

# Abstracts of Oral Presentations-WADEM Congress on Disaster and Emergency Medicine 2019

## WILDERNESS MEDICINE

### A Fresh Look at Whether the Human Appendix Should Be Considered “Friend or Foe” in the Context of Long-duration Remote Expeditionary Medicine (Benivolem aut Insidiator?)

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**Introduction:** Traditional belief holds that the human appendix is a vestigial organ devoid of any purpose, and consequently, surgical appendectomy has been the “gold standard” treatment for suspected appendicitis. Prophylactic (preventative) appendectomy remains the policy of the Australian Antarctic Division for wintering medical practitioners and has been discussed in the context of long-duration non-orbital space flight.

**Aim:** New research around appendiceal function, increasing adoption of non-surgical treatment modalities for acute appendicitis, and emerging research on the long-term consequences of appendectomy have recently enabled researchers to challenge this paradigm.

**Methods:** This novel project set out to test the hypothesis that a “one size fits all” prophylactic appendectomy policy may not be in the best interest of individual expeditioners, and utilized a “mindmap” to identify several key areas for a scoping literature review. This enabled disparate research to be drawn together in an innovative way.

**Results:** A growing body of research has discovered that the appendix plays an important role in the gut immune system and maintaining gut health. It acts as a reservoir of good bacteria that repopulates the gut after pathogenic challenge. This is particularly important for people with impaired immune systems, such as those that occur in extreme environments. Appendicitis can often be successfully treated with intravenous antibiotics. Prophylactic appendectomy is not without risk, as 1:4 to 1:3 people will encounter some sort of postoperative complication. After an appendectomy, there is an increased risk of many serious medical conditions, including intra-abdominal adhesions, ischaemic heart disease,

inflammatory and irritable bowel diseases, rheumatoid arthritis, and many others.

**Discussion:** The increased morbidity and mortality associated with appendectomy is costly for individuals (the burden of disease) and society (health economics). It also poses a currently unappreciated health risk for long-term off-world expeditions.

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### Use of Solar Power Production for Point-of-Care Ultrasound: A Comparative Analysis

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**Introduction:** Use of Point-of-Care Ultrasound (US) has grown considerably in resource-limited and wilderness environments because of a combination of features, including portability, durability, and safety. However, the optimal method of powering US devices in such environments is not well established.

**Aim:** This project has the following aims:

1. Develop a solar power generation and storage system that maximizes power capacity and minimizes weight while being easily transportable by a single person.
2. Test the system in a real-world environment to evaluate actual performance relative to stated performance.
3. Determine the approximate US scan-time where solar systems would outperform pre-charged batteries with respect to weight.

**Methods:** We developed multiple solar collecting systems using a combination of polycrystalline, monocrystalline, and thin-film solar arrays paired with different powerbanks and tested them using a variety of US systems. From this, the duration of usage was calculated, which makes the solar power generation system a superior option to pre-charged batteries.

**Results:** Lithium-ion energy storage was found to be superior to lead-acid batteries for multiple reasons, most prominently, weight. Several models of US systems were tested revealing that portable US systems consume between 30 to 50 watts. Tri-fold monocrystalline solar panels coupled with lithium-ion

powerbanks provided the best combination of weight and transportability. Total weight of the combined solar array, powerbank, and US system is 10 kilograms and easily packs into a backpack carrier. It was found that systems using solar generating capacity become superior to pre-charged powerbanks in regard to weight at approximately 14 hours of scanning time.

**Discussion:** While these results are not fully generalizable due to seasonal and geographic variability as well as the type of US system used, use of solar generating capacity to power US systems is optimal for extended durations of use in resource-limited environments.

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