Space Adaptation Urinary Retention CLIFF Peer Review

1. *Strength of evidence presented in CLIFF in modeling the characteristics and mission impact of this medical condition within the spaceflight environment?*

   Score: 3

   Grading Scale:

   4 - Confident

   3 - Somewhat confident

   2 – Neutral

   1 – Somewhat unconfident

   0 – Not confident

2. How confident are you that these data accurately represent the spaceflight environment?	*Tables 1, 2* *Composite Incidence and Level of Confidence*	*Table 3, 4 BC/WC* *LOC and* *probability*	*Table 4 - Clinical Phase 1, 2 durations* *Table 5 – CP 2 LOC*	*Table 4 – RTDC %* *Table 6 – RTDC LOC*	*Table 4 – Loss of crew life %* *Table 7 – Loss of crew life LOC*	*Table 8 – TI*
Score	*3*	*3*	*3*	*2*	*4*	*3*

Comments and limitations:

1. **General comments.** This CLiFF examines urinary retention which occurs during the first 5 days of space flight after insertion into orbit. Urinary retention may be the result of drugs (e.g. anticholinergics, opioids), obstruction, an unfamiliar environment (especially for first-time fliers), infections, reluctance to use the vehicle waste management system, and sympathetic nervous system response to stress. Space adaptation urinary retention has a higher incidence during the early phase of spaceflight while the body is adapting to microgravity. Although there have been no instances in which a return to earth has been necessary, refractory urinary retention would necessitate a return to definitive care (RTDC). Historically, the incidence in females has been higher than in males although there is less data on women. The best case is considered to be urinary retention within the first 5 days of spaceflight that resolves spontaneously or requires one-time straight catheterization for resolution. The worst case is urinary retention that requires repeated straight catheterization or an indwelling catheter.

2. **Incidence.** The incidence for this CLiFF was derived from LSAH data that collected the inflight reports of urinary retention. The IMM CLiFF used the same data, but one additional report was added to update this CLiFF for IMPACT. Two gender-specific distributions were calculated based on the reported differential incidence between males and females. The best case/worst case

probabilities used LSAH inflight reports, Including newer data in which there was one worst case reported. This yields 1 worst case out of a total of 11 reports or a probability of 91% best case and 9% worst case scenarios. The clinical phase durations are based on observational data that show the best case usually lasts from 0 to 24 hours while the worst case may continue for another 5 days beyond the initial 5 days of space adaptation, or 10 days total. At this point it is assumed that resolution or RTDC would occur. Loss of crew life probabilities were considered to be zero given the medical condition definition. The probability density curve that was derived appears to be a reasonable representation of the data presented.

3. **Clinical phase data**. I am in agreement with the clinical phase 1 duration entered in this CLIFF. This data was compiled by a team of expert clinicians, and I was involved in the discussions leading to the calculation of the clinical phase duration. CP2 was supported by spaceflight evidence.

4. **Task impairment**. The analysis was performed and reviewed by a separate team of expert clinicians. I am aware of the methods that were used but did not directly participate in the discussions.

5. **Dependence on mission phase or duration of mission**. This medical condition is dependent on mission phase as it only begins during the first five mission days.

6. **Limitations**

- The data studied only a limited number of subjects and used specific vehicle and mission profiles. Future missions may differ in terms of vehicles and mission profiles.
- Worst case RTDC probabilities are predicated on the possibility that catheterization supplies or skills may not be available. This is unlikely given current planning.
- The clinical phase II durations for this CLiFF were taken from the prior IMM CLiFF which is based on LSAH data. The ExMC composer/editor of this CLiFF did not have access to the primary source but felt after looking through multiple other sources that these estimates for duration were reasonable given that they are spaceflight specific.

Reviewed by:

David C. Hilmers