

Non-invasive Ventilation and the VM-2000: Improving the Versatility of an
Affordable, Easy-to-Use Emergency Ventilator
(Technical Report)

The Struggle Over Medical Bias in the United States
(STS Research Paper)

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Preface

How is a patient's access to healthcare resources determined?

In the US, demand for ventilators rose 32 percent during the COVID-19 pandemic. The research team developed a noninvasive mask for the Ventis 2000 ventilator, contributing to a larger effort to develop a cost-effective, accessible, portable, noninvasive ventilator for Emergency Medical Services (EMS) and other medical professionals. The mask must comfortably fit over the nose and mouth, remain sealed on the face while providing the patient with sufficient respiratory pressure, and recognize when the patient takes a breath. Through human subject testing we experimentally evaluated a prototype. We also applied finite element analysis in CAD. FDA-approved masks were tested on diverse study subjects to assess fit and air leakage. A neck brace was designed for the patient and the algorithm was adjusted to be compatible with a noninvasive method.

Successful healthcare depends not only on state-of-the-art care, but also on inclusive access to affordable care. Sociotechnical innovation can contribute to these ends. Biases pervade the US healthcare system, compromising care equity, quality, and access.

This struggle can be alleviated by public awareness to these biases in medicine. Health professionals, medical societies, insurance companies and health justice advocacies generally agree that biases disadvantage some groups in the US healthcare system. The responses, however, are divided. Mainstream health institutions typically favor incremental change, invoking scientific objectivity as the road to unbiased care. To social justice advocates and their allies, however, institutional science is in itself part of the problem. They demand for fundamental, structural reforms to redress dangerous biases in healthcare.