Coronaviruses (CoV) are a large family of viruses discovered in the 1960s that exhibit characteristics of ‘corona’ (crown)-shaped spiked proteins with a lipid envelope [1]. CoV infections are emerging respiratory viruses that typically spread via airborne droplets of fluids produced by infected individuals and have a devastating impact on human health around the world. Some strains of CoV are zoonotic and known to cause illness ranging from the common cold and sore throat to more severe diseases. Some of the CoV that have emerged in recent years include the first severe respiratory syndrome (SARS-CoV) pandemic in 2002 (~800 deaths), Middle East respiratory syndrome (MERS-CoV) in 2012 (860 deaths) and the recent novel coronavirus (2019-nCoV).

Between 8 December 2019, to 2 January 2020, 44 cases of pneumonia of unknown etiology were detected in Wuhan City, Hubei Province of China, and these patients have connections to a large wholesale seafood and animal market [2]. Fever, dyspnea and cough are some of the clinical symptoms and chest radiography investigations showed bilateral lung invasive lesions. The Center for Disease Control and Prevention (CDC) recommended screening of patients with severe respiratory illness and a recent travel history to Wuhan and recommended that staff take contact precautions and wear an N95 disposable facepiece respirator [3]. On 11 January 2020, gene sequencing data of the whole genome of the Wuhan 2019-nCoV was submitted to GenBank (MN908947.3) [4]. On 12 January 2020, one death was linked to 2019-nCoV, and the World Health Organization (WHO) rapidly issued an alert regarding the outbreak of 2019-nCoV. On 14 January 2020, a patient with the 2019-nCoV strain similar to that in Wuhan was detected in Thailand, and the WHO debated declaring an international health emergency. The WHO has issued guidance on how to detect and treat patients with 2019-nCoV and release related biosafety indications [5]. On 16 January 2020, Japan confirmed its first case of pneumonia caused by the 2019-nCoV strain. Thereafter, the surge of 2019-nCoV continued to rise globally, with a total of 17,384 confirmed cases, and the death toll is advancing at a breakneck pace with 362 deaths [6] (Table 1). The majority of internationally exported cases reported to date have a travel history in Wuhan [7]. Furthermore, it is estimated that each sick person could infect 2.68 people; over 75,000 people in Wuhan have already contracted the virus as of January 25, 2020, and it took 6.4 days to double its epidemic size [7].

As the 2019-nCoV outbreak continues, several scientists and researchers started their investigations to disseminate the evidence to better understand 2019-nCoV. First, Huang et al., published the clinical features of the first 41 patients with 2019-nCoV with the onset of fever, shortness of breath, myalgia and bilateral ground-glass opacities observed in their chest radiography [8]. The majority of them are hypotensive and have high neutrophil count and lactate dehydrogenase (LDH) and are likely to have acute kidney injury, secondary infection and shock [9]. Later, Zhu and his colleagues described the 2019-nCoV characteristics through whole-genome sequencing and direct PCR and revealed the genus Betacoronavirus [9]. A family cluster of five patients with 2019-nCoV with confirmed human-to-human transmission within a 3-6 day incubation period was reported [10]. The pattern of early human-to-human transmission has an estimated R0 value of approximately 2.2 (90% high-density interval: 1.4-3.8) [11], and snakes have also been investigated as the possible reservoir for 2019-nCoV [12]. A critical observation by Wuhan virologists identified a higher viral load in the deep respiratory tract samples than oral/throat swabs [13]. The researchers also confirmed that 2019-nCoV uses the angiotensin-converting enzyme II (ACE2) receptor to enter into human cells, similar to SARS-CoV [13].

The key epidemiological characteristics of 2019-nCoV with a real-time assessment were presented by the Eurosurveillance team [14]. Researchers also investigated the
early transmissibility of 2019-nCoV using a phenomenological modeling method and estimated 2- to 3.3-fold of early basic reproduction of cases [15]. The current epidemiological perspectives of 2019-nCoV allow us to draw the surveillance pyramid that is mostly unavailable [16]. Based on the available 164 confirmed 2019-nCoV cases, the Guangdong Provincial CDC reported a detailed epidemic curve and an estimated Ro value of 2.9, with an average incubation period of 4.8 days [17]. The recent modeling study published in Lancet estimated that each sick person could infect 2.68 people, and over 75,000 people in Wuhan had already contracted the virus as of January 25, 2020, and it took 6.4 days to double its epidemic size [18]. Following the epidemiological transitions, the CDC has issued interim guidance for clinicians on identification and caring for the patients with potential 2019-nCoV through a flowchart (Fig. 1) [18].

The Chinese government has imposed an unprecedented quarantine across 15 cities in Hubei Province as an emergency public health measure to curtail spreading to other parts of China and the world. The creative innovation of using drones with a microphone to prevent local gatherings, urging people to wear masks, and increasing awareness of 2019-nCoV among residents in rural areas has been implemented [19]. This creative approach was also used to patrol and check people's temperature to prevent human-to-human contact. This exponential boom of Artificial Intelligence (A.I.) was used to detect cases and circumvent mass screening. The Center for Systems Science and Engineering has developed another innovation using an interactive map for monitoring, visualizing, and tracking the reported cases of 2019-nCoV on the daily timeline [6]. Whole-genome sequencing of the Wuhan virus in less than a month was a critical step for the development of diagnostics and vaccines [4]. Several new technology innovations, including Toronto-based health monitoring A.I. (Bluedot), portable lab-on-chip detection kits, and robots to rescue are some of the game changers helping health professionals speed up diagnosis and save more lives in the process.

Table 1. Global cases of novel coronavirus (2019-nCoV)*.

| Countries                  | Confirmed Cases |
|----------------------------|-----------------|
| China                      | 17302           |
| Japan                      | 20              |
| Thailand                   | 19              |
| Singapore                  | 18              |
| Hong Kong                  | 15              |
| South Korea                | 15              |
| Australia                  | 12              |
| US                         | 11              |
| Germany                    | 10              |
| Taiwan                     | 10              |
| Macau                      | 8               |
| Malaysia                   | 8               |
| France                     | 6               |
| Vietnam                    | 6               |
| United Arab Emirates       | 5               |
| Canada                     | 4               |
| Italy                      | 2               |
| Russia                     | 2               |
| Philippines                | 2               |
| India                      | 2               |
| UK                         | 2               |
| Nepal                      | 1               |
| Cambodia                   | 1               |
| Spain                      | 1               |
| Finland                    | 1               |
| Sweden                     | 1               |
| Sri Lanka                  | 1               |

*As of February 4, 2020.
Flowchart to Identify and Assess 2019 Novel Coronavirus

For the evaluation of patients who may be ill with or who may have been exposed to 2019 Novel Coronavirus (2019-nCoV)

A. Identify
   if in the past 14 days since first onset of symptoms a history of either
   Travel to China
   OR
   Close contact with a person known to have 2019-nCoV illness

B. AND the person has
   Fever or symptoms of lower respiratory illness
   (e.g., cough or shortness of breath)
   if both exposure and illness are present

   Isolate
   - Place facemask on patient
   - Isolate the patient in a private room or a separate area
   - Wear appropriate personal protective equipment (PPE)

2. Assess clinical status
   EXAM
   - Is fever present?
     - Subjective?
     - Measured? ______°C/F
   - Is respiratory illness present?
     - Cough?
     - Shortness of breath?

3. Inform
   - Contact health department to report at-risk patients and their clinical status
   - Assess need to collect specimens to test for 2019-nCoV
   - Decide disposition

If discharged to home

Instruct patient
   As needed depending on severity of illness and health department consultation
   - Home care guidance
   - Home isolation guidance

Advise patient
   If the patient develops new or worsening fever or respiratory illness
   - Call clinic to determine if reevaluation is needed
   - If reevaluation is needed call ahead and wear facemask

* Documentation of laboratory-confirmation of 2019-nCoV may not be possible for travelers or persons caring for patients in other countries. For more clarification on the definition for close contact see CDC’s Interim Guidance for Healthcare Professionals: www.cdc.gov/-coronavirus/2019-nCoV/hcp/clinical-criteria.html

Fig. (1). Centers for Disease Control and Prevention flowchart to identify and assess 2019-nCoV.

We hope that any plan for stopping the ongoing 2019-nCoV epidemic, using advanced techniques to control further transmission, is urgently needed to end the epidemic.

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