

Small Diameter Nasogastric Tube with Guide Wire Insertion Design Excellence Award Executive Summary

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Problem Statement

The client desires a new nasogastric tube that will decrease patient discomfort during the insertion process. The standard nasogastric tube that the client uses is constructed of PVC, is 6 mm in diameter, and causes severe discomfort when being inserted through the patient's nasal cavity. The client would like a tube that functions similarly when decompressing the stomach, but is smaller in diameter and more pliable for an insertion that is more comfortable.

Final Design

The proposed solution is to use silicone tubing with an outer diameter of 3.2mm and an inner diameter of 1.6mm, which is an inner diameter decrease of 1.6mm. This tube is very flexible and will require a steel guide wire similar to those currently used in catheters. During the placement of the nasogastric tube, this guide wire would provide the required rigidity, and then be easily removed after insertion is complete.

Testing

The silicone tube with the guide wire has been tested in an anatomical model that mimics the curve of the nasal cavity as it bends down into the nasopharynx. The results of our testing showed that our design navigates the curve of the nasopharynx more easily than the original nasogastric tube produced by Kendall and Corvidien. Mathematical modeling was also performed to evaluate the collapse of the nasogastric tube from negative pressure. With this modeling, our device will function safely even at a suction pressure two times greater than what is required by our client. Viscous lidocaine will be applied to the tip of the nasogastric tube for both lubrication and anesthetic purposes. The use of the lidocaine and the guide wire will allow for an overall easier and more comfortable insertion of the redesigned nasogastric tube.

Competition

Several devices, currently on the market, are designed to increase patient comfort throughout the use of the nasogastric tube. The NanoVibronix NG-shield tube generates vibrations during insertion, and a Kimberly-Clark tube utilizes a silicone balloon to maintain placement in the stomach. These tubes are not widely used because they cost approximately \$100, which is much greater than the \$18 cost of the Kendall and Corvidien, low-tech tube that our client uses. Our tube will be producible below a \$30 price point. There are approximately 170,000 nasogastric tubes inserted in the United States every year. Since our tube will be: competitively priced, improve the patient's level of comfort, and maintain the current insertion procedure, it is conceivable that our product may capture as much as 30% of the current market. This makes the tube very novel in its field and the client is hoping to patent the tube design.