



# What orthopedic surgeons need to know about Covid-19 pandemic<sup>☆</sup>

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## ABSTRACT

The ongoing outbreak of COVID-19, also known as SARS-CoV-2 and coronavirus disease 2019, is considered a major public concern that propagates steadily by the increased number of the infected cases and the mortality rate. In this article, we provide a brief review for Orthopedic surgeons as regard COVID-19 virus microbiology, epidemiology, clinical picture, and diagnosis. Moreover, what measures should be taken amid this pandemic to assess its control, maintain the urgent duties, and protect health care workers (HCW) are also discussed.

## 1. Introduction

The ongoing outbreak of COVID-19, also known as SARS-CoV-2 and coronavirus disease 2019, is considered a major public concern that propagates steadily by the increased number of the infected cases and the mortality rate. It began on December 2019 in Wuhan, Hubei Province of China and has spread to most countries of the world. WHO declared it as pandemic on 11 March 2020 and advised all countries to take urgent and aggressive actions to control its spread.<sup>1</sup> At the time of writing this review, 22 March 2020, there were 338,850 infected cases and more than 14,400 deaths.<sup>2</sup> Figures that continue to rise substantially among the last few days threatening a global pandemic crisis with great sequelae. In this article, we provide a brief review for Orthopedic surgeons as regard COVID-19 virus microbiology, epidemiology, clinical picture, and diagnosis. Moreover, what measures should be taken amid this pandemic to assess its control, maintain the urgent duties, and protect health care workers (HCW) are also discussed.

## 2. Microbiology

Coronaviruses are enveloped single stranded RNA viruses that range between 60 and 140 nm in diameter. They have crown appearance attributed to spike projections on their surfaces and hence their name.<sup>3</sup> Coronaviruses are comprised of four subfamilies: alpha, beta, gamma, and delta. Alpha and beta subfamilies originate in mammals particularly bats. On addition, alpha subfamily causes mild symptomatic infection or no symptoms at all, beta subfamily can cause serious

respiratory symptoms.<sup>4,5</sup>

COVID-19 shares 79% sequence identity with SARS-CoV, the virus that caused an outbreak in China on 2003,<sup>6</sup> and shares 96% of the whole-genome to a bat Coronavirus raising the suspicion of bats' origin of the disease.<sup>5</sup>

## 3. Epidemiology

Disease transmission mainly occurs via heavy droplets that are sneezed or coughed by symptomatic cases and probably asymptomatic carriers that spread in area of 1–2 m in diameter. Inhalation of these heavy droplets or touching contaminated surfaces with the virus then contact mouth, nose, or eye can transmit the infection.<sup>7</sup> The virus can live on surfaces for several days but can easily be destroyed upon usage of disinfectants as hydrogen peroxide or ethanol alcohol 70%.<sup>8</sup> The problem in the disease is that it is highly infectious, a person can be the source of infection to several individuals. Patients are infectious in asymptomatic period before the appearance of symptoms, thorough the disease, and on clinical recovery.<sup>9</sup>

Incubation period between contacting the virus to the appearance of symptoms varies widely between two days and 28 days with mean at five days.<sup>10</sup> Feco-oral transmission has also been hypothesized.<sup>11</sup> All ages can be infected but the severity of the disease depends on age, associated co-morbidities (as diabetes mellitus, cardiovascular diseases, and renal failure), and smoking history. Surprisingly, children showed mild forms of the disease.<sup>12</sup> However, no age is immune to severe affection because progression is suggested to be attributed to the marked elevation of inflammatory cytokines such as IL2, IL7, IL10, GCSF, and

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TNF $\alpha$ .<sup>13</sup>

Based on its highly infectivity and its severity among old smoker individuals with multiple comorbidities, high burden is established on health care systems with depletion of the available resources augmenting the crises that is evident in Italy with total cases more than 95,000 and total death over 5400 up till now.<sup>2</sup>

#### 4. Clinical picture

Clinical picture of the disease can be difficult to be differentiated from other respiratory tract infections. It ranges from mild or no symptoms at all to severe infection with pneumonia, adult respiratory distress syndrome (ARDS), shock, and/or multiorgan dysfunctions as acute renal injury. The commonest symptoms are fever (98%) and dry cough (76%). Other symptoms include myalgia, fatigue, sore throat, sneezing, chest tightness, headache, sputum production, hemoptysis, conjunctivitis and diarrhea. After 7–8 days, a group of patients deteriorated to pneumonia and ARDS. 32% of a series of 41 patients required intensive care unit (ICU) admission for respiratory support.<sup>14</sup> Recovery, if occurred, started 2–3 weeks from onset of the symptoms with median hospital stay duration at 10 days.<sup>15</sup>

#### 5. Diagnosis

Suspected cases with fever and dry cough especially those with recent travel history to the disease epicenters or in contact with positive cases should undergo specific molecular test, a reverse transcription polymerase chain reaction (PCR) based test, to identify the disease. Whole genome sequencing may also be required to identify the source of infection and any new mutations. Samples used for the diagnosis are usually of respiratory origin (throat swab, sputum, nasopharynx swab, endotracheal aspirates, and bronchoalveolar lavage). Great cautions are required to conduct the samples and regulations with local infectious disease authorities.<sup>16</sup>

Laboratory investigations reveal leukopenia and lymphopenia in a quarter of the patients. ESR and CRP are generally elevated. Raised aspartate aminotransferase, D-dimer, prothrombin time, CPK, LDH, and troponin are also noticed in some patients especially those admitted to ICU. Procalcitonin level is usually normal and its elevation may indicate bacterial superinfection.<sup>17</sup>

Regarding imaging, chest x ray may reveal bilateral chest infiltrates. CT chest is more sensitive and specific than chest x ray and shows bilateral involvement in 98% of the cases, with ground glass opacities and subsegmental consolidations. In some cases, diagnosis was made on CT basis only with negative molecular tests that turned positive later on; raising the importance of CT chest in the diagnosis and prognosis of the disease.<sup>18</sup>

#### 6. Orthopedic measures

Although Orthopedic surgeons are not considered the frontline in combating the pandemic of COVID-19, but certain measures can be adopted in their practice during this period that help to control and lessen the spread of the disease. Generally, the main target in such adaptation circle around three main pillars: manage the surgeries according to their priority, protect health care workers, and allocate the available resources toward disease control.

##### 1) Outpatient clinic measures:

Surgeons are advised to widen the follow up visits after surgeries to decrease the crowd in the clinics. Patients who are in the waiting list with imminent due dates are called to inform them regarding the new circumstances and the postponing of their surgeries and asked them not to visit the clinic until the arrangement of new dates. The number of attendant patients in the clinic are reduced to the half and the duration

of clinic is doubled to ensure low number of patients at any time in the clinic. A thermal scanner in the clinic is better be available to trace those who have fever and refer them to the emergency department for proper assessment.<sup>19</sup>

The surgeons in duty in the clinics are divided into two groups; each group takes over a period of time in the clinic. So, each surgeon theoretically will expose to a quarter of the usual number of patients. Protective face mask is advised for every health care worker and regular hand disinfection by ethanol alcohol 70%, or water and soap is a mandatory measure between each patient to control the spread of the disease.

Certain simple clinic procedures are activated to decrease the burden on surgical lists such as: intra-articular steroid injection in arthritis cases to decrease pain exacerbation and delay the need for surgical treatment, steroid injection for tendinopathy cases as rotator cuff tendinopathy, Golfer's and Tennis elbow, steroid injection for Carpal Tunnel Syndrome, and percutaneous tenotomy for talipes equinovarus cases.

A cell phone number with WhatsApp service are given to all clinic attendee to keep in contact in case of emergency and to send clinical photos regarding the wounds and the dressings in case of any inquiry. A home delivery service of medications is advised for all patients rather than regular visits to hospitals and pharmacies to ensure good distancing among the individuals.

AAOS recommends activation of telemedicine amid this pandemic in the form of telephone visits, video conferencing, and E-visits.<sup>20</sup>

##### 2) Surgery list measures:

AAOS recommends that the decisions concerning the resources utilization and the management of elective musculoskeletal procedures to be made based on institutional policies and recommendations from Federal and local authorities, considering the availability of finite and essential resources. However, AAOS supports the recommendations on delaying elective surgeries advocated by the Centers for Medicare and Medicaid Services (CMS), the American College of Surgeons (ACS), and the U.S. Surgeon General.<sup>21</sup>

Based on the suggested three pillars. We recommend to keep on the urgent cases lists that cannot be delayed as: trauma cases, malignant tumor cases, acute infection necessitating surgical intervention such as: Septic joint, acute osteomyelitis with failed medical treatment or subperiosteal abscess, or acute on top of chronic osteomyelitis, and certain cases that need 2nd stage surgery to complete the treatment as: cases with Masquelet technique, bone grafting surgery, and infected arthroplasty requiring debridement or staged procedure using spacer. A council of Orthopedic experts in different subspecialties are organized to assess the cases needed exception and decided who can't be postponed on individual basis. However, in analyzing the risk and benefit of any planned procedure, not only the clinical situation must be evaluated, but resource conservation also should be considered.<sup>22</sup>

Other cases that are elective and can be postponed safely are cancelled to preserve the resources, improve the hospital capacity, and decrease the cross-infection; which include pediatric cases, limb reconstruction, arthroplasty, foot and ankle, hand, benign tumor cases, and spine deformities. Recommendation from orthopedic department, National University of Singapore is to continue elective one day surgeries such as implant removal and arthroscopy as they don't utilize hospital resources and rapid discharge if possible.<sup>19</sup> We think this can be adopted but we prefer decreased number of cases in the hospital to ensure appropriate distancing especially that these measures can be postponed safely and reassess the situation periodically for any changes that can be implemented accordingly.

Measures should be taken to divide the health care workers into two groups with day and night separate lists (instead of single large operation list). Therefore, surgeries performed sequentially rather than concomitantly to achieve good distancing. This separation enables the

utilization of laminar air flow theatres with ultraclean air currents.

### 3) In-patient measures:

Preoperatively, if elective case is planned for surgery, surgery is scheduled at the same day of admission, if possible, to reduce in-patient stay. Similarly, postoperatively, the patient has to stay the lowest possible duration in the hospital. Forty-eight hours in most of the trauma cases is more than enough to ensure intact neurovascular status, no endangering swelling, and good dressing status. Only one visitor per patient is allowed during visits and should register his/her data to trace source of infection if any. Upon discharge, physiotherapy, if needed, is learned to be at home rather than at rehabilitation institutes or formal physiotherapy sessions.

The American College of Surgeons recommends having a plan for a surge of critically ill patients and identify additional spaces to care for these patients. Separate spaces in the Emergency department and ICUs to manage suspected/known COVID-19 patients should be available. Isolating COVID-19 patients from other patients and Identifying dedicated staff to care for COVID-19 patients are also recommended.<sup>22</sup>

### 4) Health care workers:

Orthopedic surgeons who started suffering any symptoms suggesting COVID-19 infection should be self-isolated for 14 days at home to ensure no cross-infection. Strict hand hygiene and face mask should be adhered during the practice. Online courses for how to wear personal protective equipment and to use them in dealing with suspected/diagnosed cases. Other courses as basic life support, respiratory support, and how to deal with patients in respiratory distress should be lunched for preparing them as a second line of defense in case of need.

Learning of residents and fellows should not be stopped amid the pandemic. The use of technology is an important substitute to face-to-face teaching. Utilizing e-learning,<sup>23</sup> videoconferences and webinars<sup>24</sup> are important to keep continuous medical education among the staff.

The intermediate and long-term consequence of this pandemic on Orthopedic surgery is difficult to be anticipated. However, economic burden is expected to affect the industries related to orthopedic surgeries, job offers, salaries, and updating knowledge and learning, if conferences and workshops cancellation period is prolonged. Plans from Orthopedic organizations, health care authorities, and governments should be made preparing the field to different scenarios.

Measures should be reviewed dynamically based on the changes of the pandemic course and to follow local guidelines and policies as well as international guidelines such as AAOS, ACS, and National Health System in UK. Orthopedic surgeons' intervention to combat the pandemic cannot be ignored and it is considered as essential as other vital specialties that defend the crisis. Following the previous recommendations, Orthopedic surgeons can make a great component in halting and regression of the disease.

### Declaration of competing interest

None declared.

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