

NASA ASTRONAUT URINARY CONDITIONS ASSOCIATED WITH SPACEFLIGHT

INTRODUCTION: Spaceflight is associated with many factors which may promote kidney stone formation, urinary retention, and/or Urinary Tract Infection (UTI). According to ISS mission predictions supplied by NASA's Integrated Medical Model, kidney stone is the second and sepsis (urosepsis as primary driver) the third most likely reason for emergent medical evacuation from the International Space Station (ISS).

METHODS: Inflight and postflight medical records of NASA astronauts were reviewed for urinary retention, UTI and kidney stones during Mercury, Gemini, Apollo, Mir, Shuttle, and ISS expeditions 1-38.

RESULTS: NASA astronauts have had 7 cases of kidney stones in the 12 months after flight. Three of these cases occurred within 90 to 180 days after landing and one of the seven cases occurred in the first 90 days after flight. There have been a total of 16 cases (0.018 events per person-flights) of urinary retention during flight. The event rates per mission are nearly identical between Shuttle and ISS flights (0.019 vs 0.021 events per person-flights). In 12 of the 16 cases, astronauts had taken at least one space motion sickness medication. Upon further analysis, it was determined that the odds of developing urinary retention in spaceflight is 3 times higher among astronauts who took promethazine. The female to male odds ratio for inflight urinary retention is 11:14. An astronaut with urinary retention is 25 times more likely to have a UTI with a 17% infection rate per mission. There have been 9 reported UTIs during spaceflight.

DISCUSSION: It is unclear if spaceflight carries an increased post-flight risk of kidney stones. Regarding urinary retention, the female to male odds ratio is higher during flight compared to the general population where older males comprise almost all cases due to prostatic hypertrophy. This female prevalence in spaceflight is even more concerning given the fact that there have been many more males in space than females. Terrestrial medications with a known side effect of urinary retention are also associated with urinary retention during flight. However, not all cases of urinary retention surrounded medication use inflight. It is also known that UTI is a terrestrial cause of urinary retention. Furthermore, the treatment of urinary retention with a urinary catheter may be more likely to initiate a UTI in space than on the ground, as aseptic techniques can be particularly challenging with an inexperienced provider in a free-floating environment. Inflight urinary retention and UTI have proven to be highly associated and urinary risks should be considered collectively when planning for space flight.