

CASE REPORT

A Quickly Organized Response to a COVID-19 Positive Case Comeback After Clearance for over 2 Months in Shenzhen, China

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SUMMARY

Background: The ongoing coronavirus disease 2019 (COVID-19) pandemic has spread quickly throughout the world. So far, there are no standard measures in terms of quick and effective control of new COVID-19 positive patient comeback after COVID-19 clearance for a certain time. Here, we report a quickly organized response from Luohu Hospital Group to a COVID-19 positive case comeback after clearance for over 2 months in Shenzhen, China.

Methods: After 2 months with no new COVID-19 cases in Shenzhen, on August 14, 2020, a supermarket employee living in the Luohu district of Shenzhen was tested positive in a nearby city. She has no any symptoms and signs, with unremarkable laboratory testing and radiological image, so she was soon diagnosed as asymptomatic COVID-19 positive case. Rapid contact tracing revealed that three of her relatives in Shenzhen were infected with COVID-19 and all of them were diagnosed as asymptomatic COVID-19 positive cases. To ensure residents' safety, Luohu hospital group (LHG) mounted a rapid organized response focusing on four measures: local environment management and residents' health monitoring, guidance for resumption of work, education and psychological counseling, and management of patients with fever in outpatient clinics.

Results: The LHG being structured as a people-centered, integrated organization responded to residents' medical and psychological needs rapidly, provided 6-hour results for COVID-19 testing, and re-cleared the city of COVID-19, as evidenced by the processing of 459,381 community samples within 15 days, with universally negative results beyond the originally identified case and her three close relatives.

Conclusions: A quick and effective response from local organization to a new comeback COVID-19 positive case after clearance for a certain time is necessary in terms of ensuring the physical and psychological health of residents, as well as guarantying normal social work.

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KEY WORDS

COVID-19, positive, comeback, a quickly organized response, people-centered integrated organization

INTRODUCTION

The ongoing coronavirus disease 2019 (COVID-19) pandemic, caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), was recognized as a public-health emergency of international concern by the World Health Organization in January of 2020 and proceeded to spread quickly throughout the world [1]. The

local government and hospitals in the city of Shenzhen, situated in Guangdong province, China, mounted a critical city-wide response that enabled the city to gain control of its COVID-19 outbreak promptly [2]. By May 1, 2020, a total of 462 confirmed SARS-CoV-2 positive cases had been reported in Shenzhen, including 423 cases attributed to community transmission within China and 39 cases that were imported from abroad. Thereafter, there were no new cases in Shenzhen for 20 consecutive days. After a hard work, 459 recovered well and 3 died by May 21. On this date, all actively infected patients, including asymptomatic patients, were cleared. Thereafter, Shenzhen enjoyed a span of over 2 months without any new SARS-CoV-2 positive cases. Notably, there were no nosocomial infections among medical staff and no nosocomial patient clusters. Hence, Shenzhen achieved rapid suppression of its COVID-19 outbreak.

So far, there are no standard measures in terms of quick and effective control of new COVID-19 positive patient comeback after COVID-19 clearance for a certain time, especially when this new asymptomatic COVID-19 patient was found positive in nucleic acid testing screening and who had contacted a large population of people before this test. Here, we report a quickly organized response from Luohu Hospital Group to a COVID-19 positive case comeback after clearance for over 2 months in Shenzhen, China.

CASE PRESENTATION

On August 14, 2020, an employee of a Hema Fresh health supermarket in the Luohu district of Shenzhen was found to be SARS-CoV-2 positive by routine nucleic acid detection screening in Lufeng, a Shenzhen nearby city. She had no symptoms or signs on physical examination, and her laboratory testing and radiological image was unremarkable. She had no past history. She was diagnosed as an asymptomatic COVID-19 positive case, and was quarantined immediately in Lufeng where she had been tested.

Interventions

The framework of response from Luohu Hospital Group (LHG)

The sudden discovery of an asymptomatic COVID-19 patient who had been working in a public-facing job within Shenzhen caused great concern related to the risk she may have transmitted the virus to others in Shenzhen. A quick response from LHG was initiated to prevent public panic. The framework on the mechanism of responding to a new COVID-19 positive comeback case encompassed 4 main aspects. First, local environment management and large-scale sample collection & nucleic acid testing for exposed populations. Second, guidance for resumption of work. Third, health education and psychological counseling. Fourth, management of patients with fever in outpatient clinics.

Local environment management and large-scale sample collection & nucleic acid testing for exposed populations

Immediately upon receiving notification of the aforementioned SARS-CoV-2 positive test result in the early morning of August 14, Shenzhen City activated its COVID-19 emergency response system, restricting all residents within the community where the patient lived and all of the patient's coworkers within their buildings of residence until they could be tested and cleared. At the same time, the patient's neighborhood and workplace were isolated and subjected to comprehensive disinfection. The patient's neighbors and coworkers submitted to nucleic acid testing carried out by LHG medical staff. On the whole day of August 14, the emergency response worker collected 3,184 human samples from the population and 2,140 residential & working environment samples. The nucleic acid testing results showed that apart from three positive test results (all in the patient's family), all other samples tested were negative for SARS-CoV-2. The three additional infected people had no clinical manifestations, and were classified as asymptomatic COVID-19 cases. The family cluster of 4 patients were monitored by their designated hospital. In this circumstance, it is essential to conduct nucleic acid testing on an expansive sample of potentially exposed people. All people who lived in or visited Luohu within the prior 14 days, in accordance with Chinese national COVID-19 guidelines, were required to have nucleic acid test done [3]. To address the huge demand of nucleic acid testing, great effort was made by LHG. First, a total of 92 sampling sites were set up in community health centers throughout Luohu. Each site was assigned a "trinity" working group consisting of two medical personnel (a local hospital employee and a community health center employee) and a police officer to ensure smooth running of the sites. Second, a rapid-response emergency sampling team consisting of at least 4,715 medical personnel was set up by LHG, including 737 support personnel employed at hospitals outside the group (Shenzhen People's Hospital, the Second People's Hospital of Shenzhen, Shenzhen Traditional Chinese Medicine Hospital, Shenzhen Maternity and Child Healthcare Hospital, and Peking University Shenzhen Hospital). Third, personal protective equipment was supplied. All medical staff in the on-site trinity teams collected nasopharyngeal swab samples while wearing protective gowns, gloves, masks, and other protective equipment. Fourth, the necessary sampling materials was distributed quickly. LHG had sampling tubes and cold-storage transported reagents in place within half an hour. Fifth, samples were transported from all testing sites to a hospital test processing laboratory on an hourly basis. Sixth, LHG has a substantial testing infrastructure to complete massive rapid testing. Seventh, outreach personnel assisted with notification of Luohu residents. By 9:00 pm on August 29, LHG had processed a total of 459,381 samples, with 121,748 samples being collected on the peak testing day of August 16, 2020.

All results were available within 6 hours of sample collection. All of the test results were negative.

Guidance for resumption of work

To ensure safe resumption of work, 136 LHG doctors and 22 staff members from the Centers for Disease Control constituted a team. They formed three working groups. One group was responsible for developing public health and epidemic prevention guidance for high-rise office buildings and large shopping malls. The second group provided on-site guidance to general enterprises. When the first two working groups encountered problems, they were supported by the third group, which was responsible for providing expert guidance from the Centers for Disease Control.

The work consisted of three parts. First, body temperature measured. All of the employees were required to have their body temperature taken. Second, epidemiological investigations. Have the employees ever been to the medium or high COVID-19 risk areas, or contact with any confirmed or suspected COVID-19 patients, or contact with any family cluster cases within the prior 14 days? Third, triage. Those who have elevated temperature and/or epidemiological history were sent to Luohu Hospital Group for further evaluation. With this strategy employed, there have been no other epidemic clusters in Luohu.

Health education and psychological counseling

LHG disseminated health education guidance to every community health center in the Luohu district, including online education for local residents. Clinical psychology services are also available in each community health center to provide residents with counseling as needed.

Management of patients with fever in outpatient clinics

LHG set up fever clinics with clinical experts in each hospital to monitor patients presenting with fever. According to China's national guidelines for the diagnosis of COVID-19 [3], the diagnosis of COVID-19 is based on the epidemiological factors (travel history to COVID-19 area, or contact with the COVID-19 patient, or family cluster cases), the clinical manifestations (1. Fever and/or respiratory symptoms, 2. Radiological pneumonia changes, 3. Normal or decreased white blood cells/lymphocytes) and nucleic acid test result. Suspected COVID diagnosis is made as any epidemiological history plus any 2 of the 3 clinical manifestations, or no epidemiological history plus all 3 of the clinical manifestations. Confirmed COVID-19 diagnosis is a suspected COVID case plus positive nucleic acid test result.

The suspected patients are isolated under close observation, and patients who tested positive for SARS-CoV-2 are confirmed with a COVID-19 diagnosis, and were referred to their designated hospital. Other patients who did not reach the suspected COVID-19 diagnosis criterion can be released from the hospital.

DISCUSSION

On May 21, 2020, after extremely hard work, Shenzhen city cleared all of the 462 confirmed COVID-19 positive cases, and lead a temperate peaceful span of over 2 months without any new SARS-CoV-2 positive cases. So, when a new COVID-19 case was discovered again on August 14, officials decided to prioritize obtaining a definitive answer regarding the scope of community transmission. That is, they needed to undertake rapid outreach and testing to determine and share with the public whether the infection had spread to a handful of people versus having spread to a large number of people in an uncontrolled manner.

These undertakings were labor intensive and required organization of the contributions of medical personnel. To mediate accurate prevention and control measures and to minimize the impact of COVID-19 on residents, LHG administered a unified deployment of resources, including sample collection and transport, laboratory testing, remote consultation, disinfection supplies, and technical support with constant communication and cooperation between community health centers and hospitals [4,5].

LHG was established as an integrated organization in August of 2015 with the aim of improving upon the limitations of the hospital-centered, treatment-dominated systems that dominate the Chinese healthcare administration system, in which there is generally quite limited inter-institutional and multi-level collaboration [6]. LHG integrated 5 level-III hospitals, 31 community health centers, a research institute, and 6 resource-sharing centers in Luohu to provide residents with a continuum of preventive and treatment services and to improve the efficiency of resource use and administration. Over the past 5 years, LHG has been committed to medical reform, with the goal of providing better services and reducing morbidity, hospital admissions, and health-related financial burdens. The Luohu model has performed so well that on September 1, 2017, China's health ministry introduced the model nationwide as a advantageous new approach to people-centered integrated care [7].

Upon detecting the aforementioned small cluster of asymptomatic COVID-19 cases, the response system was faced with the challenge of unknown direct and indirect exposures for an unclear period of time, and testing hundreds of thousands of samples in a very short period requires strong medical group organization. First, there needs to be timely establishment of sampling hubs. Second, timely establishment of personnel readiness is paramount. Third, testing staff must wear adequate personal protective equipment to ensure their safety while collecting samples. Fourth, the necessary materials need to be available and distributed quickly. Fifth, samples need to be collected and transported in a short time. Sixth, achieving massive rapid testing requires a substantial testing infrastructure. Seventh, potentially exposed people need to be notified in a timely

manner. At the same time, LHG arranges guidance for resumption of work, provides health education and psychological counseling, and manages patients with fever in outpatient clinics. LHG levered its strong integration and excellent medical competencies to ensure the safety of local residents.

CONCLUSION

LHG has managed the COVID-19 epidemic with great efficiency owing to its focus on four key measures: local environment management and large-scale sample collection & nucleic acid testing for exposed populations, guidance for resumption of work, health education and psychological counseling, and management of patients with fever in outpatient clinics. As a people-centered and integrated organization, it has proven to be highly responsive to residents' needs while acting as a gatekeeper of community health services.

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Declaration of Interest:

The authors declare that there is no conflict of interest.

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