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Research In-Progress

Smart VB: A Pressure Monitoring and Automatic Suction Telemedicine System for the Vacuum Bell Therapy for Treating Pectus Excavatum

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Introduction: The Vacuum Bell (VB) is a non-invasive treatment for Pectus Excavatum (PE), the most common congenital chest wall deformity. The VB treatment is a gradual process that may take more than 1 year. The pressure inside VB and patient compliance are crucial determinants of outcomes. However, PE patients use VB with a hand pump and do not have a system that helps them maintain the pressure of VB within the required pressure range. Moreover, the pressure profile of the treatment over time and patient compliance is unavailable for doctors.

Methods: To address these issues, this project proposes a pressure monitoring and automatic suction telemedicine system to facilitate patients to utilize VB within the right pressure range, record the duration and the pressure of the treatment for doctor evaluation. The system consists of a hardware device and a mobile app. The hardware device monitors the pressure inside VB, automatically adjusts the pressure within the right pressure range, and keeps track of the applied pressure and the usage of VB while the mobile app allows patients to configure the pressure range, set up the planned usage time, retrieve treatment history from the device, and display treatment history and usage data, etc.

Preliminary Results: A prototype of the proposed system is shown in Figure 1. The device includes a microcontroller, a suction pump, a pressure sensor, data storage, an OLED display and power. The mobile app can also help doctors review the treatment pressure over time and the usage of the VB, and guide the patients about next steps—increase treatment pressure or treatment duration.

Next Steps: The safeness and effectiveness of the system will first be evaluated on manikins. Then, the authors will recruit some PE patients under VB treatment and evaluate the developed system on patients.


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