In support of NASA's strategic thrust to advance "human augmentation" capabilities, the Autonomous Medical Operations (AMO) project primarily intends to develop an on-board software system, the preliminary Medical Decision Support System, or MDSS, that provides medical augmented intelligence for both planned and emergent clinical care aboard deep space exploration missions. The MDSS being developed offers rudimentary, but increasingly sophisticated support at multiple stages of the clinical workflow on such missions.

The key objective in developing the preliminary MDSS is to enable augmentation of an astronaut's capabilities on long-duration exploration missions. This system is not intended to replace decision-making capabilities of a chief medical officer, but rather to support medical actions via rapid and assured access to data such as patient health records, radiographic image analysis, clinical notes, and test results.

Thus, AMO aims to develop a "triage" assistant that eventually assigns degrees of urgency to a medical scenario. Computerized biomedical support systems can be designed and trained to accurately interpret certain clinical findings within a confidence interval, as well as to identify latent adverse health events. The AMO MDSS computer system offers a unique mix of medical image assessment, anatomical feature interpretation, and differential diagnosis advice. For example, computer-aided analysis of on-board ultrasound images (whether of the heart, the bladder, the kidney, or the lungs) will inform the chief medical officer of possible diseases or pathologies. In the process, the MDSS can recommend further actions, such as additional tests, to help confirm diagnoses and suggest drug therapy or other care measures.

The AMO project is working extensively to train medical models on the reliability and confidence of computer-aided interpretation of such ultrasound images in various settings, and the acquisition of clinically validated image assessment is a major part of the MDSS development. The MDSS will be demonstrated throughout the project, and it will be deployed in order to gain crew feedback on station or within ground-based analog settings.

AMO is ably supported by two collaborations that aid in both ultrasound data acquisition and crew feedback display: (1) the US Army Institute for Surgical Research that is providing validated ultrasound lung and other body-part images, and (2) the Augmented Reality Group at NASA's Johnson Space Center in Houston, Texas, who have developed the HoloLens visual heads-up display and who will receive AMO-developed image analytics to help guide placement of ultrasound transducers for best imaging results. These collaborations are seminal to the final development of the MDSS.

The Game Changing Development (GCD) Program is part of NASA's Space Technology Mission Directorate. The GCD Program aims to advance exploratory concepts and deliver technology solutions that enable new capabilities or radically alter current approaches.

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