

## COVID-19: the case for health-care worker screening to prevent hospital transmission

The outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has placed unprecedented strain on health-care services worldwide, leading to more than 100 000 deaths worldwide, as of April 15, 2020.<sup>1</sup>

Most testing for SARS-CoV-2 aims to identify current infection by molecular detection of the SARS-CoV-2 antigen; this involves a RT-PCR of viral RNA in fluid, typically obtained from the nasopharynx or oropharynx.<sup>2</sup>

The global approach to SARS-CoV-2 testing has been non-uniform. In South Korea, testing has been extensive, with emphasis on identifying individuals with respiratory illness, and tracing and testing any contacts. Other countries (eg, Spain) initially limited testing to individuals with severe symptoms or those at high risk of developing them.

Here we outline the case for mass testing of both symptomatic and asymptomatic health-care workers (HCWs) to: (1) mitigate workforce depletion by unnecessary quarantine; (2) reduce spread in atypical, mild, or asymptomatic cases; and (3) protect the health-care workforce.

Staff shortages in health care are significant amidst the global effort against coronavirus disease 2019 (COVID-19). In the UK, guidance for staffing of intensive care units has changed drastically, permitting specialist critical care nurse-to-patient ratios of 1:6 when supported by non-specialists (normally 1:1) and one critical care consultant per 30 patients (formerly 1:8–1:15).<sup>3</sup> Fears of the impact of this shortage have led to other measures that would, in normal circumstances, be considered extreme: junior doctors' rotations have been temporarily halted during the outbreak; annual leave for staff has been delayed; and doctors undertaking research activities have been redeployed.

Workforce depletion will not only affect health care; the Independent Care Group, representing care homes in the UK, has suggested that social care is already "at full stretch",<sup>4</sup> with providers calling for compulsory testing of social and health workers to maintain staffing.

In spite of this, a lack of effective testing has meant that a large number of HCWs are self-isolating (125 000 HCWs, according to one report<sup>5</sup>). In one small sample, only one in seven self-isolating HCWs were found to have the virus.<sup>6</sup> A letter to National Health Service (NHS) Trust executives on April 12, 2020, outlined that priority is being given to staff in critical care, emergency departments, and ambulance services to prevent the impact of absenteeism in those areas.<sup>7</sup> Increased testing capacity will enable all staff who are self-isolating unnecessarily to bolster a depleted workforce. Asymptomatic HCWs are an underappreciated potential source of infection and worthy of testing.

The number of asymptomatic cases of COVID-19 is significant. In a study of COVID-19 symptomatic and asymptomatic infection on the *Diamond Princess* cruise ship, 328 of the 634 positive cases (51.7%) were asymptomatic at the time of testing.<sup>8</sup> Estimated asymptomatic carriage was 17.9%.<sup>8</sup> Among 215 obstetric cases in New York City, 29 (87.9%) of 33 positive cases were asymptomatic,<sup>9</sup> whereas China's National Health Commission<sup>10</sup> recorded on April 1, 2020, that 130 (78%) of 166 positive cases were asymptomatic. Moreover, transmission before the onset of symptoms has been reported<sup>11–14</sup> and might have contributed to spread among residents of a nursing facility in Washington, USA.<sup>15</sup> Furthermore, evidence from modelled COVID-19 infectiousness profiles suggests that 44% of secondary cases were infected during the presymptomatic phase of illnesses from index cases,<sup>16</sup> whereas a study of COVID-19 cases in a homeless shelter

in Boston, MA, USA, implies that individual COVID-19 symptoms might be uncommon and proposed universal testing irrespective of symptomatic burden.<sup>17</sup> Substantial asymptomatic transmission might also mean that current estimates of the basic reproduction number,  $R_0$ , for COVID-19 are inaccurate.<sup>18</sup>

HCW testing could reduce in-hospital transmission. In a retrospective, single-centre study in Wuhan, 41% of 138 patients were thought to have acquired infection in hospital.<sup>19</sup> At the Royal Gwent Hospital in Newport, Wales, approximately half of the emergency room workforce have tested positive.<sup>20</sup> Blanket testing near Venice, Italy, helped to identify asymptomatic cases and might have helped eliminate SARS-CoV-2 in a village.<sup>21</sup> Moreover, asymptomatic and presymptomatic HCWs continue to commute to places of work where personal protective equipment (PPE) might be suboptimal. This disease spread could, in turn, propagate out of hospitals: during a period of lockdown asymptomatic COVID-19 carriage among hospital staff could conceivably act as a potent source of ongoing transmission.

Protecting the health of HCWs is paramount when staffing is limited. As well as by the provision of adequate PPE, the wellbeing of HCWs can be promoted by ensuring that infected colleagues are promptly tested and isolated. The scale of this problem is not yet fully understood, nor is the full potential for asymptomatic and presymptomatic HCWs to transmit infection to patients who do not have COVID-19, other HCWs, or the public. However, given that asymptomatic transmission has been documented, utmost caution is urged.<sup>11–14</sup>

Our own NHS Trust at University College London Hospitals, London, UK, will soon be testing asymptomatic HCWs. In partnership with the Francis Crick Institute in London, UK, where COVID-19 testing will



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be performed, this initiative is an attempt to further limit nosocomial transmission. It could also alleviate a critical source of anxiety for HCWs.<sup>22</sup> A healthy, COVID-19-free workforce that is not burned out will be an asset to the prolonged response to the COVID-19 crisis. As testing facilities increase in number and throughput in the coming weeks, testing should aim to accommodate weekly or fortnightly screening of HCWs working in high-risk areas.

There is a powerful case in support of mass testing of both symptomatic and asymptomatic HCWs to reduce the risk of nosocomial transmission. At the time of writing, the UK is capable of performing 18 000 tests per day,<sup>23</sup> with the Health Secretary targeting a capacity of 100 000 tests per day by the end of April, 2020. Initially, the focus of testing was patients, with NHS England stating only 15% of available testing would be used to test NHS staff.<sup>24</sup> Although this cap has been lifted, symptomatic HCWs, rather than asymptomatic HCWs, are currently prioritised in testing. This approach could mean that presymptomatic HCWs who are capable of transmitting the virus are not being tested; if they were tested and found to be COVID-19 positive, they could be advised to isolate and await the onset of symptoms or, if no symptoms develop, undergo repeat testing.

As countries seek to flatten the growth phase of COVID-19, we see a significant opportunity in expanding testing among HCWs; this will be critical when pursuing an exit strategy from strict lockdown measures that curb spread of the virus.

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- 1 WHO. Coronavirus disease (COVID-19) situation report – 84. April 13, 2020. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019> (accessed April 14, 2020).
- 2 Beeching NJ, Fletcher TE, Beadsworth MBJ. Covid-19: testing times. *BMJ* 2020; **369**: m1403.
- 3 Dunhill L. Intensive care staffing ratios dramatically diluted. March 24, 2020. <https://www.hsj.co.uk/exclusive-intensive-care-staffing-ratios-dramatically-diluted/7027214>. article (accessed April 14, 2020).
- 4 Gilroy R. Already stretched care homes 'must prepare to go beyond' for Covid-19. March 19, 2020. <https://www.nursingtimes.net/news/older-people/already-stretched-care-homes-must-prepare-to-go-beyond-for-covid-19-19-03-2020/> (accessed April 14, 2020).
- 5 Woodcock A. Coronavirus: fewer than one in 50 NHS frontline staff forced to stay at home have been tested. April 1, 2020. <https://www.independent.co.uk/news/uk/politics/coronavirus-nhs-staff-tests-stay-at-home-how-many-a9441251.html> (accessed April 14, 2020).
- 6 The Economist. What's gone wrong with covid-19 testing in Britain. April 4, 2020. <https://www.economist.com/britain/2020/04/04/whats-gone-wrong-with-covid-19-testing-in-britain> (accessed April 14, 2020).
- 7 Philip P, Marsh S-J. Testing of NHS staff and household members. April 12, 2020. <https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/C0295-Testing-of-NHS-staff-and-household-members-letter-12-April-2020.pdf> (accessed April 14, 2020).
- 8 Mizumoto K, Kagaya K, Zarebski A, Chowell G. Estimating the asymptomatic proportion of coronavirus disease 2019 (COVID-19) cases on board the Diamond Princess cruise ship, Yokohama, Japan, 2020. *Euro Surveill* 2020; **25**: pii=2000180.
- 9 Sutton D, Fuchs K, D'Alton M, Goffman D. Universal screening for SARS-CoV-2 in women admitted for delivery. *N Engl J Med* 2020; published online April 13. DOI:10.1056/NEJMc2009316.
- 10 Day M. Covid-19: four fifths of cases are asymptomatic, China figures indicate. *BMJ* 2020; **369**: m1375.
- 11 Bai Y, Yao L, Wei T, et al. Presumed asymptomatic carrier transmission of COVID-19. *JAMA* 2020; **323**: 1406–07.
- 12 Rothe C, Schunk M, Sothmann P, et al. Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. *N Engl J Med* 2020; **382**: 970–71.
- 13 Tong Z-D, Tang A, Li K-F, et al. Potential presymptomatic transmission of SARS-CoV-2, Zhejiang Province, China, 2020. *Emerg Infect Dis* 2020; published online May 17. DOI:10.3201/eid2605.200198.
- 14 Ye F, Xu S, Rong Z, et al. Delivery of infection from asymptomatic carriers of COVID-19 in a familial cluster. *Int J Infect Dis* 2020; published online April 2. DOI:10.1016/j.ijid.2020.03.042.
- 15 Kimball A, Hatfield KM, Arons M, et al. Asymptomatic and presymptomatic SARS-CoV-2 infections in residents of a long-term care skilled nursing facility—King County, Washington, March 2020. *MMWR* 2020; **69**: 377–81.
- 16 He X, Lau EHY, Wu P, et al. Temporal dynamics in viral shedding and transmissibility of COVID-19. *Nat Med* 2020; published online April 15. DOI:10.1038/s41591-020-0869-5.
- 17 Baggett TP, Keyes H, Sporn N, Gaeta JM. COVID-19 outbreak at a large homeless shelter in Boston: implications for universal testing. *MedRxiv* 2020; published online April 15. DOI:10.1101/2020.04.12.20059618 (preprint).
- 18 Aguilar JB, Faust JS, Westafer LM, Gutierrez JB. Investigating the impact of asymptomatic carriers on COVID-19 transmission. *medRxiv* 2020; published online March 31. DOI:10.1101/2020.03.18.20037994 (preprint).
- 19 Wang D, Hu B, Chang H, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA* 2020; **323**: 1061–69.
- 20 BBC. Coronavirus: 'half of A&E team' test positive. April 12, 2020. <https://www.bbc.co.uk/news/uk-wales-52263285> (accessed April 14, 2020).
- 21 Day M. Covid-19: identifying and isolating asymptomatic people helped eliminate virus in Italian village. *BMJ* 2020; **368**: m1165.
- 22 Shanafelt T, Ripp J, Trockel M. Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA* 2020; published online April 7. DOI:10.1001/jama.2020.5893.
- 23 James W. UK has conducted 18 000 coronavirus tests in 24 hours: PM's spokesman. April 13, 2020. <https://www.reuters.com/article/us-health-coronavirus-britain-tests/uk-has-conducted-18000-coronavirus-tests-in-24-hours-pms-spokesman-idUSKCN21V139> (accessed April 15, 2020).
- 24 Iacobucci G. Covid-19: hospitals can remove 15% cap on testing of NHS staff. *BMJ* 2020; **369**: m1339.