Physical distancing, face masks, and eye protection for prevention of COVID-19

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See **Articles** page 1973

The choice of various respiratory protection mechanisms, including face masks and respirators, has been a vexed issue, from the 2009 H1N1 pandemic to the west African Ebola epidemic of 2014,[1] to the current COVID-19 pandemic. COVID-19 guidelines issued by WHO, the US Centers for Disease Control and Prevention, and other agencies have been consistent about the need for physical distancing of 1–2 m but conflicting on the issue of respiratory protection with a face mask or a respirator.[2] This discrepancy reflects uncertain evidence and no consensus about the transmission mode of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). For eye protection, data are even less certain. Therefore, the systematic review and meta-analysis by Derek Chu and colleagues in *The Lancet*[3] is an important milestone in our understanding of the use of personal protective equipment (PPE) and physical distancing for COVID-19. No randomised controlled trials were available for the analysis, but Chu and colleagues systematically reviewed 172 observational studies and rigorously synthesised available evidence from 44 comparative studies on SARS, Middle East respiratory syndrome (MERS), COVID-19, and the betacoronaviruses that cause these diseases.

The findings showed a reduction in risk of 82% with a physical distance of 1 m in both health-care and community settings (adjusted odds ratio [aOR] 0·18, 95% CI 0·09–0·38). Every additional 1 m of separation more than doubled the relative protection, with data available up to 3 m (change in relative risk [RR] 2·02 per m; $p_{interaction}$=0·041). This evidence is important to support community physical distancing guidelines and shows risk reduction is feasible by physical distancing. Moreover, this finding can inform lifting of societal restrictions and safer ways of gathering in the community.

The 1–2 m distance rule in most hospital guidelines is based on out-of-date findings from the 1940s, with studies from 2020 showing that large droplets can travel as far as 8 m.[4] To separate droplet and airborne transmission is probably somewhat artificial, with both routes most likely part of a continuum for respiratory transmissible infections.[4] Protection against presumed droplet infections by use of respirators, but not masks,[5] supports a continuum rather than discrete states of droplet or airborne transmission. Both experimental and hospital studies have shown evidence of aerosol transmission of SARS-CoV-2.[6–8] One study found viable virus in the air 16 h after aerosolisation and showed greater airborne propensity for SARS-CoV-2 compared with SARS-CoV and MERS-CoV.[6]

Chu and colleagues reported that masks and respirators reduced the risk of infection by 85% (aOR 0·15, 95% CI 0·07–0·34), with greater effectiveness in health-care settings (RR 0·30, 95% CI 0·22–0·41) than in the community (0·56, 0·40–0·79; $p_{interaction}$=0·049). They attribute this difference to the predominant use of N95 respirators in health-care settings; in a subanalysis, respirators were 96% effective (aOR 0·04, 95% CI 0·004–0·30) compared with other masks, which were 67% effective (aOR 0·33, 95% CI 0·17–0·61; $p_{interaction}$=0·090). The other important finding for health workers by Chu and colleagues was that eye protection resulted in a 78% reduction in infection (aOR 0·22, 95% CI 0·12–0·39); infection via the ocular route might occur by aerosol transmission or self-inoculation.[9]

For health-care workers on COVID-19 wards, a respirator should be the minimum standard of care. This study by Chu and colleagues should prompt a review of all guidelines that recommend a medical mask for health workers caring for COVID-19 patients. Although medical masks do protect, the occupational health and safety of health workers should be the highest priority and the precautionary principle should be applied. Preventable infections in health workers can result not only in deaths but also in large numbers of health workers being quarantined and nosocomial outbreaks. In the National Health Service trusts in the UK, up to one in five health workers have been infected with COVID-19,[10] which is an unacceptable risk for front-line workers. To address global shortages of PPE, countries should take responsibility for scaling up production rather than expecting health workers to work in suboptimum PPE.[11]

Chu and colleagues also report that respirators and multilayer masks are more protective than are single layer masks. This finding is vital to inform the proliferation of home-made cloth mask designs, many of which are single-layered. A well designed cloth mask should have water-resistant fabric, multiple layers, and good facial fit.[12] This study supports universal face mask use, because masks were equally effective in both health-care and community settings when adjusted for type of mask use. Growing evidence for presymptomatic and asymptomatic transmission of SARS-CoV-2[13] further supports universal face mask use and distancing. In regions with a high incidence of COVID-19, universal face mask use combined with physical distancing could reduce the rate of infection (flatten the curve), even with modestly effective masks.[14] Universal face mask use might enable safe lifting of restrictions in communities seeking to resume normal activities and could protect people in crowded public settings and within households. Masks worn within households in Beijing, China, prevented secondary transmission of SARS-CoV-2 if worn before symptom onset of the index case.[15] Finally, Chu and colleagues reiterate that no one intervention is completely protective and that combinations of physical distancing, face mask use, and other interventions are needed to mitigate the COVID-19 pandemic until we have an effective vaccine. Until randomised controlled trial data are available, this study provides the best specific evidence for COVID-19 prevention.

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Biomarkers in Down syndrome can help us understand Alzheimer's disease

See **Articles** page 1988

Down syndrome is associated with increased risk of developing early-onset Alzheimer's disease, primarily because of the overexpression of the *APP* gene on chromosome 21. People with Down syndrome, as a form of genetically determined Alzheimer's disease, represent one of the largest cohorts at risk of early-onset Alzheimer's disease because virtually all adults with Down syndrome will develop Alzheimer's disease by age 40 years.[1] However, the age range for the onset of cognitive decline is wide (from <50 years to >70 years).[2] The characterisation of the preclinical phases of Alzheimer's disease is crucial for early diagnosis in this susceptible group of people.