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## New analysis recommends less reliance on ventilators to treat coronavirus patients

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By using ventilators more sparingly on Covid-19 patients, physicians could reduce the more-than-50% death rate for those put on the machines, according to an [analysis](#)<sup>4</sup> published Tuesday in the American Journal of Tropical Medicine and Hygiene.

The authors argue that physicians need a new playbook for when to use ventilators for Covid-19 patients — a message consistent with new treatment guidelines issued Tuesday by the National Institutes of Health, which advocates a

phased approach to breathing support that would defer the use of ventilators if possible.

As the pandemic has flooded hospitals with a disease that physicians had never before seen, health care workers have had to figure out treatment protocols on the fly. Starting this month, a few physicians have [voiced concern](#)<sup>5</sup> that some hospitals have been too quick to put Covid-19 patients on mechanical ventilators, that elderly patients in particular may have been harmed more than helped, and that less invasive breathing support, including simple oxygen-delivering nose prongs, might be safer and more effective.

The new analysis, from an international team of physician-researchers, supports what had until now been mainly two hunches: that some of the Covid-19 patients put on ventilators didn't need to be, and that unusual features of the disease can make mechanical ventilation harmful to the lungs.

“This is one of the first coherent, comprehensive, and reasonably clear discussions of the pathophysiology of Covid-19 in the lungs that I've seen,” said palliative care physician Muriel Gillick of Harvard Medical School, who was one of the first to ask if ventilators were harming some Covid-19 patients, especially elderly ones. “There is mounting evidence that lots of patients are tolerating fairly extreme” low levels of oxygen in the blood, suggesting that such hypoxemia should not be equated with the need for a ventilator.

If a Covid-19 patient is clearly struggling to breathe, then invasive ventilation makes sense, wrote Marcus Schultz of Amsterdam University Medical Centers and his colleagues.

But using low levels of blood oxygen (hypoxemia) as a sign that a patient needs mechanical ventilation can lead physicians astray, they argue, because low blood oxygen in a Covid-19 patient is not like low blood oxygen in other patients with, for instance, other forms of pneumonia or sepsis.

The latter typically gasp for breath and can barely speak, but many Covid-19 patients with oxygen levels in the 80s (the high 90s are normal) and even lower

are able to speak full sentences without getting winded and in general show no other signs of respiratory distress, as their hypoxemia would predict.

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“In our personal experience, hypoxemia ... is often remarkably well tolerated by Covid-19 patients,” the researchers wrote, in particular by those under 60. “The trigger for intubation should, within certain limits, probably not be based on hypoxemia but more on respiratory distress and fatigue.”

Absent clear distress, they say, blood oxygen levels of coronavirus patients don't need to be raised above 88%, a much lower goal than in other causes of pneumonia.

Without effective drugs, surviving severe Covid-19 depends on supportive care, including breathing support where necessary. But recommendations for that care are largely based on guidelines for other viral pneumonias and sepsis. That explains the second reason ventilators aren't helping more patients: Covid-19 affects the lungs differently than other causes of severe pneumonia or acute respiratory distress syndrome, the researchers point out, confirming what physicians around the world are starting to realize.

For one thing, the thick mucus-like coating on the lungs developed by many Covid-19 patients impedes the lungs from taking up the delivered oxygen.

For another, unlike in other pneumonias the areas of lung damage in Covid-19 can sit right next to healthy tissue, which is elastic. Forcing oxygen-enriched air (in some cases, 100% oxygen) into elastic tissue at high pressure and in large volumes can cause leaks, pulmonary edema (swelling), and inflammation, among other damage, contributing to “ventilator-induced injury and increased mortality” in Covid-19, the researchers wrote.

“Invasive ventilation can be lifesaving, but can also damage the lung,” Schultz told STAT.

It’s important to highlight “aspects of Covid-19 that differ from other diseases that require respiratory support,” said Phil Rosenthal of the University of California, San Francisco, editor of the journal. Patients with Covid-19 pneumonia are often less breathless “compared to other patients with similar [blood oxygen] levels,” he said, adding that this difference “may allow physicians to avoid intubation/ventilator support in some patients.”

There is a growing recognition that some Covid-19 patients, even those with severe disease as shown by the extent of lung infection, can be safely treated with simple nose prongs or face masks that deliver oxygen. The latter include [CPAP](#)<sup>6</sup> (continuous positive airway pressure) masks used for sleep apnea, or BiPAP (bi-phasic positive airway pressure) masks used for congestive heart failure and other serious conditions. CPAP can also be delivered via hoods or helmets, reducing the risk that patients will expel large quantities of virus into the air and endanger health care workers.

Earlier this month, the Mount Sinai Health System in New York [developed](#)<sup>9</sup> a protocol to repurpose sleep apnea machines for Covid-19 patients, while in Rhode Island, the Department of Public Health, University of Rhode Island, and others are collecting the devices for hospitals to use instead of ventilators where possible.

“We use CPAP a lot, and it works well, especially in combination with having patients lie prone,” Schultz said.

The Covid-19 treatment [guidelines](#)<sup>10</sup> released by the NIH do not specifically address what criteria physicians should use for putting patients on a ventilator. But in a recognition of the damage that the ventilators can do, they recommend a phased approach to breathing support: oxygen delivered by simple nose prongs, escalating if necessary to one of the positive-pressure devices, and intubation only if the patient’s respiratory status deteriorates. If mechanical ventilation becomes

necessary, the NIH said, it should be used to deliver only low volumes of oxygen, reflecting the risk of damaging healthy lung tissue.

“Patients can tolerate low oxygen levels in the blood often remarkably well,” Schultz said. “They do not need to be intubated [unless levels are] getting too extremely low for too long.” Some patients “were asked to get off their cell phone because they had to be intubated,” he added. “That is not necessary, and we frequently decided not to intubate.”

*This story has been updated with additional comments from outside experts.*

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