Transmission characteristics and principles of infection prevention and control

Public Health England, updated 23 July 2020

1. Routes of transmission

Infection control advice is based on the reasonable assumption that the transmission characteristics of COVID-19 are similar to those of the 2003 SARS-CoV outbreak. The initial phylogenetic and immunologic similarities between COVID-19 and SARS-CoV can be extrapolated to gain insight into some of the epidemiological characteristics.

The transmission of COVID-19 is thought to occur mainly through respiratory droplets generated by coughing and sneezing, and through contact with contaminated surfaces. The predominant modes of transmission are assumed to be droplet and contact.

During AGPs there is an increased risk of aerosol spread of infectious agents irrespective of the mode of transmission (contact, droplet, or airborne), and airborne precautions must be implemented when performing aerosol generating procedure (AGPs), including those carried out on suspected as well as confirmed cases of COVID-19.

Initial research has identified the presence of COVID-19 virus in the stools and conjunctival secretions of confirmed cases. All secretions (except sweat) and excretions, including diarrhoeal stools from patients with known or possible COVID-19, should be regarded as potentially infectious.

2. Incubation and infectious period

The incubation period is from 1 to 14 days (median 5 days). Assessment of the clinical and epidemiological characteristics of COVID-19 cases suggests that, similar to SARS, most patients will not be infectious until the onset of symptoms. In most cases, individuals are usually considered infectious while they have symptoms; how infectious individuals are, depends on the severity of their symptoms and stage of their illness.

The median time from symptom onset to clinical recovery for mild cases is approximately 2 weeks and is 3 to 6 weeks for severe or critical cases. There have been case reports that suggest possible infectivity prior to the onset of symptoms, with detection of SARS-CoV-2 RNA in some individuals before the onset of symptoms.

Further study is required to determine the frequency, importance and impact of asymptomatic and pre-symptomatic infection, in terms of transmission risks.

From international data, the balance of evidence is that most people will have sufficiently reduced infectivity 7 days after the onset of symptoms.

Please see guidance for stepdown of infection control precautions within hospitals and discharging COVID-19 patients from hospital to home settings. Guidance is also available from Public Health Wales (PHW) and Health Protection Scotland (HPS).

3. Survival in the environment

In light of limited data for SARS-CoV-2, evidence was assessed from studies conducted with previous human coronaviruses including MERS-CoV and SARS-CoV. Human coronaviruses can survive on inanimate objects and can remain viable for up to 5 days at temperatures of 22 to 25°C and relative humidity of 40 to 50% (which is typical of air-conditioned indoor environments).

Survival on environmental surfaces is also dependent on the surface type. An experimental study using a SARS-CoV-2 strain reported viability on plastic for up to 72 hours, for 48 hours on stainless steel and up to 8 hours on copper. Viability was quantified by end-point titration on Vero E6 cells. Extensive environmental contamination may occur following an AGP.

The rate of clearance of aerosols in an enclosed space is dependent on the extent of any mechanical or natural ventilation and the size of the droplets created. The greater the number of air changes per hour (ventilation rate), the sooner any aerosol will be cleared.

The time required for clearance of aerosols, and thus the time after which the room can be entered without a filtering face piece (class 3) (FFP3) respirator, can be determined by the number of air changes per hour (ACH) as outlined in WHO guidance; in general wards and single rooms there

should be a minimum of 6 air changes per hour, in negative-pressure isolation rooms there should be a minimum of 12 air changes per hour.
Where feasible, environmental decontamination should be performed when it is considered appropriate to enter the room or area following an AGP without an FFP3 respirator. A single air change is estimated to remove 63% of airborne contaminants, after 5 air changes less than 1% of airborne contamination is thought to remain. Clearance of infectious particles after an AGP is dependent on the ventilation and air change within the room. In an isolation room with 10 to 12 ACH, a minimum of 20 minutes is considered pragmatic. In a single room with 6 ACH this would be approximately one hour.