



# The “piecework anesthetists” solution to the lack of ventilators during the COVID-19 pandemic

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Received: 17 April 2020 / Accepted: 17 April 2020 / Published online: 24 April 2020  
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## To the Editor,

We are told that we are now facing a critical lack of ventilators to treat all patients that will require assisted ventilation during the coronavirus disease (COVID-19) pandemic. Despite all intentions and efforts to build enough ventilators to face these needs, it will likely be impossible to produce enough units to meet the demand of the next few weeks if not months.

Now is the time to find an “out of the box” and pragmatic solution to get over this crisis and the shortcomings of the healthcare system and shortages of therapeutic equipment. The solution proposed herewith is based on lessons provided by the history of anesthesia. While we see many comparisons of the current COVID-19 pandemic with the 1918 Spanish flu pandemic, I believe that the lessons learned from the 1952 polio pandemic are even more appropriate to help us in the current crisis.

## History

In 1952, Denmark was hit by a severe polio epidemic. A huge number of cases ( $n = 5,722$ ) were registered in the country, and 2,450 patients were faced with life-threatening respiratory paralysis.<sup>1</sup> In the first four months of the epidemic, the Belgrams Hospital of Copenhagen had to treat three times as many patients with respiratory failure than it had in the previous ten years. The Danish healthcare system was overwhelmed. In the first six weeks of the epidemic, 27 of 31 patients with respiratory insufficiency

died. That crisis is reminiscent of the current COVID-19 concerns in our hospitals today.

At the beginning of the polio epidemic in Denmark, treatment consisted of oxygen administered after tracheostomy and the occasional use of “iron lungs”—also known as cuirass respirators based on the shell-like closure around the thorax—with little reduction in mortality.

Similar to today, the lack of proper ventilation equipment and other related systems placed “the doctors in the intolerable situation...of having to choose which patients to treat and which not to treat.”<sup>2</sup>

During the polio epidemic, Dr. Björn Ibsen was consulted by the department of anesthesia of the Belgrams Hospital in Copenhagen.<sup>1</sup> He was asked to find a pragmatic solution to the dire situation of the Copenhagen hospital “as we were forced to seek new ways of ventilating our patients, the need for improvisation became imperative”.<sup>3</sup> Ibsen was then aware that for polio patients in respiratory failure, the mortality rate had been reduced from 80% to 20% through the early use of artificial ventilation with “tank ventilators”.<sup>4</sup> Also similar to today, there were not enough tank ventilators available to meet the growing needs. Improvisation and pragmatism became the only way out of the nightmare.

After attending to a child that had been left to die by his colleagues, just as so many others had not been able to be saved, the successful treatment method that he designed for that child was henceforth instituted for all patients with similar medical conditions.<sup>1</sup> Patients with respiratory insufficiency were tracheostomized, and continuously *manually* ventilated with supplemental oxygen by an attendant caretaker.

Within three days of his pragmatic treatment, three new 35-bed wards were opened in the hospital.<sup>1</sup> This created a

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new problem that also had to be solved pragmatically. A large number of patients admitted to these wards met the criteria of Dr. Ibsen to be treated with tracheostomies and manual ventilation by an attendant. The non-availability of enough medical staff to manually ventilate all those patients became the new challenge. Ibsen convinced the authorities to recruit all the medical students of Denmark and have them come to the rescue. These newly appointed care givers received a brief introduction in the method of manual ventilation. They then sat for six-hour shifts at the bedside of the patients to ventilate them and suction their lungs when needed. Over 250 medical students and 260 nurses were enrolled to provide this care to those patients.<sup>1</sup> At the height of the epidemic, 75 patients were manually ventilated. The mortality from respiratory failure in polio patients was thus reduced from 90% to 15%. Dr. Ibsen referred to these healthcare workers as “piecework anesthetists”.<sup>1</sup>

### Recommendations

The cruel reality is that it may very well be impossible to produce enough ventilators to meet the demands in the next few weeks to months. Just as in 1953, doctors would then be “in the intolerable situation...of having to choose which patients to treat and which not to treat”.<sup>2</sup>

A pragmatic solution learned from the lessons of the polio epidemic of 1953 in Denmark is available. We need “piecework living ventilators”. If, as some epidemiologists believe, individuals exposed to COVID-19 are “vaccinated” against a subsequent infection by the virus, there will be soon an army of volunteers protected against COVID-19 re-infection that could be rapidly trained to ventilate patients manually. It is relatively easy to learn how to manually ventilate an intubated patient. Even though the quality of their ventilation may not be perfect, it would be 100% better than no ventilation. Fortunately, it appears that the younger generation is being relatively spared from the most severe effects of COVID-19. There will soon be enough volunteers to fill two-hour shifts for

ventilating patients when and/or where ventilators are not available. The risks of re-infection for those with demonstrated antibodies against COVID-19 will need to be evaluated and they will still need appropriate personal protective equipment.

We must all work together to find a pragmatic short-term solution to the crisis until an effective treatment is found, or a vaccine is developed. But we must go to war against COVID-19 just as generals go to war—i.e., not with what we would like to have in our war chest, but with what we have at our disposal. We may not have enough ventilators at our disposal in the coming weeks and months, but we may very well have an army of volunteers who have recovered and are immunized against COVID-19. If so, they could help save lives with minimal risks to their own health.

**Disclosures** None.

**Funding statement** None.

**Editorial responsibility** This submission was handled by Dr. Hilary P. Grocott, Editor-in-Chief, *Canadian Journal of Anesthesia*.

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