

26 August as 'Bjørn Ibsen day'

The day Ibsen proposed using positive-pressure ventilation to save lives. Most people have no idea what they owe to this remarkable doctor and his colleagues in Copenhagen.

The COVID-19 pandemic will generate many more patients over a longer time horizon and differ from the 1953 polio epidemic in many ways besides. Still, Ibsen's example is inspiring. Few at that Copenhagen hospital could have known at the time that their deeds would echo down through the decades as their collective success inspired imitators and advances that transformed medicine. May any of us put in a position to serve similarly in this pandemic succeed as admirably.



Bjørn Aage Ibsen (August 30, 1915 – August 7, 2007) was a Danish anesthetist and founder of intensive-care medicine. He graduated in 1940 from medical school at the University of Copenhagen and trained in anesthesiology from 1949 to 1950 at the Massachusetts General Hospital, Boston. He became involved in the 1952 poliomyelitis outbreak in Denmark, where 2722 patients developed the illness in a 6-month period with 316 suffering respiratory or airway paralysis.

Treatment had involved the use of the few negative pressure ventilators available, but these devices, while helpful, were limited and did not protect against aspiration of secretions. After detecting high levels of CO₂ in blood samples and inside a little boy's lung, Ibsen changed management directly. He instituted protracted positive pressure ventilation by means of intubation into the trachea, and enlisting 200 medical students to manually pump oxygen and air into the patients lungs. In this fashion, mortality declined from 90% to around 25%. Patients were managed in 3 special 35 bed areas, which aided charting and other management.

In 1953, Ibsen set up what became the world's first Medical/Surgical ICU in a converted student nurse classroom in Kommunehospitalet (The Municipal Hospital) in Copenhagen, and provided one of the first accounts of the management of tetanus with muscle relaxants and controlled ventilation. In 1954 Ibsen was elected Head of the Department of Anesthesiology at that institution. He jointly authored the first known account of ICU management principles in *Nordisk Medicin*, September 18, 1958: 'Arbejdet på en Anæsthesiologisk Observationsafdeling' ('The Work in an Anaesthesiologic Observation Unit') with Tone Dahl Kvittingen from Norway

The following is a joint summary of the following 2 articles:

**The Doctor Who Had to Innovate or Else
An anesthesiologist's exemplary performance
during a bygone epidemic
is an inspiration.**

MARCH 18, 2020 – by Conor Friedersdorf, Staff writer at *The Atlantic*

The outbreak that invented intensive care

WORLD VIEW - 03 APRIL 2020

A heroic community effort at a daring hospital saved lives, led to today's ventilators and revolutionized medicine — it holds lessons for our times.

The number of hospital admissions was more than the staff had ever seen. And people kept coming. Dozens each day. They were dying of respiratory failure. Doctors and nurses stood by, unable to help without sufficient equipment.

It was the polio epidemic of **August 1952, at Blegdam Hospital in Copenhagen**. This little-known event marked the start of **intensive-care medicine and the use of mechanical ventilation** outside the operating theatre — the very care that is at the heart of abating the COVID-19 crisis.

In 1952, the iron lung was the main way to treat the paralysis that stopped some people with poliovirus from breathing. Copenhagen was an epicentre of one of the worst polio epidemics that the world had ever seen. The hospital admitted 50 infected people daily, and each day, 6–12 of them developed respiratory failure. The whole city had just one iron lung. In the first few weeks of the epidemic, 87% of those with bulbar or bulbospinal polio, in which the virus attacks the brainstem or nerves that control breathing, died. Around half were children.



Medical students manually ventilate children with polio at Blegdams Hospital in Copenhagen in 1953.
Credit: Medical Museion, Univ. Copenhagen

Desperate for a solution, the chief physician of Blegdam called a meeting. Asked to attend: Bjørn Ibsen, an anesthesiologist had a radical idea. It changed the course of modern medicine.

Ibsen hypothesized that insufficient oxygen and a buildup of carbon dioxide was killing patients. Ibsen's idea was to blow air directly into the lungs to make them expand, and then allow the body to passively relax and exhale. He proposed the use of a tracheostomy: an incision in the neck, through which a tube goes into the windpipe and delivers oxygen to the lungs, and the application of positive-pressure ventilation. At the time, this was often done briefly during surgery, but had rarely been used in a hospital ward.

Ibsen was given permission to try the technique the next day. We even know the name of his first patient: Vivi Ebert, a 12-year-old girl on the brink of death from paralytic polio. Ibsen demonstrated that it worked. The tracheostomy protected her lungs from aspiration, and by squeezing a bag attached to the tube, Ibsen kept her alive. Ebert went on to survive until 1971.

The plan was hatched to use this technique on all the patients in Blegdam who needed help to breathe. The only problem? **There were no ventilators.**

Very early versions of positive-pressure ventilators had been around from about 1900, used for surgery and by rescuers during mining accidents. But modern ventilators, to support a person for hours or days, had yet to be invented.

What followed was one of the most remarkable episodes in health-care history: in six-hour shifts, medical and dental students from the University of Copenhagen sat at the bedside of every person with paralysis and ventilated them by hand. The students squeezed a bag connected to the tracheostomy tube, forcing air into the lungs. They were instructed in how many breaths to administer each minute and sat there hour after hour. This went on for weeks, and then months, with hundreds of students rotating on and off. By mid-September, the mortality for patients with polio who had respiratory failure had dropped to 31%. Ibsen recognized that inadequate ventilation caused carbon dioxide to build up in the blood, making it very acidic — which caused organs to shut down.

Three further lessons are central today. First, Blegdam demonstrated what can be achieved by a medical community coming together, with remarkable focus and stamina. Second, it proved that keeping people alive for weeks, and months, with positive-pressure ventilation was feasible. And third, it showed that by bringing together all the patients struggling to breathe, it was easier to care for them in one place where the doctors and nurses had expertise in respiratory failure and mechanical ventilation.

So, the concept of **an intensive-care unit (ICU)** was born. After the first one was set up in Copenhagen the following year, ICUs proliferated. And the use of positive pressure, with ventilators instead of students, became the norm.

In the early years, many of the safety features of modern ventilators did not exist. Doctors who worked in the 1950s and 1960s describe caring for patients without any alarms; if the ventilator accidentally disconnected and the nurse's back was turned, the person would die. Early ventilators forced people to breathe at a set rate, but modern ones sense when a patient wants to breathe, and then help provide a push of air into the lungs in time with the body. The original apparatus also gathered limited information on how stiff or compliant the lungs were and gave everyone a set amount of air with each breath; modern machines take many measurements of the lungs, and allow for choices regarding how much air to give with each breath. All of these are refinements of the original ventilators, which were essentially automatic bellows and tubing.

Some anesthetists and intensive-care doctors, mark **26 August as 'Bjørn Ibsen day'** — the day Ibsen proposed using positive-pressure ventilation to save lives. Most people have no idea what they owe to this remarkable doctor and his colleagues in Copenhagen.

We owe so much to this exceptional doctor - Bjørn Aage Ibsen