



# breath e a s y

by ELIZABETH KUMRU

*Dr. Ben Boedeker and his new devices make intubation so easy, even a seventh-grader can do it with 10 minutes of training.*

He has developed a variety of other devices to assist with intubation, including a novel video stylet, a video bougie – a thin cylinder of rubber used to widen a passageway or guide another instrument into a passageway – and the telemetry concept for the devices.

With these tools, non-medical professionals can be trained within 10 minutes to successfully intubate, using an anatomically correct intubation mannequin. The process is simplified to the point that Dr. Boedeker's seventh-grader taught his classmates successful intubation.

Dr. Boedeker took the existing Karl Storz Tele Pack™ video laryngoscope intubation system and made it better with the help of a massive collaboration between industry, academia and the government. His laboratory is funded by Karl Storz Endoscopy, an international leader in endoscopy, and his research is supported by a \$1.6 million federal earmark from the United States Department of Defense. Additional support comes from UNMC's tobacco settlement grants and U.S. Army grants and assistance from the Army National Guard, the U.S. Air Force and Air National Guard, and the Omaha Fire Department.

John Tinker, M.D., chairman of anesthesiology, recruited Dr. Boedeker to UNMC in 2003 from the Medical College of Georgia in Augusta, where he was associate professor of anesthesiology and director of anesthesia education. Dr. Boedeker worked quietly for about six months, then approached Dr. Tinker for research seed money.

"He is amazing in his ability to garner funding for all his projects," Dr. Tinker said. "I have never met anyone like him."

Seed money in hand, Dr. Boedeker began to innovate.

"He looked at the Storz system and said, 'I wonder if we could use this on the battlefield,'" Dr. Tinker said.

The cart-based system is housed in a 10-pound, two-foot square metal box, powered by electricity. A laryngoscope, equipped with a fiberoptic camera and light, is attached to the machine, allowing the medic to see down the throat and correctly place a breathing tube.

Dr. Boedeker will work with Karl Storz Endoscopy to miniaturize the entire system to match the size and weight of a cell phone, which can potentially connect medics on the battlefield to physicians anywhere in the world. He also plans to add patient monitoring capabilities and electronic recordkeeping, along with wireless telemetry to transmit a patient's vitals.

Respiratory failure on the battlefield is common and can result in trauma to the head, neck and face when soldiers are injured by an improvised explosive device (IED). Unless highly trained, military medics are not allowed to intubate in the field, Dr. Boedeker said. IEDs have become an increasing problem for the military, but no records are kept on the number of deaths associated with respiratory failure and roadside bombs.

"Sometimes medics do more harm than good and cause trauma while intubating. They can scrape the trachea, which causes swelling, or put the tube down the esophagus instead of the trachea," Dr. Tinker said.

Death of the patient is often the result.

The 90-degree angle of the throat prohibits medics from being able to see what they are doing. Other challenges include limited cervical spine mobility, large tongues, short or large neck circumference, big teeth, cervical trauma and other abnormalities of the neck or mouth.

Dr. Boedeker's new devices quickly caught the military's attention. Of course, it helped that he recently retired as a colonel after serving a combined 30 years in the U.S. Army, Air Force and Air Force Reserves.

He currently serves as a special medical adviser to the commander of the Telemedicine and Advanced Technology Research Center, Medical Research and Materiel Command, Fort Detrick, Md., and as an individual mobilization augmentee to the commander of the Global Innovation and Strategy Center Strategic Air Command.

Maj. Gen. Mark Musick, mobilization assistant to the deputy command at Stratcom, U.S. Air Force and Nebraska

Go straight down, then make a right. Be careful not to take the wrong fork in the road or you'll end up in the stomach.

Intubation, the placement of a flexible plastic tube into the trachea to protect the patient's airway and provide a means of mechanical ventilation, is a tricky maneuver, even for the most seasoned of anesthesiologists. And getting it right means the difference between life and death.

It's in those precious moments that anesthesiologist Ben Boedeker, D.V.M., M.D., Ph.D., hopes his inventions will help civilian and military medics save lives.

"It's easy to lose the airway passage in a trauma," said Dr. Boedeker, associate professor at UNMC and staff physician at the VA Nebraska Western-Iowa Health Care System (VA). "Tissues can collapse when a person is unconscious and

cause death within five minutes if a medic can't ventilate. Up to 85 percent of pre-hospital deaths from trauma may be due to airway obstruction."

The field of "teleanesthesiology," which Dr. Boedeker helped create, has the potential for changing how airways are managed. His goal – to increase the ease and accuracy of airway management – has led to 15 inventions and related patents that he has filed through UNeMed, the marketing and licensing arm of intellectual property for UNMC.

One such invention, the CMOS distal chip video laryngeal mask, is the cornerstone of a suite of novel, easy-to-use video airway management tools that minimally trained medics can use on trauma patients. Dr. Boedeker inserted optics in the shoe-horn shaped laryngeal mask (LMA) to enable medics to see around the corner, from the mouth to the throat.

Previously, technology allowed only visualization after the LMA was in place.



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Air Guard, said he saw the importance of Dr. Boedeker’s work and has helped him with increased military access. He recently arranged a meeting with the Air Force Surgeon General Lt. Gen. (Dr.) James Roudebush, a 1975 UNMC College of Medicine graduate, to review the project.

“Dr. Boedeker has done a good job documenting how the system can be easily used in helicopters, ambulances and many environments,” Musick said. “He’s persistent and always about four steps ahead. He’s a doctor who’s an inventor – that’s a real asset.”

He’s also verified that distance training works well with the system. Dr. Boedeker has a multi-center study underway at medical centers and military hospitals in Hawaii, San Antonio, Texas and Nebraska. Through this network, Dr. Boedeker has trained local medics, as well as medics being deployed to Afghanistan.

He continues to look for ways to expand that network. Between briefing officials from the Czech Republic, the Pentagon and Nebraska’s Congressional delegation, it seems that Dr. Boedeker hardly has time to breathe himself.

The system, however, has applications beyond emergency use.

“My goal with teleanesthesiology is to change the entire practice of outpatient sedation procedures and conscious sedation in 10 years,” Dr. Boedeker said.

Teleanesthesiology could impact any type of sedation given for outpatients undergoing dental, eye or plastic surgical procedures, he said.

James Linder, M.D., president of UNeMed and associate vice chancellor for research at UNMC, said Dr. Boedeker’s interest in developing new technology for practical use is an example many faculty could follow.

“He’s very inventive. He’s skilled at recognizing opportunities to improve clinical practice and the military thinks highly of him,” he said.

The next step is to commercialize such inventions as the LMA intubation endotracheal tube, the rod used to insert a tube through that mask, and the supraglottic (laryngeal)

airway device. “We’re in active discussions with companies now to do just that,” Dr. Linder said.

Impacting Nebraska’s economy is another goal of Dr. Boedeker’s. He has encouraged Storz to build a plant in the state to manufacture the bougie.

While that idea is under discussion, Storz has committed further resources to Dr. Boedeker by funding the Karl Storz Center for Advanced Airway Technology, a new research facility at the VA. This summer, Storz also will fund a new biomedical engineering position, said Jay Houser, director of marketing at Storz’s American headquarters in Culver City, Calif.

“Dr. Boedeker is an extremely bright and innovative person,” Houser said. “He’s not in it for his own benefit. He takes an altruistic approach to development, which is unique from the industry side. That fits well with the Storz philosophy to save lives.” 🇺🇸

## UNMC-VA Collaboration

Academic and research affiliations between UNMC faculty and the VA Nebraska Western-Iowa Health Care System (VA) are long standing, said Debra Romberger, M.D., professor and vice chairwoman of research in UNMC’s internal medicine department, and associate chief of staff for research at the VA.

“Dr. Boedeker is an example of one of these affiliations,” she said. “We have approximately 15 investigators who have laboratories at the VA and have appointments at UNMC.”

For 50 years, the VA has encouraged investigators to specifically address health questions for veterans. UNMC has developed research programs for liver problems, diabetes, lung disease, rheumatoid arthritis, surgical vascular problems and clinical oncology studies – all issues relevant to the VA, Dr. Romberger said.

“This collaboration attracts physician/scientists and researchers to the VA and UNMC,” she said.