

Baby Bubbler a breath of fresh air (w/ Video)

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Haruka Maruyama of Tokyo prepares a doll for a prototype of the Baby Bubbler, which will be demonstrated this summer in Malawi and Lesotho as part of Rice's global health initiative, Beyond Traditional Borders. Credit: Jeff Fitlow/Rice University

Gently, gently. That's how babies should be handled, and it was the prime consideration when a team of Rice University seniors developed a device that could save babies' lives.

The Baby Bubbler - or in its more technical guise, the Continuous Positive Airway Pressure (CPAP) device - helps children with acute respiratory infections breathe naturally as they recover. According to the World Health Organization, about 20 percent of deaths in children under 5 are caused by acute lower respiratory infections; 90 percent of those deaths are caused by pneumonia.

Rice's global health team recognized the need for a portable device for

infants that can be taken to countries lacking resources for medical equipment.

"Our device is not a replacement for a ventilator - it's a respiratory support device," said Heather Machen, an attending physician in the emergency center and assistant professor of pediatrics at Texas Children's Hospital, who advised the students. "Unlike a ventilator, a patient must be able to breathe on his or her own. With the use of CPAP, many children will be able to recover without a [ventilator](#)."

The Baby Bubbler has two main components, said Michael Pandya, a Lubbock, Texas, native who developed it with four other seniors.

One component, a flow generator, pumps air through a tube and allows clinicians to add oxygen if needed. The tube goes from the generator to the infant, who breathes through nasal prongs, and then to the second component, a water bottle that serves as a regulator. "The pressure level to the patient can be changed by adjusting the depth of water in the bottle," Pandya said.

An alarm to detect backflow of water into the line warns doctors if the circuit loses pressure. "It's a simple design, but it's incredibly important in developing countries where the nurse-to-patient ratio is sometimes one nurse for 40 or so patients," he said.

Members of the Baby Bubbler team also included Jocelyn Brown of Pittsburgh, Joseph Chang of Lexington, Mass., Haruka Maruyama of Tokyo, and Katie Schnelle of Cincinnati.

Brown served double duty as the only bioengineering student on the five-member infantAIR team, which brought the Baby Bubbler to Rwanda this spring as part of a global health technology commercialization class offered at Rice University's Jones Graduate School of Business. The

team subsequently won \$11,750 in the prestigious Rice Business Plan Competition, including first prize for Best Social Venture, and earned honors for Best Engineering Design in Service to Society in this year's Brown School of Engineering Design Showcase.

"This team has been great at understanding the design challenges and addressing them head-on," said Maria Oden, professor in the practice of engineering education and director of Rice's Oshman Engineering Design Kitchen, where much of the work was done. Bioengineers at Texas Children's helped students check the flows and pressures of their device. "That's been very valuable," she said.

Prototypes, which cost about \$140 to make, will travel with students this summer as part of Rice's global health initiative, Beyond Traditional Borders. They will be demonstrated in Malawi and Lesotho, the first step toward clinical testing.

In addition, Machen is recruiting local physicians interested in piloting the device and educational materials in their hospitals. "Their input and involvement will be vital to the success of this project," she said.

"The United Nations has designated reducing under-5 mortality by two-thirds by 2015 as one of its Millennium Development Goals," said Machen, who credited Texas Children's Steven Abrams, a neonatologist, and Suzanne Iniguez, a respiratory therapy educator, for their help in realizing the project. "We hope that this bubble CPAP will contribute toward achieving that goal."

Provided by Rice University

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