

Dental Abscess 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 Loss of Crew and probability	Table 4 - Clinical Phase 1, 2 durations Table 5 – CP 2 Loss of Crew	Table 4 – RTDC % Table 6 – RTDC Loss of Crew	Table 4 – Loss of Crew Life % Table 7 – Loss of Crew Life, Loss of Crew	Table 8 – TI
Score	3	2	3	2	3	3

Comments and limitations:

1. General comments. Dental abscesses are classified according to their anatomical location. These include gingival, periodontal, periapical and apical (typically the most severe), and pericoronal abscesses. Acute apical/periapical dental abscesses typically arise secondary to dental caries, trauma, or failed root treatment when these spaces are compromised and become colonized with anaerobic bacteria. Generally, these abscesses cause local pain, edema, and pus formation, but they can lead to an odontogenic infection and sepsis. Sepsis is a separate condition covered in another CLIFF. The standard of care is drainage and elimination of the source of infection; antibiotics are not recommended unless the infection spreads. However, this strategy is modified in spaceflight to initiate antibiotics as soon as the infection is recognized and, if not controlled, to either perform a dental extraction or incision and drainage. Definitive care would be accomplished upon return. As astronauts have regular dental care throughout their careers and receive a complete dental check before launch, the incidence of dental abscesses is expected to be much lower than in the general population. There have been no episodes of dental abscess during manned US spaceflights to date although there are several documented cases of abscesses during the pre-flight timeframe in male astronauts.

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2. Incidence. As there is no spaceflight data to inform the development of composite incidence, pre-flight data with reports of 4 abscesses over the cumulative time between astronaut selection to first flight was used. This was felt to be descriptive of the risk of abscess formation during spaceflight. This may be an overestimation because astronauts have a dental exam prior to launch but could underestimate the risk if the duration of the mission exceeds the normal interval between dental visits. The best-case scenario is defined as an abscess that responds to pain medications and antibiotics while the worst case is not responsive to conservative measures and requires IV antibiotics or incision/drainage. The best case/worst case probability is supported by terrestrial evidence; however, as noted above, the standard of care is I&D and not antibiotics. Also, there is a possible overestimation of the worst case as the study that was used to derive the BC/WC probability used a population that would not have had the same level of dental care as astronauts and poorer dental health at baseline. The clinical phase durations, RTDC and Loss of crew life probabilities are supported by terrestrial evidence, and I am in agreement with their calculation. 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 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. This medical condition should not be dependent on mission phase.

6. Limitations

- For the best-case treated scenario RTDC and Loss of crew life were both assumed to be 0% based on the BC definition. While this is likely an accurate assumption, it was not verified with a literature search.
- Best-case/worst-case probability split is based off one study of a population that is likely poorly representative of the astronaut corps as it is suspected the population had much poorer dentition than astronauts at the time of selection for a mission. One of the inclusion criteria of the study was: “had at least one tooth”.
- For the untreated best-case scenario, there is a paucity of data regarding dental abscesses that go untreated. Terrestrial standard of care advocates not to treat with antibiotics, rather to treat only with early I&D, but this does not constitute a lack of treatment since I&D is definitive treatment in many cases.
- No data was identified in the literature search to inform untreated durations, or RTDC but dental abscess literature does show a strong consensus that an untreated dental abscess could progress to a more severe, or even deadly, infection. Therefore, the durations for the untreated best-case scenario utilize the treated worst-case scenario values as a surrogate.
- CP 2 duration, RTDC and Loss of crew life may be underestimated in this scenario based on utilizing the treated worst-case scenario. This is a limitation due to the paucity of untreated data.

Reviewed by:

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