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Implementation of Orthopedic Surgery in Hospitals During the Covid-19 Pandemic: A Literature Review

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A B S T R A C T

The spread of COVID-19 through the air has prompted adjustments in the orthopedic field by delaying elective surgical treatment to reduce the burden on the health system and allow more beds to be made available for those in need so that hospital services are optimal. This research aims to determine the implementation of orthopedic surgery services in hospitals during the COVID-19 pandemic. This literature review uses articles in the PubMed, Google Scholar, and ProQuest databases published in 2019-2020, in full text, in English, using the keywords orthopedic AND COVID-19 AND emergency department OR trauma service. The researcher obtained 191 articles and then reviewed them using the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) diagram and The Joanna Briggs Institute (JBI) Critical Appraisal instrument. Seven articles were eligible for analysis. During the COVID-19 pandemic, orthopedic surgery services were limited to only allowing emergency surgery. Orthopedic specialists are also empowered to screen and examine suspected COVID-19 patients. Surgery is only performed by an exceptional team and outside working hours. This study shows a change in orthopedic services in hospitals during the COVID-19 pandemic.

Kata kunci:

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A B S T R A K

Penularan penyakit COVID-19 melalui udara mendorong penyesuaian di bidang ortopedi dengan penundaan perawatan bedah elektif untuk mengurangi beban sistem kesehatan dan memungkinkan tersedianya lebih banyak tempat tidur bagi mereka yang membutuhkan, sehingga pelayanan rumah sakit menjadi optimal. Tujuan literatur review ini untuk mengetahui pelaksanaan pelayanan terkait bedah ortopedi di rumah sakit selama masa pandemi COVID-19. Literature review ini menggunakan artikel pada database PubMed, Google Scholar, dan ProQuest yang diterbitkan pada 2019-2020, memiliki teks lengkap, berbahasa Inggris, menggunakan kata kunci ortopedic DAN COVID-19 DAN emergency department ATAU trauma service. Didapatkan 191 artikel kemudian direview menggunakan diagram Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) dan menggunakan instrumen The Joanna Briggs Institute (JBI) Critical Appraisal, mendapat 7 artikel yang memenuhi syarat untuk dianalisis. Selama masa pandemi COVID-19, layanan bedah ortopedi dibatasi dengan hanya mengizinkan operasi darurat. Spesialis ortopedi juga diberdayakan untuk melakukan skrining dan memeriksa pasien suspek COVID-19. Pembedahan hanya dilakukan oleh tim khusus dan dilakukan di luar jam kerja. Prosedur ortopedi yang menghasilkan aerosol akan dibatasi dan jumlah operator dalam satu ruang operasi dikurangi. Penanganan pasien ortopedi di klinik rawat jalan dapat dilakukan secara virtual. Penelitian ini menunjukkan bahwa terdapat perubahan pola pelayanan ortopedi di rumah sakit selama pandemi COVID-19

INTRODUCTION

Corona Virus Disease 2019 (COVID-19) has a fast transmission, and the World Health Organization (WHO) designated COVID-19 as a pandemic on March 11, 2020 (WHO, 2020). This global epidemic status indicates that the spread of COVID-19 is fast, so several countries. cannot avoid the coronavirus (Nyamnjoh, 2020). More than 258 million cases in 226 countries worldwide caused more than 5.16 million deaths. Prevalence data in Indonesia, more than 4.2 million cases and caused more than 143 thousand deaths. Every day, there is an increase (Task Force for the Acceleration of Handling COVID-19, 2022). The COVID-19 virus spreads through droplets, characterized by symptoms of fever, cough, and shortness of breath. This disease becomes deadly if there are complications of pneumonia and acute respiratory distress syndrome (Rothan & Byrareddy, 2020).

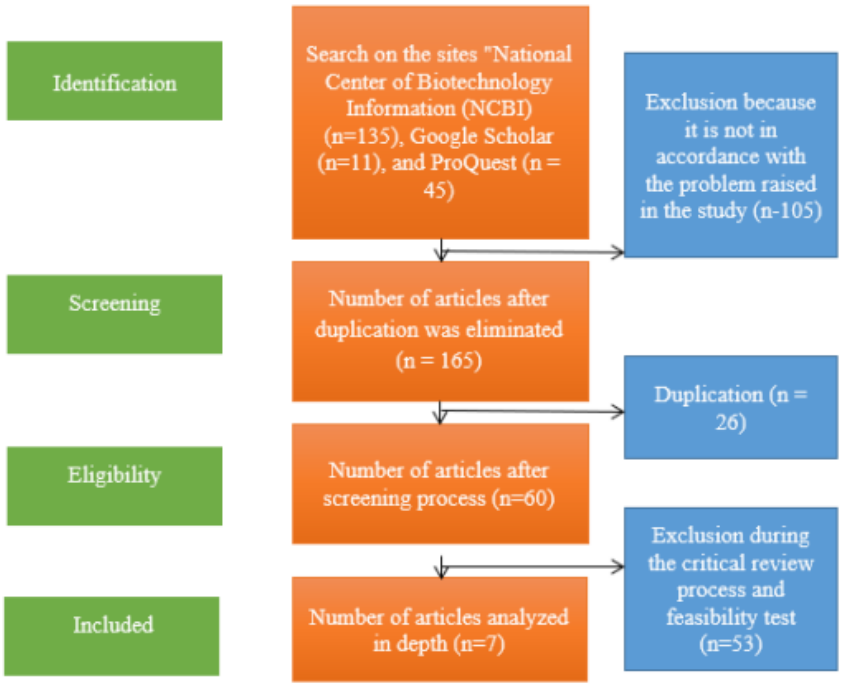
A significant burden on healthcare systems worldwide, COVID-19 has impacted various aspects of medical practice, including orthopedic surgery. Elective surgical procedures were postponed to reduce the burden on the healthcare system (Flemming et al., 2020). Health facilities must always be ready to reopen and continue medical care (Karamelias et al., 2020). This condition requires more understanding of preventive measures to restart during the critical phase, and there is some speculation of a third wave of COVID-19 (Elizabeth Brindle & Gawande, 2020).

Based on the description above, COVID-19 is one of the critical health problems because it has high morbidity and mortality rates globally including in Indonesia. Airborne transmission of this disease encourages an adjustment made by the hospital management so that various activities in the hospital take place optimally. This literature review aims to determine the implementation of orthopedic surgery services in hospitals during the COVID-19 pandemic.

METHOD

This study uses a systematic review of research through article searches with the Pubmed, Google Scholar, and ProQuest databases, which obtained 191 articles. Researchers conducted screening, selection, and critical assessment. The included final study will be assessed for feasibility using the JBI System for the Unified Management, Assessment, and Review of Information. Search results are reported in full in the final report and presented according to the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) guidelines. Data were synthesized and analyzed qualitatively. The results of each research report are written in tabular form for further analysis. Keywords use orthopedic, AND COVID-19 AND emergency department OR trauma service. The inclusion criteria for literature articles used were English published in the last two years 2019-2021, reviewed related to COVID-19 cases, and quantitative descriptive articles, and not literature articles.

Figure 1 PRISMA (Search and Screening Strategy) of literature review



RESULTS AND DISCUSSION

The results of the article search contained seven research articles that were used to answer the problems in this literature 2 articles describe changes in orthopedic service patterns, 2 articles describe changes in the duties of orthopedic staff in hospitals, 2 articles describe changes in orthopedic procedures in operating rooms, and 1 article describes telemedicine services in orthopedics.

Table 1. Results

No	Investigator	Sample	Design	Results
1	(Ruggieri et al., 2020) Italy	Changes in the pattern of orthopedic services in hospitals	Descriptive	The strategy implemented is the reallocation of resources for the care of COVID-19 patients and extensive swab tests. Relocation of orthopedic staff (doctors and residents) and reduction of orthopedic surgical activity with recommendations to perform only urgent or emergency cases, as well as delaying or avoiding elective procedures.
2	(Awad et al., 2020) United States	Changes in the pattern of orthopedic services in hospitals	Descriptive	Key principles of staff separation, physical restructuring, and designed workflows should focus on reducing exposure and contamination, ensuring compliance with PPE, and decontamination. Ideally, two types of hospital separation should be carried out. Segregation of orthopedic staff by location reduces the potential risk of cross-infection. Orthopedic surgeons should not perform screening examinations in the general population because of the risk of exposure. With the rapid increase in the number of COVID-19 patients, orthopedic staff should be separated into those who treat suspected/confirmed COVID-19 patients and those who treat non-infectious patients whenever possible. In addition to screening and isolation of confirmed high-risk COVID-19 patients, close and frequent screening from separate OR staff is mandatory. Separated or exposed staff members should report signs of illness immediately and should be dismissed from duty immediately. In addition, all incidents of contact between patients and staff should be recorded so that contact tracing and infection control measures can be implemented quickly, if any staff member tests positive.
3	(Konda et al., 2020) United States	Changes in the duties of the orthopedic team in the hospital	Descriptive	The Ortho-COVID-19 team is structured to enable efficiency while maintaining adequate oversight and accountability. Family doctors or internal medicine specialists are at the top of the hierarchy and act as a point of contact should the orthopedic surgery team face complex medical questions related to COVID-19. Each team is given their own task which is called the "Agricultural Model", namely: Sower: is a junior resident who works in multiple rooms carrying a portable oximeter and recording oxygen supplementation levels. They will then initiate an oxygen demand challenge by lowering the patient's oxygen flow rate, ensuring that no rapid decompensation will occur, and marking a new oxygen flow rate. Reaper: is a resident at the chief level who rechecks the new oxygen saturation and titrates oxygen demand as needed. After confirming that the patient's oxygen level has stabilized, they will report to the "farmer" Farmer: a junior resident working in a portable electronic medical record [computer-on-wheels (COW)] who remains outside the patient's room. This resident will record the patient's new oxygen requirement, make important updates, and write a progress note on the patient Furthermore, the orthopedic surgery resident will provide updates on the patient's condition to other orthopedic surgery teams who are not on duty. Patients without COVID-19 treated are seen first, followed by patients with COVID-19. In one day, the team completes an average of two surgical cases
4	(Jensen et al., 2020) Denmark	Changes in the duties of an orthopedic specialist and the functions of an orthopedic outpatient ward	Descriptive	Orthopedic surgeons are redistributed to treat minor and severe trauma in the emergency department. Meanwhile, ER doctors were deployed to staff COVID-19 screening, triage, and COVID-19 clusters. These changes cause minimal disturbance and discomfort among orthopedic surgeons. The remaining orthopedic specialists were asked to work from home or on vacation. During this period, the ER physical space was reused as a COVID-19 triage area and therefore the orthopedic outpatient clinic was renovated to accommodate ER patients.
5	(Rodrigues-Pinto et al., 2020) Portugal	Changes to orthopedic procedures in the operating room	Descriptive	The central surgical area is divided into five zones, namely dressing room (where to use complete PPE, including hazmat), anteroom (disinfection place), special operating room for COVID-19 patients, exit room (where PPE is removed), exit dressing room (where the medical team is located). disinfection and bath). In orthopedic surgical procedures, the use of power tools, such as electrocautery, bone saws, reamers, and drills will be reduced because they release aerosols and increase the risk of spreading the

				virus. Suction devices to remove smoke and aerosols should always be used during surgical procedures.
6	(Coccolini et al., 2020) Italy	Changes to orthopedic procedures in the operating room	Descriptive	It is important to minimize the total number of operators working in a single operating room. Operations for COVID patients may be arranged with special on-call shifts performed outside business hours to optimize resource use and minimize contact. Medical records should remain outside the OR and should be consulted and updated there after adequate doffing. Intraoperative document consultation is not recommended and should be minimized. The OR door must be kept closed at all times, even the supply of materials to the OR during operation should also be avoided. The nurse, in collaboration with the orthopedic surgeon, must anticipate what is needed during the surgery. Personnel who are in the OR during the operation are not allowed to leave the room
7	(Miguela Álvarez et al., 2021) Spain	Use of telemedicine methods for orthopedic services in hospitals	Descriptive	Of the 2,572 telephone consultations, 1650 (64%) were considered effective and 922 (36%) required follow-up in the form of face-to-face visits. Telephone consultations are carried out entirely by orthopedic surgeons and traumatology specialists to enhance resolution and reassure patients. Telemedicine is a viable option in orthopedic services and when properly processed, it will be an attractive option to maintain after a pandemic.

Ruggieri's research (2020) in Italy stated that in dealing with COVID-19, the hospital management had reallocated various resources to deal with COVID-19 patients. Orthopedic specialists and residents perform emergency surgeries, while elective surgeries are canceled or postponed. There were no other significant changes in orthopedic surgery services at the hospital (Ruggieri et al., 2020).

Awad's (2020) study in the United States showed many changes to services at the hospitals where the research was conducted. In addition, some of the changes made were staff separation, facility restructuring, and the creation of workflows specifically designed to reduce exposure, ensure compliance with PPE, and decontamination. Specifically, orthopedic specialists are not assigned to perform screening examinations on patients in the orthopedic field. The increase in COVID-19 patients forced the hospital to separate orthopedic staff into two several medical teams explicitly treating patients with suspected/confirmed COVID-19 and some non-COVID-19 patients. In addition, all orthopedic staff routinely and strictly undergo a rigorous screening process and periodic tests to identify any transmission of COVID-19 to orthopedic staff. Exposed staff members should immediately report signs of illness and should be temporarily suspended from duty (Awad et al., 2020).

Konda's research (2020) in the United States stated an adjustment in the duties of orthopedic staff at the hospital where the research was carried out. Separate teams create orthopedic staff specializing in treating COVID-19 patients for efficiency, supervision, and accountability. An internal medicine specialist within the team acts as a point of contact if the orthopedic surgery team faces medical questions related to COVID-19. Each member of the team (consisting of specialist doctors and orthopedic residents) is given their respective tasks called the "Agricultural Model" (Konda et al., 2020): a) sower is a junior resident who works in some rooms carrying portable oximeters and records oxygen supplementation levels, b) reaper is a resident at the top level who rechecks the new oxygen saturation and titrates oxygen demand as needed, then after. confirming that the patient's oxygen level has stabilized, they report to the "farmer," c) farmer is a junior resident working in a portable electronic medical record computer-on-wheels (COW) who remains outside the patient's room. This resident records the patient's new oxygen requirement, makes essential updates, and writes a progress note on the patient. Furthermore, updates on the patient's condition are reported to the entire orthopedic surgery team, including those not on duty. Patients without COVID-19 are treated first, then patients with COVID-19.

Jensen's research (2020) in Denmark also showed a change in the duties of orthopedic specialists in hospitals. The study reported that most orthopedic specialists were placed in the emergency department to treat mild to severe trauma. Meanwhile, doctors who usually stand guard in the ER were deployed to staff for COVID-19 screening, triage, and COVID-19 cluster location. Orthopedic specialists who are not on duty in the ED will be assigned to work from home (via telemedicine) or on vacation. During this period, the ER physical space was used as a COVID-19 triage area, and various outpatient clinics, including an orthopedic outpatient clinic, were refurbished to accommodate ER patients (Jensen et al., 2020).

Regarding the arrangement of the central operating room for orthopedic procedures, research by Rodrigues-Pinto (2020) reported on changes in the layout and function of his hospital. The study reported that the central surgical area was modified so that it can be divided into five zones dressing room (where to use complete PPE, including hazmat), anteroom (disinfection place), particular operating room for COVID-19 patients, exit room (where PPE is removed), exit dressing room (where the medical team disinfects and bathes). In orthopedic surgical procedures, the use of power tools, such as electrocautery, bone saws, reamers, and drills, will be reduced because they release aerosols and increase the risk of spreading the virus. Surgical procedures use suction devices to remove smoke and aerosols (Rodrigues-Pinto et al., 2020).

Coccolini's research (2020) also reported a slight change in standard operating procedures at his hospital's major surgery. The study reported a limit to the number of orthopedic specialists working as operators in one operating room. Special orthopedic measures for COVID-19 positive patients are carried out by a special team which is also carried out outside. In collaboration with orthopedic surgeons, nurses must anticipate what is needed during the surgery (Coccolini et al., 2020). The number of orthopedic operations in all elective fields should be limited.

Nosocomial COVID-19 infection must be prevented to protect patients and staff (Kalantar et al., 2020).

Research Miguela-Alvarez (2021) reports another approach used in orthopedic services: telemedicine. Telephone consultations are carried out entirely by orthopedic surgeon specialists to reassure patients. The study concluded that telemedicine is a viable option in orthopedic services, this modality being an option that must be maintained.

During the COVID-19 epidemic, hospitals created a system so that patients could contact orthopedic surgeons to ask questions regarding their health problems. This system aims to ensure that patients stay at home to reduce transmission of patients without COVID-19 symptoms. Some orthopedic patients and surgeons who are old have higher mortality rates. The telecommunication system should be well designed so that postoperative patients have access to services to orthopedic surgeons (Kalantar et al., 2020).

One of the health services from hospitals that need attention is surgery, both emergency and elective. Surgical procedures involve many medical personnel and the close contact with patients makes surgery a consideration to do because some surgical procedures can produce aerosols. So that a shift change system is carried out, limiting the number of health workers, and increasing personal protective equipment according to standards (Toto, 2022). This is in accordance with Dzakiratul (2021) who explains that to reduce the transmission of infection, preventive measures can be taken such as washing hands and maintaining personal hygiene. The use of masks and personal protective equipment (PPE) by medical personnel while in the operating room or when in contact with immunosuppressed patients is necessary because it aims to protect the patient.

The management of orthopedic surgery in the COVID-19 pandemic situation is carried out fairly quickly in an emergency situation. All emergency patients should be tested for antigen according to suspected or confirmed patients (Rothe, 2020). This is also explained by Sarac (2020) explaining that all medical personnel must take measures of second-level protective equipment, using special transfer devices with disposable sheets to direct patients to be transferred to the negative pressure operating room via special channels and special elevators.

Yulong (2020) explained that using tight protection in every surgical procedure is very important to reduce the risk of infection and transmission of COVID-19. Supported by Decaro (2020) states that the management of orthopedic surgery provides several recommendations for protective measures during the entire process of diagnosis and treatment of traumatic patients and helps others to manage orthopedic patients with COVID-19, to reduce the risk of cross-infection between patients and to protect health workers during work.

As evidenced by Guo's research (2020) revealed that for patients undergoing routine surgery, if COVID-19 is urgently needed an immediate operation then surgery must be arranged with normal care procedures according to patient priorities, namely health workers must take level 1 protective measures at least during surgery. Meanwhile, according to Li (2020) explained that for patients with contraindications to surgery in the early stages or other reasons such as failure of conservative treatment, fear of hospitalization during the pandemic, in addition surgery can be carried out according to the treatment schedule to be delayed. This is in line with Massey's research (2020) which explains that in addition to patients without indications of COVID-19 and if the operation is not urgent, the surgical procedure can be rescheduled to reduce infection and transmission in the hospital.

Donally (2020) stated that the implementation of standardized orthopedic surgery in the covid protocol is with operating room door marking with COVID-19 sign. This is also supported by Ducournau's (2020) research which revealed that minimizing the number of staff should be in the operating room, visitors to the operating room should be limited and medical personnel should not enter or leave the operating room to avoid negative pressure disturbances. In line with research Francesco (2020) explains that since the beginning of the COVID-19 emergency, the number of active operating rooms has been reduced. Under normal circumstances, hospitals operate with a number of operating theaters at different times of operation. Having a single COVID-19 surgical team working around the clock on COVID-19 cases allows the hospital to maximize efficiency (save change time) and save valuable PPE. In addition, DePhillipo (2020) explained that staff wearing PPE in the operating room are prohibited from leaving the operating room until the PPE is removed and the operation is complete. Level three PPE is required in the operating room for all staff except nurses in the PACU who can use level two PPE (Ti, 2020).

Based on the study results, during the COVID-19 pandemic, some hospital resources will be diverted to manage COVID-19 patients more optimally, limiting orthopedic surgery services by only allowing emergency operations. Orthopedic specialists are also doctors who screen for COVID-19 and treat trauma patients in the ER. The orthopedic team carries out the surgery, but only by a team appointed to perform surgery on COVID-19 patients, and this procedure is carried out outside of hospital working hours. Aerosol-generating orthopedic procedures will be limited, the number of operators in one operating room reduced, and the operating room door must permanently be closed during the operation. Handling of orthopedic patients in outpatient clinics can be done virtually.

LIMITATION OF THE STUDY

The review has some limitations. We searched using several keywords, the number of terms under "orthopedic" varied widely. Although we added special terms such as trauma, covid-19, which did not include our search terms they may not have been included in the search results. We limited our search and inclusion criteria for literature published in English. This may lead to relevant studies being excluded from our review.

CONCLUSIONS AND SUGGESTIONS

The COVID-19 pandemic has caused restrictions on orthopedic surgery in hospitals. In addition to the number problem, there are differences in the orthopedic services provided compared to before the pandemic. Orthopedic staff can be assigned to treat minors with severe trauma in the emergency department. It is necessary to have a team of orthopedic specialists who specifically perform operations on COVID-19 patients. It is necessary to adjust facilities and standard operating procedures in the center. Telemedicine can be done effectively in the orthopedic field.

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ETHICAL CONSIDERATIONS

This research does not require ethics because it does not use human subjects. The author only reviews a few articles.

Funding Statement.

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Conflict of Interest Statement

The author declares that there is no conflict with other parties related to this research.

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