



# A Physical Simulator for Training Clinical Palpation Skills in Exams of the Prostate Gland

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Funded by: Academy of Distinguished Educators, Undergraduate Medical Education Research Grant, U.Va.

### Research Goal

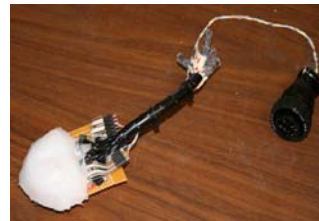
Our interdisciplinary team - from medicine, nursing, and engineering - has designed and is currently building a physical simulator to teach palpation skills of the prostate gland to medical and nurse practitioner students. These skills are important for clinical assessment and detection of the normal and abnormal prostate. The long term focus of this research is to ensure that practitioners' clinical skills are systematic, time-effective, and highly accurate. The aim is to design a simulator to effectively train students to detect prostate hypertrophy, prostatitis and cancers at the earliest possible stages.

### Research Design

The Virginia Prostate Examination Simulator (VPES) is being designed to assess and train practitioners regarding specific diseases while monitoring and providing feedback to trainees on technique. Specifically, what differentiates this simulator is the use of i) a range of graded practice scenarios that accurately reflect disease progression and ii) augmented and real time visual feedback. Most importantly, the simulator and its training protocol will be designed to ensure that skills learned through simulation transfer to actual clinical exams. This work expands upon past work with a breast cancer simulator. Once construction of the simulator is complete, we will test the simulator's design and its training protocol with medical and nurse practitioner students. A set of one-day experiments and one longitudinal study will test the simulator's effectiveness by evaluating trainee competency, the consistency of training across trainee groups, and transfer of training to other simulators. Upon completion, we hope to integrate this model into existing training programs at the University of Virginia.



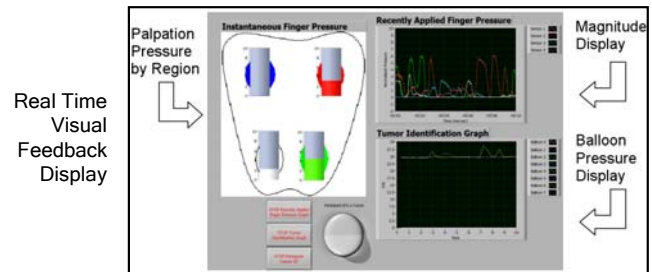
Virginia Prostate Simulator



Instrumented Prostate



Internal Track for Interchanging Instrumented Prostates

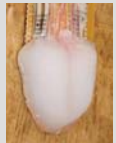


Real Time Visual Feedback Display

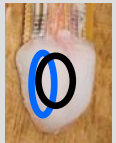
### Simulators with Corresponding Disease State Representations

Simulator	Normal Prostate	Prostatitis	BPH	Carcinoma
Nasco (with torso)	One Case ▪Normal state	No Cases	No Cases	Three Cases, 3 Scenarios ▪Under skin tumor ▪Small tumor on the outside of skin ▪Entire prostate is cancerous
Nasco (without torso)	One Case ▪Normal state	No Cases	Two Cases ▪BPH only ▪BPH with early cancer nodule	Three Cases, 3 Scenarios ▪Early cancer in normal prostate ▪Early cancer in hyperplastic prostate ▪Late invasive cancer
Virginia Prostate Examination Simulator (VPES)	One Case ▪Normal state	Four Cases ▪Left lobe only inflamed ▪Right lobe only inflamed ▪Left lobe and center inflamed ▪Right lobe and center inflamed ▪Prostatitis with cancer (34 scenarios)	Four Cases ▪Left and right lobes inflamed with sulcus intact, no tumors ▪Mild inflammation with sulcus mostly obliterated, no tumors ▪Left and right lobes inflamed with sulcus mostly obliterated, no tumors ▪BPH with cancer (17 scenarios)	Three Cases, 96 Scenarios ▪Single tumor cases of 4 different sizes ▪Multiple tumors of different sizes ▪Entire prostate is cancerous ▪62 different cancer scenarios  ▪No tumors on the outside of skin, this is not necessary to replicate

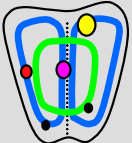
Scenarios Modeled by Virginia Prostate Exam Simulator




Normal



Prostatitis



BPH with and without Carcinoma



Carcinoma