

## Original Article

DOI: 10.22114/ajem.v4i2s.410

## Three Tier Screening Tool and Second Triage to Minimize the Spread of COVID-19 in Emergency Department of a Tertiary Hospital in India

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Published online: 2020-05-10

### Abstract

**Introduction:** Since the outbreak of Coronavirus on December 31, 2019 in Wuhan, Hubei Province, People's Republic of China, the number of cases from China that have been imported into more than 180 countries and regions around the world.

**Objective:** The goal of this study is to flatten the curve of new infection, through nosocomial transmission by health care system along with early identification of asymptomatic COVID-19 cases.

**Methods:** A Survey was conducted over a period of 35 days. A total of 1709 individuals were screened (647 patients and 1062 patient attendees) coming to emergency Department. The waiting area of Emergency Care was divided into 3 screening zones and a separate second triage is established. The individuals entering are ensured that they are screened at all the 3 zones. Individuals were divided into two Groups after screening: Group A (suspected COVID-19) and Group B (unsuspected COVID-19). In Acute emergencies, the patient was directly treated at second triage.

**Results:** A total of 1709 individuals, 247 in Group A (Suspected COVID-19) and 1462 in Group B (Unsuspected COVID-19). Among 247 individuals, 141 were males and 106 were females. Age ranged from 14-72 years with a mean age of 46.7years. Among 247 individuals (Group A), 81 were patients, of which one case was found to be COVID-19 Positive. Two Health care workers (HCW's) found to be positive.

**Conclusion:** Challenges from the widespread pandemic underscores the importance of early implementation of a second triage and vigorous screening for all the individuals to minimize the spread of infection, failing which pandemic infection may turn into an epidemic.

**Key words:** COVID-19; Emergency Service, Hospital; Secondary; Triage

**Cite this article as:** Silvery A, Nizami MI, Sharma A, Baskar L. Three Tier Screening Tool and Second Triage to Minimize the Spread of COVID-19 in Emergency Department of a Tertiary Hospital in India. *Adv J Emerg Med.* 2020;4(2s):e50.

### INTRODUCTION

In December 2019, Wuhan in People's Republic of China reported a cluster of pneumonia cases of unknown etiology that were later identified as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (1-3). Patients with this illness are labelled as coronavirus disease 2019 or COVID-19 (4). HCoV-19 has been proposed as an alternate name for the virus; Jiang et al., 2020 (5). Increasing trends of cases have been imported into other countries from China and the epidemiological map is changing rapidly (6). In this regard, World Health Organization (WHO) on, 30 January 2020, announced COVID-19, a Public Health Emergency of International Concern (PHEIC), and the pandemic of corona virus was declared on March 11, 2020 (7,8).

The index case in India was reported on January 30, 2020 from Thrissur, Kerala, in a person who had recently travelled from China. In our state Telangana, the first case was reported on March 2,

2020. On 10 March 2020, 54 COVID-19 positive cases were reported in India. By this time all the health care professionals worldwide were aware of the contagious nature of the virus. According to Indian Council of Medical Research (ICMR) the spread of this pandemic can be restricted by: 1) maintaining the social distance between individuals, 2) by meticulous hand hygiene, 3) rapid testing by reverse transcription polymerase chain reaction (RT-PCR) for all the individual who are suspected for COVID-19 (people who had travel history in past 14 days / who had contact with the COVID-19 positive case), 4) use of mouth masks, eye protection, gloves and gowns, and 5) avoiding social gatherings (9).

Screening for COVID-19 symptoms among the asymptomatic carriers was a failure attributing to the prolonged incubation period (2-14 days) of virus. Probably, prolonged incubation period and non-

availability of vaccination contributed for the rapid spread of this pandemic and escalated spread of infection within the community<sup>(10)</sup>. It had become a great challenge for the emergency physicians to implement proper infection control practices in a resource limited setting which include inadequate supplies of personal protective equipment (PPE) and other items (e.g., alcohol-based hand sanitizer); delayed recognition of cases because of a low index of suspicion; limited availability of testing; and difficulty in identifying persons with COVID-19 on the basis of symptoms alone<sup>(11,12)</sup>.

We face a constant risk that a health care worker (HCW) with early infection may bring the virus into our facilities and transmit it to others. Moreover, asymptomatic and pre-symptomatic HCWs continue to commute to places of work where PPE might be suboptimal due to crisis. This disease spread could, in turn, propagate out of hospitals during a period of lockdown<sup>(13)</sup>. Asymptomatic COVID-19 carriage among hospital staff could conceivably act as a potent source of ongoing transmission by at least 20%, although it is unclear as to what extent such transmission contributes to the overall spread of infection<sup>(14-16)</sup>. According to ICMR, in India, 69% of the COVID-19 positive cases are asymptomatic.

Many studies have documented regarding the spread of infections among the emergency physicians and HCWs who are in frontline of exposure during this pandemic. In our study, we focused on minimizing the spread of infection (nosocomial transmission) within the HCWs and identifying the suspected proactive COVID-19 cases with the minimal resources for reducing the spread of infection in the community. Lessons learned from this initial cluster can provide valuable guidance for the emergency departments (EDs) in other parts of the world. Measures to prevent or reduce doubling in size should be implemented in populations at risk. We found that cases of COVID-19 have been doubling in size approximately every 7.4 days in Wuhan<sup>(17)</sup>.

It may be necessary to commit considerable resources to testing in outpatient clinics and EDs for proactive case finding, both as part of the containment strategy in locations without local spread yet as well as to permit earlier clinical management of cases.

## Methods

Our study was conducted over a period of 35 days among which 21 days (March 10<sup>th</sup> to March 31<sup>st</sup>) for data collection and remaining 14 days (April 1<sup>st</sup> to April 14<sup>th</sup>) for observing the symptoms of COVID-19 among the HCWs in the ED of our institute. Doctors,

**Table 1:** Used questionnaire at Zone 3

History of cough	1
History of cold	1
History of diarrhoea	1
History of sore throat	1
History of myalgia/body aches	1
History of headache	1
History of fever(37.8 degree Celsius and above)	2
History of fatigue	2
History of shortness of breath	4
History if international travel after 25 <sup>th</sup> January by him or his family members.	Yes/No
History of direct contact / Taking care of COVID-19 positive patient by him or his family members.	Yes/No

nurses, technicians and workers had undergone knowledge and skill assessment for COVID-19 and the requisite training was given. All the HCWs were explained about the importance of using mouth mask (N95), eye wear, hand sanitization, wearing gloves, using PPE kit and the procedure of quarantine if at all required, before starting the study. The number of visitors entering the ED along with the patients was restricted. A total of 1709 individuals were screened (647 patients and 1062 patient attendees). The waiting area of the ED was divided into 3 screening zones each of which is separated by a minimum space of 6 feet distance with good ventilation. The individuals entering were ensured that they undergo screening at all the 3 zones in ED. Individuals were divided into two groups after screening: group A (suspected COVID-19) and group B (unsuspected COVID-19). Examiners of zone 1 and zone 2 are provided with N95 mouth mask, goggles and hand gloves for their safety. Zone 3 examiners are provided with PPE kits. At all three zones the examiners maintained a spatial distance of at least 1 meter from the patient. At the level of zone 1, all the individuals (patients and patient attendees) entering the ED are advised to wear a mouth mask and hand sanitization (70% alcohol based) is done at this level following which they enter zone 2. In zone 2 no-touch thermal screening is done and evaluated for being febrile or not. In zone 3 each individual is evaluated by a questionnaire and examined for symptoms of COVID-19 by a health care provider. The questionnaire contains a set of 11 questions (Table 1). These questions are modified from the Revised Guidelines on Clinical Management of COVID-19. Published by Ministry of Health & Family Welfare, Directorate General of Health Services<sup>(18)</sup>.

### **Inclusion criteria for Group A:**

Score of 6-14 from above mentioned questions.

**Table 2:** Equipment required in second triage

Healthcare workers (Doctors and Nurses) and the minimum equipment in second triage to handle the case	<input type="checkbox"/> PPE <input type="checkbox"/> Drugs & Disposable <input type="checkbox"/> Oxygen Apparatus <input type="checkbox"/> Suction Machine <input type="checkbox"/> Defibrillator <input type="checkbox"/> Aerosol box <input type="checkbox"/> Table Top Pulse oxymeter <input type="checkbox"/> Hand washing and Hand sanitizer facility
Cleaners	Entering the room of second Triage patients with proper PPE
Disinfection of surfaces	Sodium hypochloride

Symptomatic/asymptomatic individual with a travel history after 25th January by them or their family members. Individuals who are in direct contact / taking care of a positive Covid-19 patient by them or their family members. Group A individuals were directed towards the state designated Covid-19 surveillance center for laboratory testing.

**Inclusion criteria for Group B:**

Score 0-5.

Unsuspected cases are directly taken into regular triage area. Our Emergency department started a second triage area which has a separate entrance from the regular triage area to address the cases which required immediate interventions like cardio pulmonary resuscitation (CPR) & intubation. Emergency second triage requirements are listed in Table. The questionnaire for the cases treated in second triage was filled by HCW once they are stabilized and categorised into Group A or Group B. HCW's assigned for second triage was trained in performing hand hygiene and don a PPE to avoid self-contamination from patients admitted in second triage.

**RESULTS**

A total of 1709 individuals, 247 in Group A (suspected COVID-19) and 1462 in Group B (unsuspected COVID-19) attended the emergency department during the study period. Among 247 individuals, 141 were males and 106 were females.

Age ranged from 14-72 years with a mean age of 46.7 years. Among 247 individuals (Group A), 81 were patients, of which one case was later proved to be COVID-19 positive. This patient was in direct contact with COVID-19 positive case. A total of 5 HCWs (1 doctor, 2 nurses and 2 workers) attended this suspected case of COVID-19 in second triage area. All the HCW's in contact with this case were quarantined for 7 days and send for RT-PCR testing. Two of the five HCWs who developed the symptoms of COVID-19 were found to be positive after testing. During the 14 days of observation period in the study (April 1<sup>st</sup> -14<sup>th</sup>, 2020) all the HCWs were observed for symptoms of the disease. None of the HCW's developed the symptoms pertaining to COVID-19. The collection of data related to Group A is listed in table 3. All the attendees who accompanied the patients were also included in Group A, 166 attendees accompanied 81 patients (166+81=247).

**DISCUSSION**

As the SARS-CoV-2 pandemic continues to explode, hospital systems are scrambling to intensify their measures for protecting patients and health care workers from the virus<sup>(10)</sup>. In this context, proactive steps are to be undertaken by emergency care facilities to identify and exclude potentially infected staff, patients and visitors by actively monitoring and implement appropriate prevention and control

**Table 3:** Findings of the questionnaire

Symptoms/ questionnaire	Points	N=81
History of cough	1	12
History of cold	1	3
History of diarrhoea	1	1
History of sore throat	1	8
History of myalgia/body aches	1	5
History of head ache	1	5
History of fever(37.8 degree Celsius and above)	2	22
History of fatigue	2	6
History of shortness of breath	4	15
History if international travel after 25 <sup>th</sup> January by him or his family members.	Yes/No	52
History of direct contact / Taking care of COVID-19 positive patient by him or his family members.	Yes/No	1

measures to prevent the spread of COVID-19. In surveys of emergency care facilities, many studies have identified the factors that contribute to the vulnerability of these facilities, which include: 1) staff who had worked while symptomatic, 2) staff who worked in more than one facility, 3) inadequate familiarity with and adherence to PPE recommendations, 4) challenges to implementing proper infection control practices.

Examples of specific PPE challenges included an initial lack of available eye protection, frequent changes in PPE types because supply chains were disrupted and PPE was being obtained through various donations or suppliers, and a need for a designated staff member to observe PPE use to ensure that staff were consistent with safe PPE handling (e.g., not touching or adjusting face protection, primarily face masks, during extended use). In addition to education, hands-on training, and maintaining adequate supplies, facilities need to reinforce staff adherence to infection prevention and control practices with regular auditing and feedback. In this study, the individuals (patients and their attendees) who reported to emergency department of our institute in Telanagana, India from 10th March – 14th April were screened for suspected COVID-19 to reduce the risk of its transmission from proactive patients and HCW's in our facilities. As our institute has been designated as the biggest non-COVID-19 center for managing all other emergencies, majority of the patients in this study belonged to unsuspected group for COVID-19. All these patients were evaluated in regular triage area. The intension of screening the patients before entering the emergency is to minimize the stress, anxiety in HCWs along with spread of infection from asymptomatic and early infected patients to the HCWs and uninfected patients in the ED. In our study, we concentrated on Group A individuals. Out of 247, there was high male predominance to females with ratio 1.3:1, which correlates with studies by Qun Li, et al. with mean age of 46.7 years which is ranging from 14-68 years, which correlates with the study conducted by Guan W et al. and Lu X et al. (17-20). Few studies suggest that there is no age limitation for this pandemic (21, 22). Screening the patients at the entry of ED had reduced stress and spread of the infection in the hospital for both HCW's and uninfected patients. There are various studies supporting preliminary screening at emergency care to minimize the spread of infection among HCWs (17, 20, 23). Protection and prevention were executed by two methods at Zone 1: Masking and hand sanitization. Masking all the individuals entering emergency department will reduce the

aerosol spread while screening. It is more effective in prevention of spread from the asymptomatic COVID-19 individuals. Universal masking is already standard practice in many countries and has recently been adopted by a handful of U.S. hospitals.<sup>10</sup> According to few studies, wearing mask outside the health care facilities offers minimal safety<sup>(10)</sup>. The chances of spread of COVID-19 from a passing interaction in a public space is therefore minimal but reflexive reaction to anxiety. There are two scenarios in which universal mask may be of possible benefits: 1) during the care of a patient with unrecognized COVID-19; 2) reduce the likelihood of transmission from asymptomatic and minimally symptomatic health care workers with COVID-19 to other providers and patients. Masking the individuals at Zone 1, helped us to prevent the spread of infections to the examiners<sup>(10)</sup>. We used N95 masks for all the examiners for its better efficacy of protection<sup>(24)</sup>. Hand sanitization for all the individuals will enhance the preventive measure at Zone 1. One of the modes of transmission of infections is from virus-laden oral and nasal droplets<sup>(10)</sup>. These aerosols may contaminate the surfaces of the surrounding living and non-living things. In order to reduce this mode of transmission all the individuals were asked to scrub their hands with 70% alcohol based sanitizer at zone 1<sup>(23)</sup>. No-touch thermal screening is performed at Zone 2 to identify the febrile individuals<sup>(25)</sup>. In this pandemic, fever is one of the common symptom (78%) among symptomatic patients. Among all the screened individuals, 43 were febrile. Thermal screening alone is not a perfect tool for screening to identify a proactive or symptomatic COVID-19 individual<sup>(26)</sup>. In zone 3, a questionnaire based on clinical symptoms of COVID-19, travel and contact history were filled. 247 of 1709 were suspected for COVID-19 and were referred to state surveillance team for laboratory confirmation. This method of screening and questionnaire is helpful to evaluate and identify the asymptomatic and proactive infected cases. It has two advantages: 1) It helps in early recognition of potentially infected patients, and implementation of appropriate infection prevention and control measures in COVID-19 positive case<sup>(19, 22, 27)</sup>; 2) Protects the HCWs and reduces the spread of this infection in the form of nosocomial spread. Emergency second triage area has a separate entrance from the regular triage area to address the cases which required immediate interventions like CPR and intubation. The HCWs appointed in this zone are provided with PPE kits total of 12 cases were treated in second triage<sup>(11)</sup>. Patients who required intubation in this region were intubated by

using “Aerosol Box” to minimize the aerosol contamination<sup>(28)</sup>. Among them three patients were suspected of COVID-19 infection after stabilization. All the HCWs, who attended those patients, were quarantined till COVID-19 results of that patients are received. One of the three patients later tested COVID-19 positive. HCWs who treated that patient were kept under observation for symptoms of COVID-19 in quarantined period. Two out of five HCW's developed symptoms of COVID-19 and on testing they were found to be positive. All the HCWs were given the PPE but only two got infected among the five HCWs, it might be because of improper PPE handling<sup>(10)</sup>. Apart from that re-screening of all admitted patients daily for signs and symptoms of COVID-19 was done. Emergency HCWs were advised to attest that they have no symptoms before starting work each day; being attentive to physical distancing between staff members in all settings (including potentially neglected settings such as elevators, hospital shuttle buses, clinical rounds, and work rooms). Restricting and screening visitors; and increasing the frequency and reliability of hand hygiene were taken care off at all instances. In our study, a total of 10 HCWs are quarantined, only two found positive. Remaining 8 HCWs were negative. This can be minimized by having a low-threshold for testing. During this period of self-isolation HCW's are particularly vulnerable to emotional distress<sup>(29)</sup>. Second triage area is properly disinfected after the patient is stabilized and shifted. We have followed an airborne infection isolation room procedure with 12 air changes/hour, it takes around 30 minutes to achieve airborne-contaminant removal efficiency over 99%, and even longer if surface disinfection with sodium hypochlorite is performed<sup>(30)</sup>.

#### Limitations

Sample collection was minimal. Collection should have been performed at multiple centres. Suspected COVID-19 cases were in larger size compared with positive Covid cases. All HCWs

should be examined for COVID-19 by RT-PCR test for every third day.

#### CONCLUSIONS

It is very important to educate and train all the HCW's about the nature of the pandemic, modes of transmission and prevention. These efforts were to ensure rapid evaluation, understand risk factors for transmission and limit further transmission. Every HCW's take home message should be “Am I Part of the Cure or Am I Part of the Disease?” Here we outline importance in testing of both symptomatic and asymptomatic health-care workers(HCWs) to: 1) mitigate work force depletion by unnecessary quarantine; 2) reduce spread in atypical, mild, or asymptomatic cases; and 3) protect the health-care workforce. We request all the emergency physicians who are in the front line of exposure to adopt a technique of maintaining a primary screening area and a second triage. All the HCWs should be provided with proper PPE and rapid testing to minimize the spread of nosocomial infection failing which pandemic infection may turn into an epidemic.

#### ACKNOWLEDGEMENTS

We thank the patients, the nurses and HCW's who supported our study.

#### AUTHORS' CONTRIBUTION

All the authors met the standards of authorship based on the recommendations of the International Committee of Medical Journal Editors.

#### CONFLICT OF INTEREST

None declared.

#### FUNDING

None declared.

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