

## BHP Adjustment Disorder 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: 2

### **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<br>Composite Incidence and Level of Confidence | Table 3, 4<br>BC/WC<br>Loss of Crew and probability | Table 4 -<br>Clinical Phase 1, 2 durations<br><br>Table 5 – CP 2 Loss of Crew | Table 4 – RTDC %<br><br>Table 6 – RTDC Loss of Crew | Table 4 – Loss of Crew Life %<br><br>Table 7 – Loss of Crew Life, Loss of Crew | Table 8 – TI |
| Score                                                                                      | 2                                                          | 2                                                   | 3                                                                             | 2                                                   | 3                                                                              | 3            |

Comments and limitations:

**1. General comments.** This CLIFF characterizes adjustment disorder that may arise during adaptation to the spaceflight environment. Adjustment disorder is defined as a maladaptive response to a psychosocial stressor, such as the separation, isolation, and limited personal space associated with long-duration space missions. Adjustment reactions may affect crew performance, crew cohesiveness and even mission success. This is a new CLIFF that is a refinement of the IMM CLIFF that dealt with behavioral emergencies as a single entity and that was not categorized by behavioral pathology. Adjustment disorder should resolve when the stressor is removed or an intervention results in an appropriate response to the stressor. It is difficult to determine the incidence of this condition because LSAH drops have not provided specific diagnoses for behavioral problems. Studies of analog environments have shown a “third quarter phenomenon” in which psychologic issues may peak in the 3rd quarter of a mission and generally improve in the 4<sup>th</sup>. The best case is considered to be an adjustment reaction caused by stressful events that alleviate without any impact to the mission or personal life, and/or requires pharmacological therapy PRN, or behavioral health intervention and increasing behavioral health countermeasures. The worst case is an adjustment disorder that causes significant distress or decline in areas including, but not limited

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to, work performance, sleep, or interpersonal dynamics, and require long-term pharmacologic therapy (minimum 6 months) and/or behavioral health intervention. Related conditions covered in other CLIFFs include anxiety, depression, grief-reaction, psychosis secondary to depression and sleep disturbance. These conditions may, and often do, coexist.

**2. Incidence.** There is a lack of robust data describing adjustment disorder during spaceflight. The incidence calculation was based on a study of 313 individuals who spent a winter in Antarctica. They were debriefed by qualified psychiatrists and a psychologist and had undergone psychological evaluation prior to starting their deployment. Twelve events were described as meeting the definition of adjustment disorder. While Antarctica is not a perfect analog to spaceflight, this study specifically categorized adjustment disorder, and the demographics of the cohort studied is similar to those of astronauts. The best case/worst case probabilities were derived from a study which investigated admissions of injured individuals to a level 1 trauma center. Out of 156 participants who were diagnosed with adjustment disorder at three months, only 54 continued to have the disorder at 12 months. The 54 subjects with continued adjustment disorder were considered to meet the worst case definition. The clinical phase durations were based on clinical studies showing the range of therapy needed based on the definitions used in the CLIFF. The data is weak to support the estimation of clinical phase times. The best case return to definitive care (RTDC) and loss of crew life probabilities were considered to be zero based on terrestrial studies. The worst case probabilities for RTDC have a maximum probability of 7.1% which is based on hospitalization rates, considered to be a surrogate for RTDC. The untreated worst case loss of crew life was as high as 4% based on the increased risk of suicide in individuals with adjustment disorder. The probability density curve that was derived appears to be a reasonable representation of the data present

**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 terrestrial 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.** The incidence of this medical condition may vary over the course of the mission. The “3rd quarter effect” is the observation that psychological problems peak during the 3<sup>rd</sup> quarter of the mission and then decrease as the mission nears completion.

### 6. Limitations

- The incidence of this medical condition may vary over the course of the mission. The “3rd quarter effect” is the observation that relationship problems peak during the 3<sup>rd</sup> quarter of the mission and then decrease as the mission nears completion.
- There is a paucity of published data relating specifically to spaceflight adjustment problems as defined by this CLIFF due to the lack of classification of behavioral problems by DSM diagnostic category.
- There is some overlap between this condition and other BHP CLIFF conditions, including anxiety, depression, grief-reaction, psychosis secondary to depression and sleep disturbance. These conditions may, and often do, coexist.
- Several assumptions needed to be made regarding the untreated RTDC and loss of crew life values given lack of available studies.

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- Terrestrial sources likely overestimate the incidence, RTDC and loss of crew life values given the extensive pre-flight screening of long-duration spaceflight crewmembers. For example, data used for UTWC RTDC has adjustment disorder co-occurring with substance use which is highly unlikely in astronauts.
- The TBC and UTBC CP2 durations are identical as are TWC and UTWC durations. This seems to indicate that treatment does not matter. However, the definitions of worst case (and sometimes best case) indicate that therapy is required. Since there is no data to support a different estimation of these times, the durations were left as suggested by the editor with the limitation as noted herein.

Reviewed by:

David C. Hilmers