



## Short Report

# Two outbreaks of SARS-CoV-2 in department of surgery in a Wuhan hospital

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## SUMMARY

The outbreak of SARS-CoV-2 in China, attracted a large number of medical staff to help in the city's hospitals and this put them at a high risk of infection. We describe twenty medical staff who were diagnosed with COVID-19 within one week in the department of surgery in a Wuhan hospital. Epidemiological investigation of these cases identified misdiagnosed patients (source of infection), an inappropriate clinical meeting and working without wearing face masks to be the causes of the outbreaks. This report emphasizes the importance of wearing a facemask and applying other standard infection control precautions to protect medical personnel from infection with the virus.

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## Introduction

Since late Dec. 2019, an increase in incidence of cases of pneumonia were initially reported to be of unknown origin. These were subsequently identified as 2019-novel coronary virus infection (COVID-19) [1,2]. The total number of diagnosed

patients reached 75,465 in China by Feb. 20th, 2020 [3]. Most of the early cases stated that they had previously visited Huanan Seafood Wholesale Market in Wuhan, but initially no direct evidence was found that the virus could be transmitted from person to person. As the cases accumulated, it was discovered that more and more clustered and sporadic patients had never visited the Huanan Seafood Wholesale market, but the evidence of human-to-human transmission had not yet surfaced when medical staff were repeatedly diagnosed with COVID-19 [4]. According to a recent release, more than 3,000 medical staff in China were diagnosed with COVID-19, among whom 6 died. Here we report two separate nosocomial outbreaks of SARS-CoV-2 involving 20 medical staff in a hospital within one week. To our knowledge, these two nosocomial outbreaks of

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COVID-19 were the earliest cases of patient to medical staff transmission.

## Results

The first nosocomial outbreak occurred in section A of the Department of Surgery of Zhongnan Hospital. There were a total of 14 medical staff and three inpatients diagnosed with COVID-19 during the outbreak. On Jan. 10<sup>th</sup>, 2020, a 66-year old woman was admitted into the section because of fever and right sided abdominal pain. She was diagnosed with cholecystolithiasis complicated with infection. Chest computed tomographic (CT) scan revealed multiple lesions with pure ground-glass opacity (GGO) in both lungs. On Jan. 15<sup>th</sup>, she was confirmed with a diagnosis of COVID-19 using the qRT-PCR assay for SARS-CoV-2. The patient was then transferred to Intensive Care Unit (ICU), after developing shortness of breath and high fever. Meanwhile, three patients within the same ward were diagnosed COVID-19 after developing similar symptoms (data of these three patients are not presented). On Jan. 13<sup>th</sup> and Jan. 14<sup>th</sup>, two doctors working in the same section, who had contact with the patient, presented with fever and cough. Without complete knowledge of the contagious nature of the disease, they joined in a multidisciplinary teamwork meeting (MDT) with 40 participants held by the department. The meeting lasted for several hours. 3–5 days after the meeting, 10 colleagues participating in the meeting (who had never made direct contact with the patient) presented with similar symptoms and were subsequently diagnosed with COVID-19. Moreover, 9 out of the 10 persons were seated near to the two doctors who had early symptoms at the meeting, suggesting that airborne transmission could be an important factor (Figure 1). Additionally, two medical staff (case 3 and case 4 in Figure 2), who were not present in the meeting, had fever and onset of symptoms on the day of the meeting and the following day. The infection time might be earlier for these two cases.

Another index case was an 81-year old male patient whose complaints were lower abdominal pain and dysuria for 5 years and these symptoms were exacerbated for the previous 10 days. He was admitted into section B of the Department of

Surgery on Jan. 14<sup>th</sup>, 2020. He developed fever and cough after admission. Chest CT scan revealed multiple patchy lesions including GGO in both lungs. Throat swabs were positive for SARS-CoV-2 testing and he was then transferred to ICU. 3.5 days later. Six medical staff who had contact with this patient in the same section were later found to be infected with SARS-CoV-2 (Figure 2). Among the 20 medical staff, 19 presented with clinical symptoms, one nurse had no symptoms except fatigue and a CT scan showed lung local GGO when she underwent a regular physical check-up.

Among the 20 medical staff, four are nurses and 16 are doctors. All cases had neither visited Huanan Seafood Wholesale market, nor had contact with COVID-19 patients outside the hospital. Fever and fatigue were the most common symptoms. Only 25% of the medical staff had the symptom of non-productive cough. Muscle pain was common. One staff member had myocardial injury and was diagnosed with severe pneumonia. 15 out of 20 cases had been confirmed by qRT-PCR for SARS-CoV-2 (Figure 2). The qRT-PCR were negative for the rest of the patients and this may be due to low virus volume or a sampling problem. The clinical and laboratory results showed no differences between COVID-19 and other sources of infection.

## Material and methods

### Cases and data collection

Cases were all from the Department of Surgery, Zhongnan Hospital of Wuhan University, in Wuhan, China. Data was collected retrospectively by two co-authors and included general demographic information, epidemiological survey, time of illness onset, clinical presentation, laboratory results and data of radiological imaging.

Diagnosis criteria of COVID-19 was performed according to the sixth edition of diagnosis and treatment of pneumonia caused by novel coronavirus infection [5].

The criteria for a nosocomial outbreak was defined as: three or more medical staff or hospital patients with similar symptoms in a short time period and caused by the same pathogen. Criteria for discharge from hospital were that clinical symptoms improved significantly, CT scans revealed that lung infiltration was largely resolved, and qRT-PCR for SARS-CoV-2 from throat samples were negative in two consecutive respiratory pathogen nucleic acid tests (sampling interval of at least 1 day).

## Discussion

Nosocomial infections of SARS-CoV-2 has raised concerns from the public [6]. Based on our understanding, more than half of patients do not have respiratory symptoms and may exhibit atypical clinical phenotypes early during the illness [7,8]. Some patients complained of indigestion, nausea, vomiting, and/or diarrhea. Others just stated an exacerbation of their usual symptoms, such as abdominal pain. These patients were thus likely misdiagnosed and admitted to a different department (from Department of Infectious Disease). Given the facilities of these departments do not include quarantine measures for pathogens through respiratory/contact transmission, many medical personnel and patients in the same

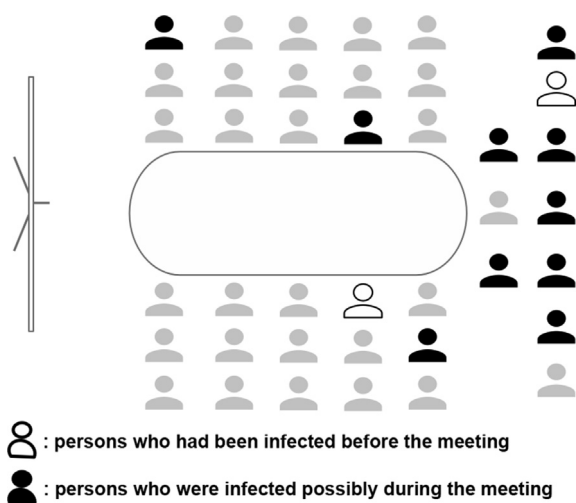


Figure 1. Diagram of seats of the multidisciplinary teamwork meeting.

patient age(years)	incubation time and onset of symptoms										virus RNaCT Scan		hospitalized days	outcome			
Section A, Department of Surgery																	
P 1	43	incubation time											positive	two lung		18	discharge
P 2	61	incubation time											positive	left lung		5	discharge
P 3	33	incubation time											positive	two lung		25	discharge
P 4*	22	incubation time											positive	two lung		18	discharge
P 5	61	incubation time											positive	two lung		11	discharge
P 6	51	incubation time											positive	upleft lung		3	discharge
P 7	42	incubation time											positive	two lung		still in hospital	improved
P 8	57	incubation time											positive	two lung		6	discharge
P 9	51	incubation time											positive	two lung		19	discharge
P 10	66	incubation time											positive	two lung		still in hospital	improved
P 11	37	incubation time											positive	left lung		12	discharge
P 12*	32	incubation time											positive	right lung		20	discharge
P 13*	56	incubation time											negative	right lung		7	discharge
P 14*	32	incubation time											negative	right lung	none		recovered
Section B, Department of Surgery																	
P 15	39	incubation time											positive	two lung		22	discharge
P 16	25	incubation time											negative	upright lung		7	discharge
P 17	44	incubation time											negative	low left lung		15	discharge
P 18	22	incubation time											positive	two lung		11	discharge
P 19	36	incubation time											positive	two lung		15	discharge
P 20	53	incubation time											negative	two lung		5	discharge
Dates	Jan. 10	Jan. 11	Jan. 12	Jan. 13	Jan. 14	Jan. 15	Jan. 16	Jan. 17	Jan. 18	Jan. 19	Jan. 20						Jan. 31

Note: 1. All patients were doctors except that those with “\*” were nurses. 2. ▲ The day of multidisciplinary teamwork meeting

**Figure 2.** Epidemiological and clinical data of cases with COVID-19 among medical staff. Light color indicates the incubation time periods, dark color indicates onset of illness. The results of CT scan of the lungs and SARS-CoV-2 RNA testing is shown. The case's age, hospitalized days, and outcomes are recorded.

ward are at risk of infection. In this report, most infected personnel are doctors and only four nurses were infected. This might be due to the fact that most nurses wear face masks routinely when performing patient procedures and wash their hands afterwards; while doctors usually did not routinely wear face masks. These results suggest that violation of standard infection control precautions will expose doctors to higher risk of infection.

The lesson we learnt from these two nosocomial outbreaks is that medical staff are at high risk of infection from COVID-19. Particularly:

1. During the early stages of the epidemic when the source of the infection and trends in cases are not known. At this time the dangers may not be fully warned against.
2. When caring for patients with early symptoms of COVID-19. These may not be typical (i.e. fever and cough)., As a result, medical staff of non-infection-related departments are vulnerable to acquiring COVID-19. Whilst lacking an effective vaccine and anti-viral drug, all medical staff (including surgery doctors) should adopt universal prevention procedures (including wearing a face mask).

Further lessons learnt included:

- During a pandemic all environmental decontamination/cleaning and quarantine and cohorting policies should be adhered to in order to prevent nosocomial outbreaks.
- During a pandemic all medical staff with symptoms should not be allowed to work.
- Clinical meetings during pandemic periods should be avoided as much as possible (or conducted online).

In summary, nosocomial outbreaks of COVID-19 usually have a specific source of infection and the incubation time can be as short as 3–5 days. Transmissions are mostly through droplet spread or close physical contact. Early diagnosis of suspected patients is critical for prevention of the spread of COVID-19 within the hospital environment. Healthcare workers are at high risk of COVID-19 and need to be protected carefully.

## Disclaimers

The authors declare that there is no conflict of interests.

## CRediT authorship contribution statement

**Shicheng Gao:** Conceptualization, Data curation, Writing - original draft, Formal analysis. **Yufeng Yuan:** Data curation, Supervision, Validation. **Yong Xiong:** Investigation, Methodology. **Yongxi Zhang:** Data curation, Project administration. **Liping Deng:** Methodology, Writing - review & editing. **Tielong Chen:** Investigation, Methodology. **Hengning Ke:** Validation, Writing - original draft, Funding acquisition. **Xinghuan Wang:** Conceptualization, Supervision, Funding acquisition.

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