Pee Xylophone: A Novel Non-Invasive Bladder Pressure Measurement System

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Lower Urinary Tract Symptoms are issues related to the bladder system, affecting over 80% of men above 60. Symptoms are caused either by an obstruction in the urinary tract or a weak bladder. To distinguish between the two causes, bladder pressure is measured by an invasive procedure called urodynamics where pressure sensors are inserted in the bladder, going through the urinary tract. Although urodynamics has the potential to identify life-threatening complications, the invasiveness and discomfort experienced during the procedure may reduce the willingness of patients to consent to the test. Alternatives to urodynamics exist such as the UroCuff and Urethra Connector but are still physically invasive. To provide a safer and more comfortable alternative, a novel non-invasive device called the Pee Xylophone was invented that measures bladder pressure with high accuracy during urination through stream analysis. The Pee Xylophone measures the velocity of urine as it hits the device and the range of each urine droplet to determine its exit velocity from the urethra. The device then uses this exit velocity to determine the internal bladder pressure. The system's theoretical framework was verified using many physical, mathematical, and computer-based experiments. The accuracy and efficiency of the approach were optimized through theoretical iterations, device prototypes, and thoughtful experimentation. Though each patient case differs, preliminary testing suggests the systematic device error is ~3%. The result of this project was the Pee Xylophone device which uses a novel stream analysis technique for accurate bladder pressure measurement, poised to revolutionize the urology industry.

Awards Won: