PREVENTATIVE ULTRASONIC DETECTION AND EXPULSION OF KIDNEY STONES


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Project Aims

NSBRI project “Smart therapeutic ultrasound device for mission critical medical care.”

- To develop a smart medical device that would be lightweight, portable, FDA-approved, commercially produced, and capable of addressing a variety of risks described in the Human Research Program Integrated Research Plan.
- To be based upon the platform technology of ultrasound and would not require high skill levels from the user.

In particular, we seek to address:

(Human Research Program Integrated Research Plan)
Risk 105,…possibility of penetrating trauma to the crew....
Risk 108:...possibility the crew will need abdominal surgery ...
Risk 14:...possibility for increased cancer morbidity or mortality.
Risk 21:...possibility that symptomatic renal stones....
Risk 87:...increased probability of renal calculi formation ...

(Space Medicine Exploration Medical Condition List)
Kidney stones: Shall for Lunar Sortie and Outpost
Shall for contingencies for ISS, Sortie, and Outpost

Stone Detection

- New algorithm written to detect kidney stones with ultrasound.
- User friendly – stone marked in color on display
- Removes confusion of colored blood vessels on screen

![Image](image1)

Stone Expulsion

The same instrument and user interface then moves the stone with acoustic radiation force out of the kidney so it will pass naturally.

![Image](image2)

Stone Tracking

The system tracks and displays the stone movement in real time.

![Image](image3)

Safety

Extensive animal studies have been and are being conducted to test the safety of stone repositioning. No injury has been observed at levels used in stone movement.

![Image](image4)

Ultrasound Detection and Expulsion of Stones

- Prototype made from Verasonics Ultrasound Engine, a COTS open architecture, software based ultrasound platform.
- Uses Philips/ATL diagnostic probes C4-2 and P4-2 on ISS now.
- Suitable platform for other NSBRI/ NASA ultrasound technology.
- VUE is radiation hardened. Working with NASA Glenn to implement it with flight-ready IBM Lenovo ThinkPad laptop.

![Image](image5)

Status

U.S. Patents pending
IRB approval for clinical trial of stone detection
Pre-IDE meeting scheduled for clinical trial on expulsion
Won business plan competition at University of Washington
Invited to present in Urology course and AUA annual meeting
Acquired additional funding from UW Commercialization foundations and the National Institutes for Health.
Current plan is to conduct clinical trial before starting company or licensing the technology.

References


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