**BreathFirst**

**A novel approach providing consistent, safe, rapid intubations**

## OPPORTUNITY HIGHLIGHTS

- Intubation fails in 25-50% of patients in a pre-hospital setting
- Failure to manage the airway is the 3rd largest cause of preventable death on the battlefield
- Vine Devices is set to disrupt the global airway device market which is set to hit almost $5 B by 2026
- Our device works safely and consistently with minimal training required and no anatomic visualization

**Location:** Princeton, NJ

**www.wardenchem.com/vine**

**Founded:** 2019

**Investment Opportunity:**
$3,000,000 (2 tranches)

**Use of Proceeds:**

Development of final design with improved efficiency and enhanced user experience. Industrial design for FDA process, validation, and production. Filing of final patent(s) for both U.S. and internationally (U.S. provisional patent filed). FDA submission/approval and BARDA/DOD collaboration. Development of manufacturing, distribution plans and partnerships. Initial brand and product marketing

**Inventor and Scientific Consultants:**

**David Drover, MD**. A medical doctor and Professor of Anesthesiology, Perioperative and Pain Medicine at the Stanford University Medical Center. Dr. Drover earned his M.D. as well a B.S. and M.S in clinical chemistry from Dalhousie University.

**Elliot Hawkes, PhD**. A professor of Mechanical Engineering at the University of California Santa Barbara. Dr. Hawkes is the co-inventor of the underlying vine robot technology. He earned his A.B. in Mechanical Engineering from Harvard and his Ph.D. from Stanford Univ.

# BreathFirst
# Self-Guided Endo Tracheal Intubation Device
# A novel approach providing consistent, safe, rapid intubations

**Vine Devices, Inc**. is commercializing a new, disruptive, endotracheal intubation technology developed and tested at Stanford University Medical School.

**Problem - Failed Intubation**

*Boston Globe – 12/3/2019 – "In the summer of 2018, Dr. Nick Asselin was doing research on cardiac arrests in Rhode Island when he made a horrifying discovery. Hospital records showed patients had been arriving by ambulance with misplaced breathing tubes, sending air into their stomachs instead of their lungs, essentially suffocating them. . At first, he said, there were four cases, then seven. More trickled in. By the time Asselin presented his findings to a state panel in mid-March, he had identified 11 patients with so-called esophageal intubations that had gone unrecognized by EMS providers over the previous 2 ½ years. All 11 had died."*

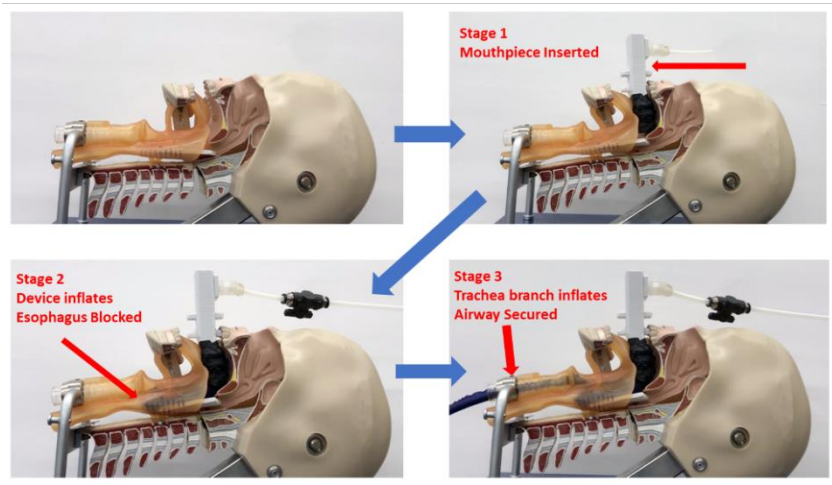
Intubation is the process of inserting a tube, called an endotracheal tube (ET), through the mouth and then into the airway. Failed intubation can result in loss of air to the lungs, and/or soft tissue damage or injury. Further, delays in establishing airways in an emergency can result in death. This procedure requires both extensive training and experience and anatomic visualization.

- Approximately 50 million intubation procedures are performed globally each year
- First pass intubation failure rates range from 3-10% for Anesthesiologists in the OR to 25-50% in pre-hospital emergency settings

**Solution – Vine's Self-Guided Intubation Device**

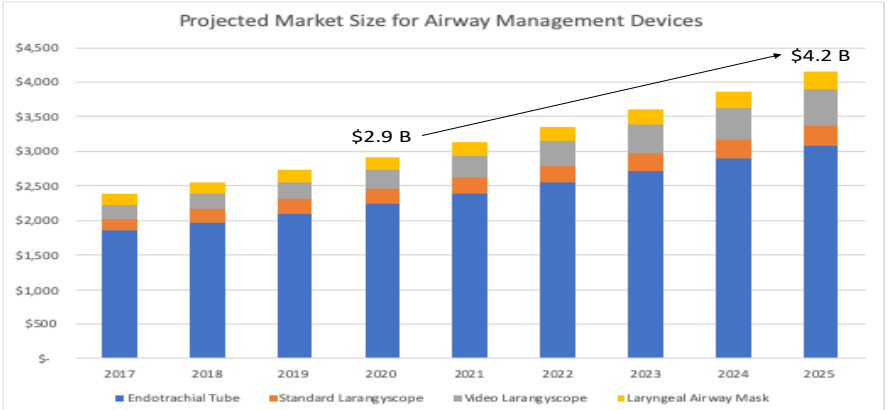
BreathFirst is designed to eliminate any need for anatomic visualization while dramatically reducing the level of experience and competence needed to successfully intubate patients on the first pass. Intubation is required in emergency response and on the battlefield to maintain oxygen to the lungs. In the hospital a patient will be placed on a ventilator to assist with breathing during anesthesia, sedation, or severe illness.

Consisting of a simple mouthpiece and a soft pre-packaged deployment tube, the device is elegantly simple. There are no electronic or mechanical parts involved, greatly reducing the risk of failure. The device uses compressed $CO_2$ to deploy. BreathFirst device is a far safer, far more effective means of endotracheal intubation than existing technologies.




***Video available on https://www.wardenchem.com/vine***

**Global Airway Management Device Market Set to Grow to $4.2 Billion**



**Vine Device Management:**

**Stephen Forden - CEO**
Has over 25 years of experience in the medical devices industry where he has led successful product development, product introduction and sales and marketing campaigns in major companies like Johnson & Johnson, Zimmer and ConvaTec as well as several early-stage companies. With experience in surgical instruments, implantable devices, wound healing, and other technologies, has worked with inventors, designers, manufacturers, sales/marketing teams and other key stakeholders to successfully bring medical devices to market.

**Rajesh Shukla – Chief Operating Officer**
Rajesh is a performance-driven R&D leader managing innovation in entrepreneurial and established companies. Device, drug and drug/device combination R&D expertise from discovery through post-regulatory approval product support including design, clinical trials, registration and product life cycle management. Extensive regulatory experience with 29 successful FDA submissions and has successfully worked with both BARDA and DOD in securing major financial commitments for both drug and device products.

**George Boyajian – Chairman**
A senior technology executive and entrepreneur with decades of experience, George specializes in technology commercialization, business development, licensing, strategic partnerships, and government relations. George has launched several ventures, including a genetic engineering company that produced the first commercial transgenic tree and two medical device companies, one of which was acquired by GE.

**David Schmidt – CFO**
Schmidt is a finance and corporate development executive leader who has successfully built several chemical, medical device, polymer, semiconductor, flat panel display, and renewable energy companies. He served as VP Finance and Operations for an invasive medical device business. He has directed finance, sales & marketing, manufacturing, and technical organizations, and has served as Corporate Officer and on Board of Director. Schmidt obtained his BS degree from Lehigh University.

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**Market Segmentation and Development**

There are three distinct market segments for use of this device based on the environment and conditions of use (Operating Room, Pre-Hospital, and Battlefield). Of these three segments, only the operating room environment is being properly served with currently available technology. There are still numerous benefits for use of the device in the OR such as reduced risk of injury and it is anticipated that we will be able to penetrate this segment. However, there is significant white space in the pre-hospital and battlefield segments for deep and rapid penetration initially while developing a clinical and scientific base within the hospital environment to facilitate increased utilization within the surgical segment of the market

Operating Room

Pre-Hospital


Battlefield

**Product Development and Go to Market Timeline**

2019 | 2020 | 2021 | 2022

Ideation
Stanford Professor, Dr. David Drover, partners with UCSB engineers to solve problem of intubation failures using soft robotic technology and pneumatic eversion

IP
Provisional Device Patent Filed - August 2019

Proof of Concept
Prototype successfully tested in both, anatomic models and the Stanford Medical School Cadaver Lab

Product
- Begin industrial design process with proven medical device design group

Regulatory
- FDA Designation Meeting
- Breakthrough Device Status Recognition
- Sprint Interface Review Process

BARDA/DOD
- Technical Meeting presentation

Product
- Finalize product design and material selection
- Identify manufacturing partner(s)

Regulatory
- Finalize FDA clearance pathway
- Prepare FDA File for submission
- Pre-market clinical trial

Product
- Test production run with finalized design
- Complete engineering, design and production Validation (DVT) for FDA Submission

Regulatory
- FDA Submission / Clearance
- CE Mark file preparation

Go to Market
- Q4/22 – Q1/23

2021 Expenses – $1.3m  2022 Expenses – $1.3m

**Medical Device Industry Comparable M&A**

- 2015 - Medtronic acquires Aircraft Medical for $110 million cash-only deal. (Video Laryngoscope)
- 2019 – Boston Scientific acquires Millipede for $350 million (pre-FDA approval)
- 2018 – Edwards Lifesciences acquires Harpoon (Univ of Maryland spin-out) for $100 million
- 2015 - Medtronic acquires Medina Medical for $150 million (prior to U.S. FDA Approval)