

Novel coronavirus: A capsule review for primary care and acute care physicians

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ABSTRACT

Novel coronavirus (nCoV) is a new emerging infectious agent causing coronavirus disease 2019 (COVID-19). Since the reporting of early cases of COVID-19 from China on December 29, 2019 till March 15, 2020, it has affected 1,42,539 humans in 135 countries, including 82 cases in India. As it is a difficult task for first-contact physicians, i.e. primary care and acute care physicians, to comprehend the fast-growing knowledge about nCoV and apply for prevention and care of suspected cases of COVID-19, we have tried to provide an updated capsule review of nCoV infection and management of COVID-19. It includes the evidence-based information on epidemiological determinants (agent, host, and environment) of the disease, its clinical features, clinical and laboratory diagnosis, basic infection prevention and control measures, and clinical management of COVID-19 cases. This review also includes the succinct summary of World Health Organization and Center for Diseases Control and Prevention interim guidelines (as of March 15, 2020) on nCoV.

Keywords: Acute care, COVID-19, novel coronavirus, primary care, Update

Introduction

Recently, the world is facing a new emerging infectious disease caused by novel coronavirus (nCoV). Since the reporting of early cases of nCoV-infected pneumonia (COVID-19) from Wuhan city, China on December 29, 2019 till March 14, 2020, it has affected 1,42,539 humans in 135 countries, with 5,393 deaths.^[1] India has the highest number of confirmed cases in South-East Asian Region, with 84 confirmed cases as of March 14, 2020; falling under “Local Transmission” category of WHO transmission classification.^[2] Cases were reported from 13 states and union territories, with two reported deaths.^[2] Primary care physicians^[3] and acute care physicians^[4] are the first-contact for most of the diseases including influenza outbreaks,^[5] so as the case in COVID-19. The rising number of cases at an alarming

rate, with multiple interim guidelines from several organizations, makes it difficult for the primary care and acute care physicians to comprehend the knowledge and apply for prevention and care of suspected cases of COVID-19. Hence, we provide an updated capsule review of nCoV infection and management of COVID-19, to help the busy-first-contact physicians for better evidence-based patient care. As this is a review article, institutional ethics committee approval was not sought.

Epidemiological Determinants

Agent factors

COVID-19 is caused by a newly recognized enveloped RNA virus, nCoV belonging to *Coronaviridae* family shared by severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV).^[6] Although coronaviruses (CoV) typically cause common cold symptoms, in the last two decades, the world has seen three fatal emerging diseases caused by CoV as SARS, MERS, and COVID-19. Transmission is thought to occur directly from person-to-person

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in hospital and family settings, and from infected travelers in various geographical locations.^[7] The route of transmission is primarily thought to be mainly by droplet infection and droplet nuclei.^[8] The portal of entry is the respiratory tract, although conjunctiva is a potential portal.^[8,9] The median incubation period (i.e. the time from infection to illness onset) is 4 days (IQR: 2–7 days)^[10] and range can be up to 14 days.^[11] From the serial interval distribution curve, it was estimated that on an average, each patient is able to spread infection to 2.68 (95%CI: 2.47–2.86) other people.^[12]

Host factors

From initial case reports and case series, the proportion of males affected (range 56% to 73%) was found to be more than that of females.^[13-15] The majority of patients with COVID-19 were reported to be of more than 15 years of age^[15] and nearly one-fifth to half of them had some underlying comorbidities like cardiovascular and cerebrovascular diseases, diabetes, chronic respiratory diseases, etc.^[13,14] The median age of the deaths was 75 (range: 48–89) years.^[16] In a report from the CDC, China that included 44,672 confirmed infections, 87% of patients were between 30 and 79 years old.^[17] The proportion of cases among healthcare workers was gradually increasing, which was 3.8% as per CDC China report.^[15,17]

Environmental factors

CoV infection usually spikes in the winter season and similar was the case in nCoV emergence.^[18] Although the source of infection has not been identified yet, the origin of COVID-19 was epidemiologically linked to Huanan seafood wholesale market in Wuhan city, where live animals like poultry, bats, marmots, snakes, etc., were on sale.^[13] A recent phylogenetic analysis of nine patients of COVID-19 suggests that bats might be the original host of this virus; an animal sold at the seafood market in Wuhan might represent an intermediate host facilitating the emergence of the virus in humans.^[19] Another two very recent similar studies have suggested bats or snakes to be the natural reservoir.^[20,21]

Clinical Features and Complications

Multiple case series had suggested that patients with COVID-19 usually present with fever, cough, and shortness of breath.^[13,14,17] Nearly one-third of patients had presented with dyspnea and days from illness onset to dyspnea was 8 days (range: 5–13 days).^[14] In the largest cohort of 44,672 confirmed cases, mild disease (no or mild pneumonia) was reported in 81%, severe disease (e.g. dyspnea, hypoxia, or >50% lung involvement on imaging within 24–48 h) was reported in 14%, and critical disease (e.g. with respiratory failure, shock, or multiorgan dysfunction) was reported in 5%.^[17] According to a joint WHO-China fact-finding mission, the case-fatality rate ranged from 5.8% in Wuhan to 0.7% in the rest of China.^[22] The median days from the first symptom to death were 14 days (range: 6–41 days) and tended to be shorter among people with ages above 70-year old than those below 70-year old.^[16] A predictive

MuLBSTA score was developed recently to predict mortality in viral pneumonia with a weighted score that included multilobular infiltrates, lymphopenia, bacterial coinfection, smoking history, hypertension, and age ≥ 60 years (2 points),^[23] though further investigation is needed to explore its use in COVID-19.

Diagnosis

World Health Organization (WHO) has published case definitions for the surveillance of COVID-19.^[24] “Suspect case” is a patient with acute respiratory infection (ARI) (fever with at least one of the respiratory signs and symptoms like cough or dyspnea), after exclusion of any alternative diagnosis, with a history of travel to or residence in country or territory which had reported local transmission of COVID-19 during last 2 weeks prior to symptoms. Patients with severe ARI requiring hospitalization without any alternative diagnosis are also included in “suspect case.” Any patient of respiratory illness with a history of contact (providing health care, sharing the same environment, travelling together, etc.) with a confirmed COVID-19 case in last 2 weeks is also called as “suspect case.” Any patient with laboratory-confirmed nCoV infection, irrespective of clinical presentation is called as a “confirmed case.” The definition of complications like ARDS,^[25] sepsis, and septic shock^[26] is as per corresponding recent guidelines. Laboratory samples to be taken in a suspected case of COVID-19 include blood cultures for pneumonia and sepsis, ideally before antimicrobial therapy, and specimens from both the upper respiratory tract (nasopharyngeal and oropharyngeal swabs) and lower respiratory tract (i.e. expectorated sputum, endotracheal aspirate, or bronchoalveolar lavage) for 2019-nCoV testing by RT-PCR (in biosafety level-2).^[27] Collection of these respiratory tract samples should be done under proper infection prevention and control guidelines (IPC) and transported to the designated lab at 4°C.^[27] According to the interim testing strategy recommended by ICMR (March 9, 2020), suspected cases with no symptoms should be home quarantined for 2 weeks and should be tested for COVID-19 only if symptoms develop.^[28] Chest radiography for the diagnosis of pneumonia and ARDS is needed. Usually, COVID-19 had bilateral pneumonia in three-fourth of all cases.^[14] Computed tomography of chest usually has ground-glass opacities, which tend to be predominantly peripheral and basal.^[29]

Infection Prevention and Control (IPC) Measures

IPC is an integral part of the clinical management of patients and should be initiated from triage at Emergency Department (ED). It is recommended that a suspect case should be given a medical mask and shifted to an isolation area at triage itself.^[9,30] Droplet precautions like using medical mask while working within 1–2 m near the suspect case, and droplet and contact precautions like use of PPE (medical mask, eye protection, gloves and gown) should be strictly followed.^[8,9] During aerosol-generating procedures, PPE (gloves, long-sleeved gowns, eye protection, and fit-tested particulate respirators like N95) is deemed necessary.^[9,16]

Asymptomatic patients with high risk of being infectious (history of travel from Hubei province, China or history of contact with confirmed nCoV in last 2 weeks) should be quarantined (voluntary or as per public health orders) in identified authorized locations, for a period of minimum 14 days.^[9,15,30]

Management of COVID-19

A modified patient flow in ED is depicted in Figure 1. Patients with suspected COVID-19 should be isolated immediately, triaged and managed in designated isolation space in ED. Appropriate

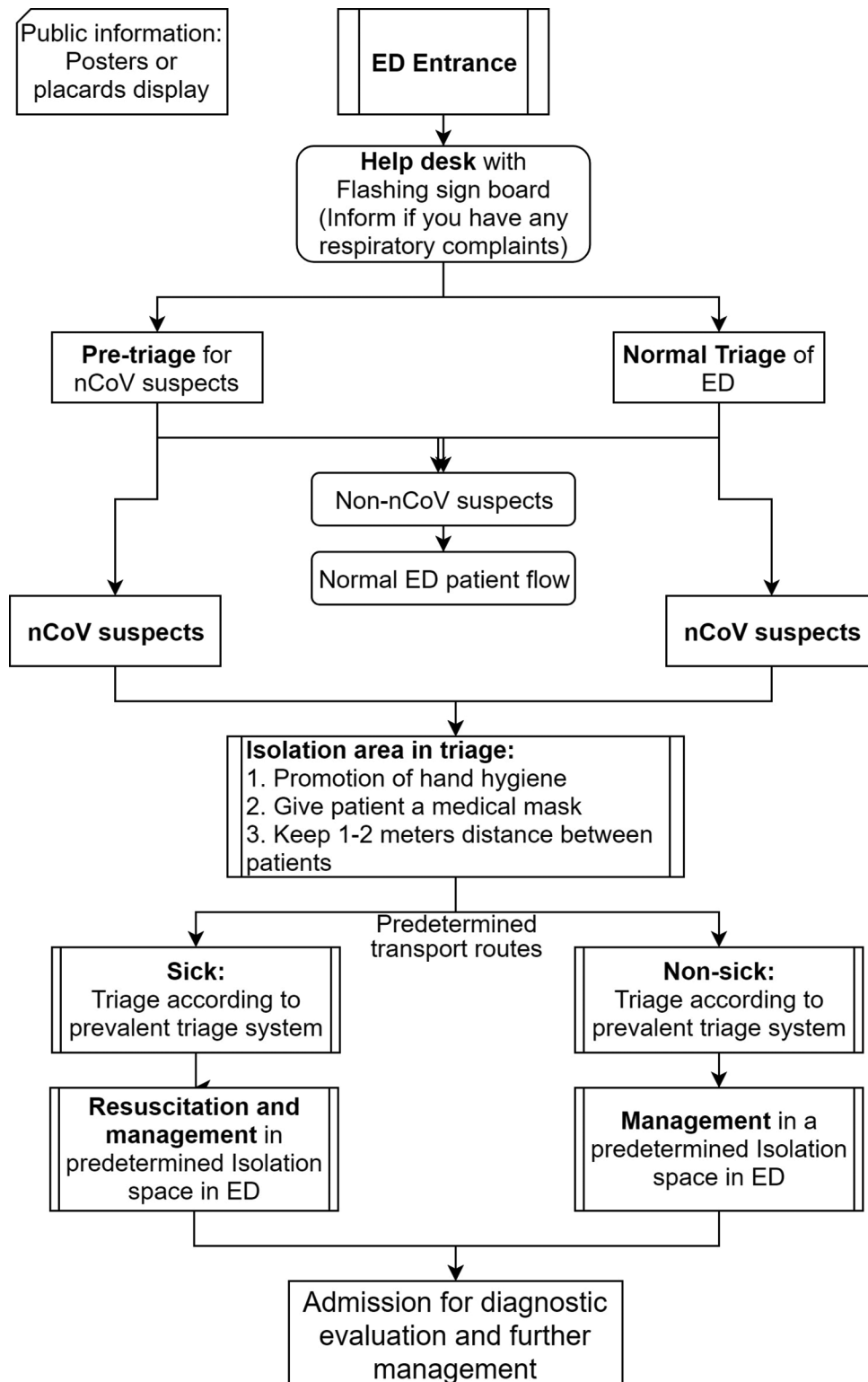


Figure 1: A modified patient flow in Emergency Department (ED), incorporating early triage and isolation of novel coronavirus (nCoV) suspect cases. The nCoV suspect will be defined by WHO definition of “Suspect case”

IPC measures should be followed in each and every step of patient management. Any case suspected in primary care should be triaged. Mild cases should be home quarantined, whereas severe cases should be referred and admitted in higher centers.^[28] Currently, there is no evidence-based treatment available specific for nCoV infection. WHO has published an interim guidelines for the clinical management of COVID-19, similar to that of management of viral pneumonia and ARDS.^[31] Airway and breathing management includes oxygen by face mask (for dyspneic, hypoxemic, and shock patients) with a target oxygen saturation of $\geq 90\%$; trial of NIV for mild ARDS (P/F ratio: 200 to 300) and MV for severe ARDS patients (P/F ratio < 200) using low-tidal volume strategy.^[32] Management of circulation includes judicious intravenous fluid (IVF) resuscitation and vasopressors. In septic shock, 30 ml/kg (adults) and 20 ml/kg (children) of isotonic crystalloid along with broad-spectrum are to be administered within the first 1 h, and to maintain a MAP ≥ 65 mm/Hg, vasopressors may be started after adequate IVF resuscitation.^[33,34] Many treatment options like antivirals (oseltamivir, ganciclovir, and lopinavir/ritonavir) and systemic corticosteroids (CS: methylprednisolone and dexamethasone) have been tried in patients with COVID-19, although no evidence is available till date regarding their efficacy in nCoV infection.^[14]

Disposition

All severe COVID-19 cases should be admitted in an isolation ward or ICU and managed. They can be discharged once there is a resolution of symptoms, radiological improvement with a documented virological clearance in 2 samples at least 24 h apart.^[31] If the laboratory results for nCoV are negative, discharge is to be decided as per discretion of the treating physician based on his provisional/confirmed diagnosis.^[31] Home management is appropriate for patients with mild infection who can be adequately isolated in the outpatient setting.^[28]

Home-based Care of People not Requiring Hospitalization

This has to be done in accordance with local health policy.^[28,35] The caring physician should assess the eligibility of residence like clinical stability of patients, availability of caregivers, and separate bedroom for the patient; provision for use of appropriate PPE for patients and relatives (minimum gloves and medical masks); and family members are capable of adhering to precautions recommended as part of home care or isolation (e.g. respiratory hygiene and cough etiquette, hand hygiene).^[35] Patient should stay at home unless requiring medical care, remain in a separate room, use appropriate cough-etiquette, avoid sharing personal items, and use face-masks to prevent infection.^[35,36]

Summary

As primary care and acute care physicians are the first-point-of-contact for patients with suspected COVID-19 disease, they should be aware of current trends and evidence-based management of patients. In this capsule review, short, succinct

Novel Coronavirus – A Capsule Review		
<p>Current situation (as of March 14, 2020)</p> <ul style="list-style-type: none"> World: 1,42,539 confirmed cases and 5,393 deaths India: 84 confirmed cases, 2 deaths India in WHO stage of 'Local Transmission' 	<p>Clinical features</p> <ul style="list-style-type: none"> Usual: fever, cough, URTI Mild disease: majority Severe disease: 14% Critical (organ failure): 5% CFR: outside Wuhan: $< 1\%$ Days from initial symptom to death: median 14 days More severe in > 70 yrs age 	<p>Infection prevention</p> <ul style="list-style-type: none"> Droplet precautions: medical mask in general, full PPE with N95 mask during procedures Frequent hand-washing and surface cleaning Home quarantine: for asymptomatic suspects Community awareness
<p>Epidemiology</p> <ul style="list-style-type: none"> Agent: +ssRNA coronavirus IP: 4 days (IQR: 2-7 days) Route: Droplets, person to person transmission R0: 2.68 (CI: 2.47–2.86) Host: <ul style="list-style-type: none"> More in > 15 yrs age Death – more in old age and with comorbidities HCW - highly vulnerable Environment: winter 	<p>Diagnosis</p> <ul style="list-style-type: none"> Case definitions: as per WHO guidelines Laboratory: <ul style="list-style-type: none"> Samples: URT – pharyngeal swabs; LRT – BAL, sputum, ET aspirate Test: RT-PCR Other labs: <ul style="list-style-type: none"> Rule out alternate Dx Imaging: CXR, CT chest 	<p>Management & disposition</p> <ul style="list-style-type: none"> Asymptomatic or mild cases: home quarantine for 2 weeks Severe cases: admitted to isolation ward and ICU Complications: manage as per guidelines Specific treatment: none proven

Figure 2: Summary of the capsule review on COVID-19 for primary care and acute care physicians. **Footnote:** WHO-World Health Organization, IP-incubation period (the time from infection to illness onset), IQR-interquartile range, R0-reproduction number (expected number of cases directly generated by one case in a population), HCW-healthcare workers, URTI-upper respiratory tract infection, CFR-case fatality rate, URT-upper respiratory tract, LRT-lower respiratory tract, BAL-bronchoalveolar lavage, ET-endotracheal, Dx-diagnosis, CXR-chest radiography, CT-computed tomography, PPE-personal protective equipment

information is provided for these busy-working physicians, which might help to improve patient care as per current science. Summary of COVID-19 disease with a special focus on management is depicted in Figure 2.

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Conflicts of interest

There are no conflicts of interest.

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