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Screening and Management of Asymptomatic Renal Stones in Astronauts

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INTRODUCTION: Management guidelines were created to screen and manage asymptomatic renal stones in U.S. astronauts. The true risk for renal stone formation in astronauts due to the space flight environment is unknown. Proper management of this condition is crucial to mitigate health and mission risks.

METHODS: The NASA Flight Medicine Clinic electronic medical record and the Lifetime Surveillance of Astronaut Health databases were reviewed. An extensive review of the literature and current aeromedical standards for the monitoring and management of renal stones was also done. This work was used to develop a screening and management protocol for renal stones in astronauts that is relevant to the spaceflight operational environment.

RESULTS: In the proposed guidelines all astronauts receive a yearly screening and post-flight renal ultrasound using a novel ultrasound protocol. The ultrasound protocol uses a combination of factors, including: size, position, shadow, twinkle and dispersion properties to confirm the presence of a renal calcification. For mission-assigned astronauts, any positive ultrasound study is followed by a low-dose renal computed tomography scan and urologic consult. Other specific guidelines were also created.

DISCUSSION: A small asymptomatic renal stone within the renal collecting system may become symptomatic at any time, and therefore affect launch and flight schedules, or cause incapacitation during a mission. Astronauts in need of definitive care can be evacuated from the International Space Station, but for deep space missions evacuation is impossible. The new screening and management algorithm has been implemented and the initial round of screening ultrasounds is under way. Data from these exams will better define the incidence of renal stones in U.S. astronauts, and will be used to inform risk mitigation for both short and long duration spaceflights.