Step 2.11 Quarantine - why do it?

With quarantine featuring heavily in the response to COVID-19, Professor Judith Glynn talks about its use, and the science informing it (recorded 2nd March 2020). This includes concepts of incubation period and infectious periods and how these relate to symptoms of COVID-19, as well as problems with establishing these measures, and the implications for quarantine.

Quarantine has been an intervention used in many contexts and countries worldwide. As you listen, think about how it has been used in your country and/or how you think it should be applied in the future.

The spread of disease in cruise ships - and their quarantine – has been an feature of the COVID-19 outbreak. You may be interested in the article about the Diamond Princess, included in the See Also section below.

Video transcript:

JUDITH GLYNN: Restricting movement of people to prevent the spread of disease has been used for thousands of years, long before the cause of infectious diseases was understood. The book of Leviticus in the Bible refers to restrictions for leprosy and the word quarantine derived from the 40 days used to try and prevent spread of the Black Death in the 14th century. Ships were routinely quarantined to prevent the spread of infections, including cholera.

But the scale of the quarantine restrictions in China is unprecedented. In this step, we will look at the science behind quarantine. There is always a period of time between acquiring an infection and beginning to show symptoms. That period is known as the incubation period. There's a characteristic incubation period for each disease. There is always variation between people so each disease has a characteristic median, minimum, and maximum incubation period.

The distribution of incubation periods is usually roughly as shown here, rising quickly to a peak with a long right tail. For some diseases the incubation period is shorter after a larger infecting dose. Because COVID-19 is new, we didn't initially know the incubation period. It was estimated from direct observation of people with COVID-19 with known dates of exposure and from travellers from Wuhan as we knew the last possible date of exposure.

Together with models of the likely distribution of incubation periods based on the typical shape and comparison with what was known for SARS from 2003, this gave a median of six days with a range of two to 14 days. This tells us how long we would need to wait to know someone is going to develop COVID-19 after exposure and forms the basis for the duration of quarantine for travellers.

But another important consideration is when is someone infectious? Remember the incubation period is the time between acquiring an infection and beginning to show symptoms. There's also a period of time between acquiring an infection and becoming infectious, that is when you can transmit to someone else. A key question was at what point someone with COVID-19 becomes infectious? Was it only after developing symptoms like in SARS or could they transmit before developing symptoms? Studies in Germany and in China have shown that people whose only contact with COVID-19 was with patients during the incubation period can get the disease. So transmission can happen during the incubation period. Transmission can certainly happen from those with symptoms and is probably more likely than those with more severe symptoms, accounting for the spread health care workers.

It's not yet clear how long people remain infectious after recovery. It's not clear whether transmission can happen from those who are infected and never show symptoms-- asymptomatic cases. But the virus has been detected in throat samples from an asymptomatic case and in a case cluster in China the only known source was someone with no symptoms, so this is a possibility. So the maximum incubation period, 14 days, gives the maximum time of quarantine following exposure. Unlike SARS transmission can occur before symptoms develop, this means that you cannot rely on screening symptomatic cases to detect all those who may transmit.

See Also

Evidence of SARS-CoV-2 Infection in Returning Travelers from Wuhan, China

https://www.nejm.org/doi/full/10.1056/NEJMc2001899

Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany

https://www.nejm.org/doi/full/10.1056/NEJMc2001468

Diamond Princess Cruise ship – new estimates highlight the successes and failures of the COVID-19 quarantine

https://www.lshtm.ac.uk/newsevents/news/2020/diamond-princess-cruise-ship-new-estimates-highlight-successes-and-failures

Covid-19 — The Law and Limits of Quarantine

https://www.nejm.org/doi/full/10.1056/NEJMp2004211