Non-COVID area of a tertiary care hospital: A major source of nosocomial COVID-19 transmission

Mahendra K. Meena, Mahendra Singh¹, Prasan K. Panda, Mukesh K. Bairwa

Abstract:
COVID-19 pandemic has spread to all corners of the world where infection control measures are being implemented. There is now a resurgence of the disease in health care facilities with documented in-hospital transmission and cases becoming positive in areas designated to cater for COVID-19 negative patients. We encountered such an event at our institution where fourteen patients (including health care workers) in the non-COVID zone were found to be COVID-19 positive. This highlights the loopholes in the system and the need for better and systematic infection control measures in hospitals that deal with infectious diseases with high infectivity. Findings also suggests the failure of government’s criteria for suspected COVID-19 cases, and therefore needs a rethinking.

Keywords:
Asymptomatic transmission, Infection prevention, nosocomial COVID-19, pandemic preparedness

Introduction
The novel coronavirus 2019 (COVID-19) pandemic has been sweeping through the whole world from December 2019 despite the various infection control measures and pandemic preparedness models available. With high infectivity and asymptomatic transmission of COVID-19, governments all over the world issued instructions and guidelines to curb the rate of the spread and be able to meet the growing demand for hospital beds.[1,2] Hospitals and health administrators formulated their working protocols for the efficient functioning of facilities to provide care for the emerging COVID-19 cases without downgrading patients suffering from other ailments. This included allocation of monetary resources for testing and relocating wards, beds, and health care workers (HCWs) for the management of these patients and at the same time prevent the spread of infection in non-COVID designated areas of healthcare facilities.

The success of the system of segregating hospital areas into COVID and non-COVID zones relies on the accurate separation of suspected COVID patients from other patients with a screening at the entry point in the hospital. This segregation becomes valueless once positive patients enter areas designated as non-COVID. The spread of infection is rapid and difficult to trace and control, with the risk of developing into a “super-spreading event.”[3] Patients in the non-COVID zone are already susceptible to infections, but this risk increases when attendants and relatives who might acquire the infection at common gathering areas such as the cafeteria, billing area, and waiting areas have uninhibited contact. The spread of COVID-19 in designated non-COVID zones demonstrates the serious failure of hospital policies of infection prevention...
and control (IPC). Even the increase in the spread belies the criteria for suspected cases in the context of rising asymptomatic transmission and negative reverse transcription-polymerase chain reaction (RT-PCR) credibility.

Here, we report two hospital outbreaks to highlight the transmission dynamics of COVID-19 in the non-COVID designated zone of a tertiary care hospital.

**Materials and Methods**

This tertiary care hospital had two areas for all patients (either through OPD or Emergency) based on COVID-19 suspect criteria as per institution protocol of patient management [Figure 1]. Suspected cases were sent to the COVID zone and once found to be positive, they are moved to a sub-section of the same zone, while nonsuspects are moved to the non-COVID zone. Non-COVID zone HCWs did not use complete personal protective equipment (PPE) while taking care of patients. The two major outbreaks were focused below.

Ethical approval was obtained from the Institutional Review Board vide letter No. 402/IEC/IM/NF/2020 dated 18/07/2020, and informed written consent was obtained from all participants in the study.

**Results**

All was well until a young male nurse (Case 1), working in a surgical allied ward (non-COVID zone) became symptomatic on April 24, 2020, and had mild fever and sore throat. He had no history of recent travel or contact exposure and reported to COVID screening OPD for COVID-19 testing. He was immediately advised to go home and self-isolate. The next day, his report confirmed that he was COVID positive by RT-PCR. A total of 101 primary contacts (68 high risk, including 17 patients and 33 low-risk contacts) of the nursing staff were traced. High-risk contacts were advised to home/facility-based quarantine after COVID samples were collected from them. Low-risk contacts were advised to be tested for COVID-19, self-monitor, and continue to work but wear PPE.

Another patient (Case 2) admitted in medicine allied intensive care unit (ICU) (COVID negative zone) of our hospital on the April 22, for hypertensive basal ganglia bleed of 40 days duration with tracheostomy in situ and ventilator-associated pneumonia became COVID-19 positive on April 28. She was a suspected case since her chest X-ray showed peripheral new infiltrates. A total of 153 primary contacts (54 high risk, including 3 patients and 99 low-risk contacts) were traced. A few days later, on a retrospective analysis of her contacts in a prior hospital admission (after information on her positive status was received from our hospital), it was confirmed that six close contacts HCWs were positive. It was, therefore, proved that she had the infection before reaching our hospital. Detailed history indicated that no other contacts were found. It was therefore, presumed that she must have got the infection in a nosocomial spread in a prior hospital admission (where she was in the non-COVID zone).

On April 28, we got two asymptomatic COVID-19 positive cases (Case 3 and 4) among the above mentioned close contacts: One was HCW (nursing staff), and the other a relative of an admitted patient who had been cared for by an earlier positive nurse. We started monitoring high-risk contacts of both cases during the quarantine period. Two more contacts (Case 5 and 6) tested positive on May 1 and 3 2020, respectively: One student intern with influenza-like illness (ILI) who came in direct contact with Case 2 in the non-COVID emergency department and another asymptomatic nursing staff who worked in the same Medicine allied ICU. Later, one asymptomatic relative (Case 7) of another admitted quarantined patient and one symptomatic patient (Case 8) of this ward tested positive on May 4 and 8, 2020, respectively during follow-up.

From our index case for this cohort when Case 2 admitted on April 22 till the last case detected on May 8, a total of eight cases were tested positive for COVID-19 from the non-COVID zone. In this cohort, there were two primary contacts and five nonprimary contacts (secondary or tertiary) of the index case. These nonprimary cases got the infection through the possible...
common canteen with primary contacts and common working place among secondary contacts. Many questions remain unanswered in this nosocomial outbreak.

After this cluster outbreak, hospital policy changed and all admissions were tested irrespective of suspect criteria, and only if they are RT-PCR negative at least once are patients shifted to the non-COVID zone [Figure 2]. This zone maintained a healthy atmosphere with respect to COVID transmission until June 19 when another nursing officer working in the Cardiology ward tested positive after having ILI. In the next 4 days, another nursing officer of the same ward and four nonsuspects, but one time COVID negative patients became positive. All were primary contacts of the index case. This was another nosocomial cluster outbreak in the non-COVID zone. So far >100 cases have been treated in the COVID zone with no nosocomial spread.

Discussion

In our institution a rigorous screening practice was adopted. All patients were screened by answering a questionnaire at the first contact point and patients with probable COVID-19 were first sent for testing before admission into the non-COVID zone. Nosocomial COVID-19 infection was documented in the hospital as severely hampering the functioning of surgical and medical allied departments late in April and more recently in the cardiology ward. Dividing the hospital into two areas designated as COVID and non-COVID zones seemed to have given a sense of false security to personnel working in the non-COVID zone. As the focus shifted to the newly formed COVID zone, standards and transmission-based precautions were not strictly adhered to in the non-COVID area.

The prevailing notion of disease surveillance and infection control in epidemics is by screening for the disease either by mass testing or using a screening criterion at public places such as hospitals, schools, transport hubs such as airports/bus station/railway station. Mass testing can be done door to door or in walk-in clinics, but this is only possible with outbreaks of pathogens whose pathogenesis, epidemiology, symptomatology, disease course, and diagnostic tests are widely known and accessible. COVID-19 diagnosis is performed by RT-PCR and rapid diagnostic tests are still under deployment. It will take time before these antigen/antibody-based assays become available for mass screening and even then they are unlikely to be helpful for the identification of cases in the initial course of the disease while the patient has the highest infectivity. Therefore, suspect criteria are useful at this point. As per MOHFW (Government of India’s) continuously changing guidelines for the testing criteria, asymptomatic cases with direct and high-risk contacts of a confirmed case are tested. The definition of a suspect is based on the WHO criteria in which asymptomatic persons are not suspect. So, in this approach many asymptomatic patients are missed, a situation. Which occurred in our case series. It therefore, means that the various guidelines need a major rethink.

For disease outbreaks due to a novel pathogen, the principal method remains the ability to identify a primary source, contact tracing and quarantine, and screening the population at risk using known manifestations of the disease. This method fails miserably if there is asymptomatic transmission of the disease, especially in regions without geographical boundaries to restrict the spread of the pathogen. COVID and non-COVID zones in a hospital are major boundaries nowadays. Once in the non-COVID zone, the transmission is due to multiple factors. As of today, testing all hospital admissions for COVID-19 is not recommended by the ICMR in its testing guidelines– the exceptions are pregnant women residing in containment areas or infection clusters. As discussed above, it is not possible to identify all COVID-19 patients based on history alone. One such patient who comes from an area with positive cases still means the patient could infect several HCWs and could significantly impact hospital services– for testing even if he/she is asymptomatic. This has previously led to lockdowns of many hospitals, including many departments in our hospital. Furthermore, the hospital then has to test several of its HCWs. Thus, the implications of missing a single COVID-19 patient can be far reaching.

Practice is unsuccessful in a developing nation where precise travel and contact history is almost never available. COVID-19 manifestations are not localized to a particular organ system and it has heterogeneous presentation. Thus screening questionnaires may miss

![Figure 2: Revised COVID-19 patient flow management at a tertiary care center](image-url)
the suspects while new data is still being published and guidelines continue to change daily.[7] In view of this, the protocol was changed [Figure 2] such that all patients who were to be admitted in our institution through both emergency and OPD and their attendants were tested for COVID-19. While awaiting results patients were admitted in an isolation area where HCWs used full PPE. Once negative, patients and attendants were moved to their respective wards where HCWs used standard precaution and N95 masks. This system helped in saving resources by utilizing PPE in areas where it was most required while giving respite to HCWs from the restriction of wearing PPE where it was not required. However, this policy also failed recently when another outbreak occurred in non-COVID zone as described above. Hence, the time has come to re-think IPC activities in these areas including the criteria for suspicious cases. Pandemic teams and designated areas should be predefined in every hospital, and activated in a timely fashion before there is panic and patients with chronic diseases bear the brunt of a paralyzed system. With the ongoing local transmission, there must be vigilance for an intra-hospital spread in non-COVID zones where there is social mingling of HCWs.

Conclusion

HCWs and patients in the non-COVID zone are more susceptible to infections and are more at risk. The spread of COVID-19 in designated non-COVID zones show a failure of hospital policies of infection control and represents a major source of nosocomial transmission. Along with rising asymptomatic transmission and negative RT-PCR credibility, the definition of a suspect case as well as the diagnosis criteria are questionable. The policymakers have to take another look at each of these.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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