

## News Coronavirus

# F1 team finds way to let patients breathe easier

Kat Lay Health Correspondent

A non-invasive breathing aid that can help to keep coronavirus patients from requiring intensive care has been developed and approved in a few days.

The device, known as continuous positive airway pressure (CPAP), was created by a partnership between the Mercedes Formula One team, University College London (UCL) and University College London Hospital (UCLH).

They work by pushing a mix of oxygen and air into the mouth and nose at a continuous rate, thereby increasing the oxygen into the lungs. They bridge the gap between an oxygen mask and the need for full mechanical ventilation, during which the patient must be sedated. Using them early can help prevent a patient needing ICU treatment.

Professor Tim Baker, of UCL's department of mechanical engineering, said: "Given the urgent need, we are thankful that we were able to reduce a process that could take years down to a matter of days."

"We worked all hours of the day, disassembling and analysing an off-patent device. Using simulations we improved the device further to create a state-of-the-art version suited to mass production. We were privileged to be able to call on the capability of Formula One."

The device is the first reported success from "Project Pitlane", in which the seven F1 teams based in England have come together to use their engineering skills to battle coronavirus.

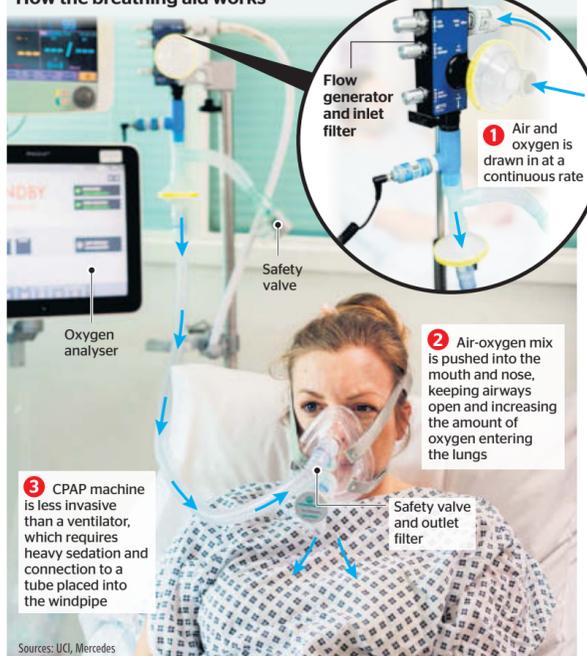
CPAP machines are used by the NHS to support patients with breathing difficulties but are said to be in short supply. They have been used extensively in foreign hospitals dealing with coronavirus outbreaks, and reports from Italy suggest that about half the patients given CPAP avoid the need for invasive mechanical ventilation.

The new design is an adapted and improved version, created via a process called reverse engineering.

The Medicines and Healthcare Products Regulatory Agency gave its approval to the device at the weekend. The first 100 machines are being delivered to UCLH for clinical trials. If they prove an asset they can be rapidly given to NHS hospitals across the country.

Some patients with Covid-19 develop inflammation in the lining of their lungs, and their alveoli, small buds re-

## How the breathing aid works



Sources: UCL, Mercedes

sponsible for transporting oxygen into the blood stream, collapse.

Experts from the Institute of Physics and Engineering in Medicine explained: "CPAP feels similar to breathing whilst having your head out the window of a moving car. The extra pressure helps to open up, and keep open, the collapsed alveoli and push oxygen across the inflamed lung membrane. Therefore, CPAP increases blood oxygen more than just giving oxygen using a conventional oxygen mask."

Professor Tim Cook, of the Royal United Hospital Bath NHS Trust, said that the machines could ease staffing concerns during the crisis.

He said: "If the patient can stay on a CPAP machine, they

JCB is making housings for Dyson-designed ventilators

UK spread 'shows early signs of slowing'

Chris Smyth, Bruno Waterfield

Britain's outbreak may be starting to slow with almost two million people infected, according to the scientist who informed the government's decision to impose a lockdown.

Professor Neil Ferguson of Imperial College London said he had seen NHS data that showed a slowing in new hospital admissions as social distancing measures imposed in recent weeks started to have an effect.

A separate antibody test that would tell people without symptoms if they had recovered from coronavirus would be available in "hopefully days rather than weeks" and would first be used in central London, the professor added.

It came as Belgian research hinted that the true number of people infected without realising it could be far higher than thought, with a study suggesting it could be 85 times greater than official estimates.

Last week doctors at the Free University of Brussels (UZ) hospital carried out lung scans on all patients who were admitted for non-coronavirus related radiology — about 50 each day — and discovered that 8 per cent showed signs of being infected by the virus without realising it.

CT scans of the lungs of people who have had coronavirus show lesions even with those who did not show any symptoms, such as fever, a persistent cough or having trouble breathing.

can stay on a ward looked after by specialised nurses rather than ICU nurses. A ward can probably look after ten of these patients with two nurses and one doctor. Ten patients in ICU may need five or ten nurses and three to four doctors. The cost and manpower needed in ICU is much, much greater, and ICU is a lot more complex and hazardous."

Professor David Lomas, vice-provost for health at UCL, said: "This has the potential to save many lives and allow our frontline NHS staff to keep patients off ventilators. It shows what can be done when universities, industry and hospitals join forces."

Andy Cowell, managing director of Mercedes AMG High Performance Powertrains, said: "The Formula One community has shown an impressive response to the call for support, coming together in the 'Project Pitlane' collective to support the national need."

JCB said yesterday that it was reopening a factory that had closed due to coronavirus to make the housings for Dyson-designed ventilators, should they get regulatory approval.



A soldier helps to prepare the temporary NHS Nightingale Hospital in east London

## One vaccine could last a long time

Rhys Blakely Science Correspondent

The genetic code of the virus that causes Covid-19 is remaining stable, raising hopes that a single vaccine could give long-term protection, scientists have said.

While at least 50 teams of researchers around the world are racing to develop potential vaccines, others are tracking the rate at which it is mutating. All viruses evolve over time, accumulating errors to their genetic code as

they make copies of themselves inside the cells of their infected host. These errors can create new strains that are more or less dangerous.

However, the Covid-19 virus has a type of "proofreading" mechanism built in, which limits the mistakes introduced to its genetic code.

The changes recorded so far are minor, researchers say, and the pace of mutation is relatively slow, suggesting that one vaccination could confer long-lasting protection.

Stanley Perlman, a professor for the department of microbiology at the University of Iowa, said: "The idea is that if the virus is not mutating to a significant extent, it will not easily evade the immune response after vaccination."

This would make Covid-19 different to seasonal influenza, which mutates more rapidly, meaning that a new vaccine must be developed each year in ad-

vance of the flu season. Ian Jones, professor of virology at the University of Reading, said: "At the moment the variation seen in the virus doesn't seem to be heading in any one direction or another."

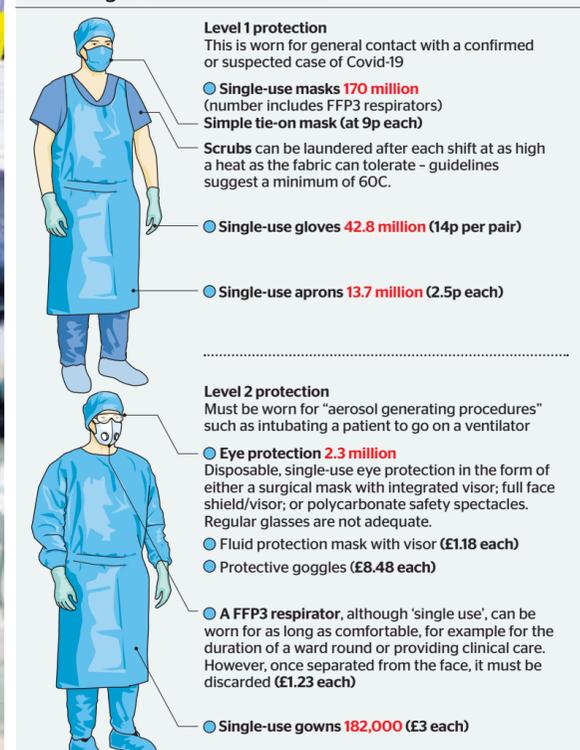
"That could change as immunity develops as this then provides an evolutionary force that the virus might try and evade, but this will take some time and is a concern for much later. All other human coronaviruses also do not vary year to year."

The coronavirus group are the biggest viruses that use a molecule called RNA to carry their genetic code. If a drug or vaccine is used, mutant virus particles that have some sort of resistance will have an advantage.

Researchers at Oxford University are planning a safety trial on humans of what is expected to be the UK's first coronavirus vaccine next month.



## Procuring PPE: numbers and costs



## Retired neurosurgeon: 'I felt a moral duty to volunteer'

Ben Ellery

Retired doctors have spoken of the "moral duty" they felt to come back.

Richard Kerr, 64, a consultant neurosurgeon and council member of the Royal College of Surgeons of England, retired from working at the John Radcliffe Hospital in Oxford last year.

"I felt I couldn't stay away while my colleagues in the NHS are engaged in this tremendous battle," he said. "I felt a moral duty to volunteer to return. I expect to start off supporting my colleagues and in particular junior doctors with the many clinical decisions they'll

have to make during this period, not least about admissions and discharges. But if colleagues fall ill I expect that I may be back in patient-facing roles. I'm nervous about being in a relatively at-risk group myself. I will be looking for that personal protective equipment that's being so much about."

Anjalee Perera, 31, from near Hemel Hempstead, retired in 2017 after growing disillusioned with the NHS. She has concerns for her safety as she has an 18-month-old daughter but said: "I took an oath to protect the sanctity of human life and that's incredibly important." She was automatically reinstated.

## Shortage of masks and gowns foreseen over a decade ago

Kat Lay Health Correspondent  
Lucy Fisher Defence Editor

Nurses have complained that they are being forced to wear protective equipment that is not suitable or to go without entirely, as shortages prompted a desperate procurement chief to tweet: "God help us all."

A quarter of doctors are now reported to be sick or in isolation, and ambulance services have thousands of staff absent, a union warned, branding the situation a "national crisis".

Despite assurances from the government that personal protective equipment (PPE) was a priority and being pushed out to hospitals as fast as possible, frontline staff continue to report shortages.

The Cabinet Office first revealed that a pandemic would lead to a "pinch point" in the availability of PPE for doctors more than a decade ago.

Simulations of flu-like pandemics were carried out by trusts in 2007-08 to help them plan for the possibility of new outbreaks across the country. Health service resilience chiefs were instructed by the Cabinet Office to factor access issues with protective kit in to their planning assumptions.

Russell King, a resilience manager in the NHS at the time, said: "The Cabinet Office had identified the availability and distribution of PPE as a pinch point in a pandemic... It was already part of the national assumption."

The fact that PPE availability issues were previously predicted is likely to raise questions over why more robust contingency plans were not put in place.

The Health Care Supply Association (HCSA), yesterday asked officials why

## Don't use CPR — it's too risky, health staff told

Charlotte Wace, Kat Lay, Sean O'Neill

A mental health trust instructed staff not to expose themselves to coronavirus by resuscitating patients due to shortages of protective equipment.

Frontline workers at the Tees, Esk and Wear Valleys NHS Foundation Trust, in Co Durham, were told not to use CPR in an emergency, even when advised by ambulance control.

An email sent to staff last week explained that enhanced personal protective equipment (PPE), including gloves, long-sleeved gowns, eye protection and face masks, was "not available". Staff were also told "not to administer rescue breaths, use a manual resuscitator or create an airway or intubate the patient under any circumstances, due to the ongoing coronavirus pandemic".

Minh Alexander, a former consultant psychiatrist and NHS whistleblower, questioned why supplies of protective equipment had not been secured earlier.

She said: "To be fair to the NHS, there is a worldwide shortage of these materials. It doesn't seem to me that there was a lot of activity until very recently in response to a mounting crisis instead of identifying that it was inevitable at a much earlier stage."

The trust said yesterday that they had now "received delivery of all the necessary PPE." Ahmad Khouja, medical di-

rector at the trust, said: "We are committed to doing everything we can to protect the patients in our care and our staff. Fortunately cardiac and respiratory arrests are a rare event in mental health hospitals. Our staff are trained in how to respond effectively and can perform resuscitation on patients — and will continue to do this."

He added that the trust has been "following national guidance" which "continues to be updated".

Hospital chiefs are also planning for shortages of both invasive and non-invasive ventilators despite promises from ministers and NHS chiefs that thousands of machines are on the way.

Heads of hospital trusts say orders do not equate to machines on the front line. One trust was expecting a shipment from India that has been caught in Delhi's ban on exports of medical equipment.

The care watchdog warned yesterday that decisions on whether to attempt resuscitation must be made on an individual basis. In a joint statement, the Care Quality Commission, British Medical Association, Care Provider Alliance and Royal College of General Practitioners said: "The importance of having a personalised care plan in place, especially for older people, people who are frail or have other serious conditions has never been more important."

protective gowns were not included in the national pandemic stockpile. The association represents procurement and supply professionals within the healthcare sector. Alan Hoskins, its chief officer, wrote in a tweet, which has since been deleted: "What a day no gowns @NHSSupplyChain rang every number escalated to [NHS England] just got message back no stock can't help can send you a ppe pack losing the will to live god help us all."

Gowns should be worn when staff perform "aerosol generating procedures", such as intubating a patient, according to Public Health England guidance that has been criticised as too lax. The World Health Organisation advises gowns when providing any care.

The Laura Hyde Foundation, a nursing charity, said it had been "bombarded" with messages from staff complaining that they either did not have PPE or that what they had was ill-fitting.

Dame Donna Kinnair, chief executive and general secretary of the Royal College of Nursing, said: "I am hearing from nurses who are treating patients in Covid-19 wards without any protection at all. This cannot continue."

Professor Andrew Goddard, president of the Royal College of Physicians, told the Press Association that about 25 per cent of the doctor workforce was off, either with coronavirus or because a family member or housemate was ill.

The GMB union said there were 4,100 ambulance workers in self-isolation across just eight trusts. It said many reported having no access to PPE even when being sent to suspected Covid-19 cases.

An NHS Supply Chain spokeswoman said gowns would be delivered to trusts last night and today, with more stock on order.