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Re: Leapman et al.: Up and Away: Five Decades of Urologic Investigation in Microgravity (*Urology* 106:18-25)

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TO THE EDITOR

We write to thank you and the authors for the fine review article entitled “Up and Away: Five Decades of Urologic Investigation in Microgravity”¹ and offer comment about how space research is transforming clinical care on Earth. We are fortunate to have been funded by the National Space Biomedical Research Institute (NSBRI), a NASA partner, to develop technologies to diagnose and manage renal stones in spaceflight.

The authors explained the risk of kidney stones in space very well. On Earth in the United States alone, over 3 million people seek treatment for stones every year, with an annual economic burden of over \$5 billion.² With National Institutes of Health and NSBRI funding, we at the University of Washington (UW) Urology and Applied Physics Laboratory have developed a new ultrasound capability to noninvasively image, fragment, and reposition urinary stones and stone fragments.³ The technologies are being integrated into the NASA Flexible Ultrasound System to fly as medical and research equipment on future missions, and are being commercialized for patients on Earth.⁴ With NSBRI funding, we performed a first-in-man study demonstrating that we can reposition stones of various sizes using transcutaneous ultrasound alone, without pain or adverse events. Clinical benefits included immediate natural expulsion of small stone fragments, diagnostic differentiation between a single large stone and a collection of fragments, and pain relief associated with moving a stone away from the ureteropelvic junction.⁵ Our group is currently conducting a randomized clinical trial of expelling residual fragments after surgery and gearing up for a trial to assess the capability of relieving obstruction and pain in emergency department patients with obstructing stones. In collaboration with military staff urologists, the system is ready to test at the Madigan Army Medical Center, an important target audience, as there are over 8000 diagnoses and 60 evacuations from theater for stones in active military personnel

each year.⁶ We are eager to train astronauts, emergency department staff, urologists, and army medics to use this technology for kidney stones. Within the next year, a spin-off company, SonoMotion, Inc., plans to bring a stone-repositioning product to market, and the UW plans to initiate a stone-breaking clinical trial. Appreciating the unique constraints of deep space missions, SonoMotion is designing a product that requires minimal electrical power and is delivered in a low mass and small volume package. The goal is to deliver a solution that will benefit Earth and space-bound patients alike.

The UW has been building technologies to address a variety of urologic conditions for many years. In June 2017, CNN listed our work as 1 of “ten healthcare technologies that have already come from space [research].”⁷ The CNN article also lists simplified, portable external kidney dialysis as another of the 10 technologies. Dialysis is used by over 600,000 Americans annually and was first tested at UW with Belding Scribner, Albert Babb, and Wayne Quinton’s shunt 57 years ago. In 2014, the first 24-hour human trial of a wearable dialysis unit took place at the UW.⁸ In 2018, researchers from that UW team and Seattle’s Kidney Research Institute will send a “kidney on a chip” to the International Space Station to measure microgravity’s effects on kidney function.⁹ We are honored and privileged to work with the space program to develop new, non-invasive, more cost-effective, and safer ways to treat urologic conditions to help patients on and off the planet.

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