as a tertiary referral hospital. Dr. Moewardi Regional General Hospital has supporting facilities for handling COVID such as intensive care unit (ICU), isolation ward for patient with infectious diseases, tertiary referral hospital, and the main academic affiliated hospital of the Sebelas Maret University, Faculty of Medicine, Surakarta. The hospital provides a high volume of health-care services for a wide range of many cases. The hospital also serves as the premier academic affiliated hospital for an education and training center for junior medical students and multispecialty residency education program. However, during pandemic, all of these functions must adapt to new situations. Orthopedic services and education are no exception.

Several publications discussed the management of services and education to overcome the current situation, especially the COVID-19 pandemic. This article reports how Dr. Moewardi general hospital as tertiary referral hospitals deal with this complicated situation. We explain the impact of the outbreak, adapted hospital policies, orthopedic patient care by comparing outpatient visits, surgical patients, and monthly inpatients during the period of January–December 2020 (early pandemic period) compared to the same period in 2019. We explain educational programs during the outbreak and also planning for future reference on service readiness and education.

## Methods

We process the data to evaluate trends in orthopedic services from the number of outpatient visits, surgical patients, and monthly orthopedic inpatients from January to December 2020 (during the pandemic period) compared to the same period in 2019 and analyzed separately. Data were taken from the database of Dr. Moewardi Hospital Health Information System. Data from 1 year before the outbreak were included in the study. We intend to give our readers a clearer picture about the impact of the outbreak. During a pandemic, only procedures necessary to live saving are permitted. The priority of the lifesaving procedure is divided to urgent and emergency. Emergency cases were defined as cases requiring immediate treatment to the emergency and/or operating room (hemodynamically unstable pelvic fracture, crush injury, and multiple open fractures).

## Results

In mid-November 2020, the Indonesian government had confirmed 59,911 active COVID-19 cases with an increase (4106 cases) of 12.83%, death rate 3.26%, new cases average of 19.76% in October, and increase in the number patients recovering (recovered cases) after the latest confirmed COVID-19 cases. Central Java province is one of the regions with high COVID-19 cases. In November 2020, these province had recorded 5723 cases as cumulative active cases, while in comparison with Jakarta, which had documented 6600 cases. From the results of the study, data show that the highest percentage of confirmed cases based on age distribution is in the 31–45 years age group (26.95%). The main comorbidities of COVID-19 patients were diabetes mellitus and hypertension.

Dr. Moewardi Hospital is a government hospital. The COVID-19 pandemic is forcing hospital management to implement new protocols in the provision of health services. Orthopedic services are affected indeed and can be seen by the number of outpatient visits, surgical patients, and inpatients. The impact of this new protocols included a reduction in outpatient visits, surgical procedures (especially elective surgeries), and inpatients.

Statistical data were analyzed using the non-parametric comparative Mann–Whitney U-test. Analyzes were performed using the Statistical Package for the Social Sciences (SPSS) for Windows version 25.0, produced by IBM in New York, USA. The results of the patients number difference were statistically calculated and considered significant if  $p < 0.05$

### Outpatients visits

The average number of outpatient visits per month during the pandemic period from January to December 2020 was 93 visits per month, a decrease compared to 108 visits in the same period in the previous year. However, the Mann–Whitney non-parametric comparative test was not significant with  $p = 0.509$  (Table 1). The lowest outpatient visits occurred in May 2020 with the number of outpatient visits as many as 35 patients. The number of monthly outpatient visits is shown in Figure 1.

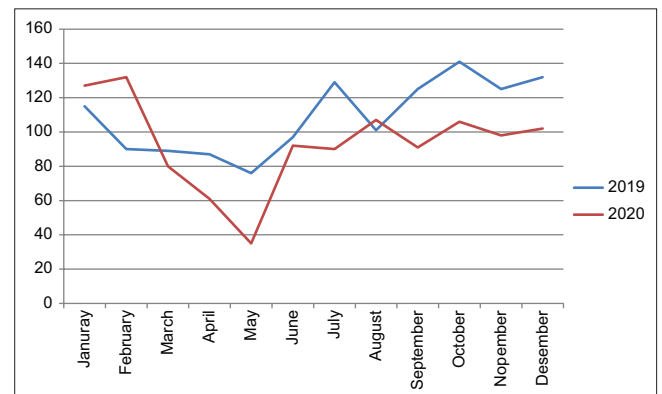


Figure 1: Outpatient visits

### Operation of orthopedic cases

The number of operations of orthopedic cases performed has also decreased. Based on the data collected, there was an average of 72 operations per month in 2020, compared to the same period in the previous year an average of 83 operations per month. The lowest number of orthopedic operations occurred in May 2020 with the number of operations in as many as 32 patients, from the results of the Mann–Whitney non-parametric comparative test, significant results were obtained with  $p = 0.016$  ( $p < 0.05$ ). The number of monthly orthopedic surgery patients is shown in Figure 2 and Table 2.

**Table 1: Outpatient visits**

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DES	p value
2019	115	90	89	87	76	97	129	101	125	141	125	132	0.509
2020	127	132	80	61	35	92	90	107	91	106	98	102	

**Table 2: Orthopedic cases operation**

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DES	p value
2019	76	64	76	63	75	74	91	97	102	103	94	84	0.016
2020	96	82	78	38	32	67	69	76	93	84	90	60	

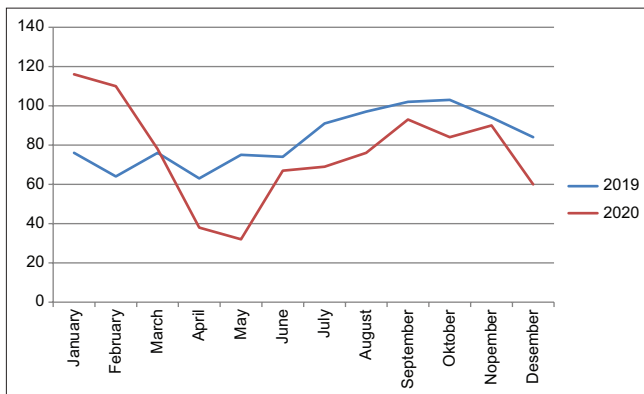


Figure 2: Orthopedic cases operations

**Inpatients**

Inpatient at Dr. Moewardi patients with orthopedic cases, based on the results of the non-parametric comparative Mann–Whitney U-test data on inpatients at the Regional General Hospital Dr. Moewardi, showed a statistically significant decrease ( $p < 0.05$ ) 0.016. Based on Table 3, it can be seen that the number of hospitalized patients was higher in the pre-pandemic period compared to the pandemic period (Figure 3).

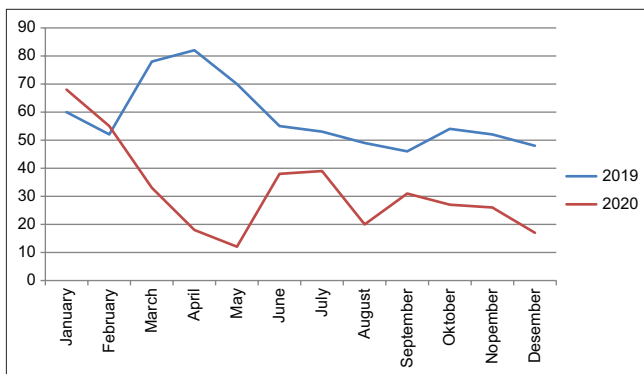


Figure 3: Inpatients

The decrease in the number of polyclinic visits, inpatients, and orthopedic surgery cases had a direct impact on the experience of resident physicians. Restructuring and reorganizing residency education in rotational settings was done to avoid exposure to COVID-19. On the other side, there is a new educational structure introduced with digital educational teleconference. The head of the residency study program rearranges residents shift for hospital services (Figure 4). Residents are divided into three teams, an emergency team, an elective team, and a team that learns and works from

home. Elective team performs elective surgeries and outpatient clinic, and off duty after that. Emergency team is in charge of emergency patients during that day and work from home the next day (third team).

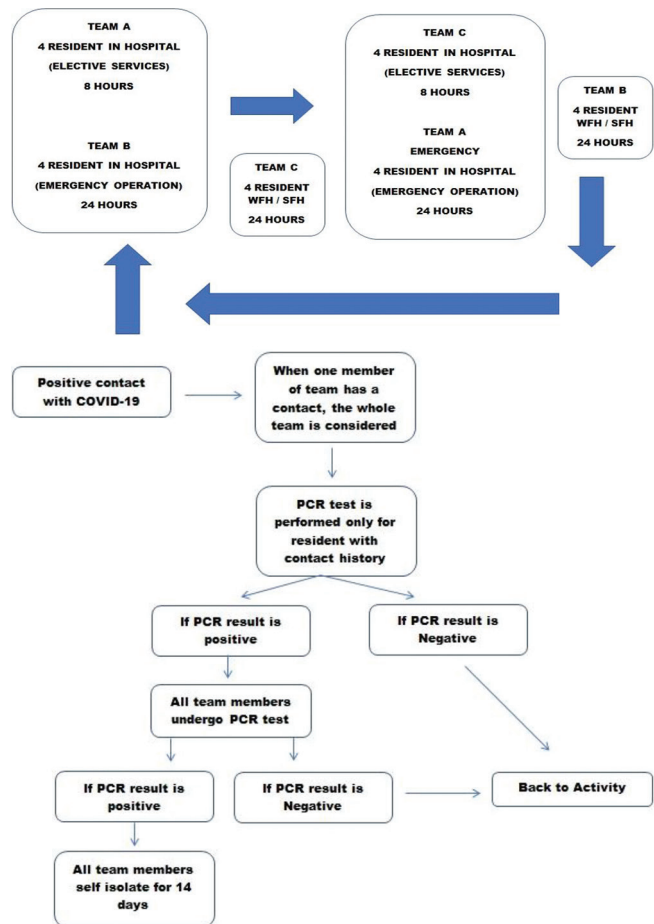


Figure 4: Resident shift regulation during pandemic

**Discussion**

The impact of COVID-19 in orthopedic services is very real and in line with the regulations of government boards of directors and hospitals. Dr. Hospital Moewardi as a tertiary referral hospital is restructuring its resources to accept more cases of COVID.

The hospital had sufficient isolation space to accommodate COVID-19 patients in early March

**Table 3: Inpatients**

Year	JAN	FEB	MAR	APR	MEI	JUN	JUL	AUG	SEPT	OCT	NOV	DES	p value
2019	60	52	78	82	70	55	53	49	46	54	52	48	0.016
2020	68	55	33	18	12	38	39	20	31	27	26	17	

2020. As cases continued to increase, the number of isolation rooms was increased. The consequence of room restructuring was a decrease in the surgical ward capacity and ICU availability for elective surgery.

At hospital entry points (outpatient clinics and emergency rooms), screening for the risk of COVID-19 infection is applied, and a screening of early warning score was performed for all incoming patients (Table 4). All swab polymerase chain reaction (PCR)-positive patients followed the confirmed COVID-19 protocol. Patients who will undergo surgery are examined by a PCR swab test.

**Table 4: Early warning system of COVID-19**

COVID-19 early warning score (COVID-19 EWS)		
Parameter	Assessment	Score
Signs of pneumonia on computed tomography scan thorax	Yes	5
A history of close contact with a patient who has been confirmed positive for COVID-19	Yes	5
Fever	Yes	3
Age	>44 years	1
Gender	Male	1
Highest body temperature (T <sub>max</sub> ) <sup>a</sup>	>37.8°C (100°F)	1
Respiratory symptoms (including dry cough, cough with phlegm, and shortness of breath)	>1 symptoms	1
NLR <sup>b</sup> (neutrophil-lymphocyte ratio)	>5.8	1
The patient is highly suspected of COVID-19 if the score		>10

Severe acute respiratory syndrome coronavirus 2-positive nucleic acid detection is an independent diagnostic indicator. <sup>a</sup>T<sub>max</sub>: The highest body temperature from the onset of the disease to the first admission to the hospital. <sup>b</sup>NLR: Neutrophil-to-lymphocyte ratio

Appropriate personal protective equipment (PPE) is applied to all activities in outpatient clinics, wards, and operating rooms. Comprehensive training was conducted on how to clean, store, and check PPE in the early phases of the outbreak. A patient requiring emergency procedures is brought to the emergency room [6], [7], [8], [9], [10], [11], [12], [13], [14].

Based on the results of our study, it shows that in January-December 2020 during the COVID-19 pandemic period, there was a decrease in the number of visits of outpatients, surgery patients, and inpatients in each month compared to the number of visits in the same period the previous year. Based on the results of the non-parametric comparative test, significant results were obtained (p < 0.05) in number of surgeries and inpatients during the pandemic period compared to the pre-pandemic period.

Decreased number of orthopedic patients at Dr. Moewardi General Hospital can also be because of the Decree of the Mayor of Surakarta Number 443.76/28 of 2020 concerning the Determination of the Status of COVID-19 Extraordinary Events in the City of Surakarta. This had led to a decrease in outpatient visits from March to April in 2020.

The significant reduction in orthopedic services did impact the direct clinical exposure and study experience of the resident doctors. Nevertheless, this pandemic opens up new means of education for junior doctor students and resident doctors to become part of

the digital era. Online medical lectures such as webinars, teleconferences, and digital learning resources are growing exponentially. Face-to-face meetings were replaced and adapted to teleconference meetings. This has an impact on the clinical experience of the resident doctor but also opens up invaluable opportunities for the resident doctor to discuss the case broadly. However, digital methods cannot replace clinical experience and real surgical operative experience.

The university holds non-physical meetings for students. Students have reduced their doctor-patient direct clinical experience during their medical studies. To overcome this dilemma, there is a new learning system that divides into two parts. The first has been implemented during the COVID-19 pandemic phase to include student knowledge and simulation experience. The latter part is expected to occur after the hospital environment is deemed safer for educational purposes (Figure 5).

Junior Doctor (Undergraduated) Medical Elective Rotation	
<b>ORIGINAL ELECTIVE ROTATION</b>	<ul style="list-style-type: none"> <li>• Knowledge</li> <li>• Clinical pathway</li> <li>• Bedside teaching</li> <li>• Problem Based Learning (PBL)</li> <li>• Surgery observer at elective operation room</li> </ul>
<b>EARLY COVID-19 PANDEMIC</b>	<ul style="list-style-type: none"> <li>• Knowledge via digital</li> <li>• Clinical posting simulation via digital</li> <li>• PBL digital</li> <li>• No surgery observer</li> </ul>
<b>DURING COVID-19 PANDEMIC</b>	<ul style="list-style-type: none"> <li>• Knowledge via digital</li> <li>• Clinical posting</li> <li>• PBL via digital</li> <li>• No surgery observer</li> <li>• Bedside teaching</li> </ul>

Figure 5: Junior doctor (undergraduated) medical elective rotation

## Conclusion

Dr. Moewardi Academic Tertiary Referral Hospital was influenced by the implementation of health protocols during COVID-19 pandemic. Orthopedic services were decreased in number of cases in outpatients, operations, and inpatients. Universities and study program heads must adapt to the health protocol policies for the learning continuity. Reorganization of resident doctors in providing services following health protocols was imposed by universities and hospitals.

The digital era is an option during a pandemic to support the education process.

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