

Smart Chest Tube

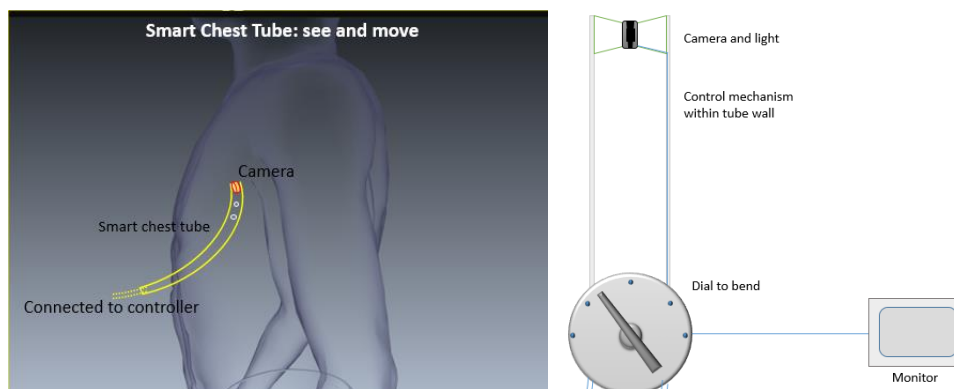
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When a patient has pneumonia or cancer, extra fluid may build up in the space around the lungs (a pleural effusion). A severe injury to the chest wall can cause bleeding around the lungs (a hemothorax). If a lung is accidentally punctured, air enters from outside the lung (a pneumothorax). After thoracic surgery, a patient can develop chyle leak into the pleural space due to lymphatic damage creating a chylothorax. In all these cases, a chest tube may be needed to drain fluid, blood, or air from the space around the lungs. Installing a chest tube (chest tube thoracostomy) involves placing a hollow plastic tube between the ribs and into the chest. The tube is connected to a suction pump and remains in the chest usually for a few days until all or most of the air or fluid has drained out.

Current chest tubes are placed blindly by the physician with the hope they would drain fluid and air at a specific location in the chest cavity. Second or multiple chest tubes or an open chest operation is required if the chest tube tip is unable to remove remaining air or fluid. The proposed *Smart Chest Tube (SCT)* has the same drainage function as current commercial chest tubes with an additional feature of maneuverability. The physician gently inserts the tube into the patient's chest adjusting the curvature to accurately position the end of the tube, which holds its position. A vision camera is added to the tip of the chest tube to help the physicians to steer the tube.

Nanoworld Lab has teamed up on the development with Dr. Maham Rahimi, a surgeon who perform tube thoracotomy daily and found the need for a maneuverable chest tube. This interdisciplinary team has been working together on the preliminary study of the concept of SCT for more than two years, and has the knowledge and experience to develop a SCT system that clinician needs.

Expected Outcome of the Pretege: The student will work on further development of the prototypes and obtain proof of concept. The project will enable optimizing the SCT and obtaining data needed for patenting and to begin commercialization including obtaining resources to seek FDA approval. Approximately 1,330,000 chest tubes were placed in United States last year and by completing our aims, this product has the potential to revolutionize the current procedure of chest tube thoracostomy.



Smart Chest Tube system and Key Components