

Behavioral Health Policy for Human Spaceflight

Nathaniel P. Morris

INTRODUCTION: Government space agencies and commercial spaceflight companies are seeking to expand human space exploration. Spaceflight can place considerable psychological stressors on humans, yet policies to support behavioral health in human spaceflight are still in their nascent stages. This article reviews international and domestic space policy relevant to behavioral health, as well as existing gaps in policy frameworks regarding the behavioral health of spaceflight crew and passengers. This article highlights behavioral health policy for human spaceflight as an emerging issue and suggests principles to guide the development of such policy moving forward.

KEYWORDS: behavioral health, spaceflight, policy, regulation.

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As humans venture beyond Earth, researchers have investigated the psychological effects of human spaceflight. Some evidence suggests spaceflight may produce positive psychological effects for humans, such as imbuing space travelers with a sense of meaning and appreciation of Earth's beauty.^{36,66,73} However, there are concerns that human spaceflight, especially long-duration space missions, can cause varying degrees of behavioral health degradation. Factors in spaceflight with potential negative psychological impact include social isolation,⁴⁰ distance from home,⁴⁰ radiation exposure,²⁵ circadian rhythm disruptions,⁴⁵ and limited access to medical care.⁶ To better understand the psychological effects of spaceflight, researchers have conducted studies that include monitoring human cognitive performance in space,⁷² examining human behaviors in remote Antarctic research settings,⁶³ and even isolating international participants for over 500 d during a simulated mission to Mars.¹⁴

Despite growing research into the psychological effects of human spaceflight, policies regarding behavioral health during spaceflight are just beginning to develop. In contrast, U.S. federal and state authorities have established stringent regulations governing research and treatment of mental disorders on Earth. For example, many aspects of psychiatric care, from informed consent for medications to the use of restraints to medical confidentiality, are highly regulated.¹³ During medical training, psychiatrists and other mental health professionals need to familiarize themselves with statutory criteria for involuntary treatment, requirements for medicolegal documentation, and additional legal matters related to psychiatric care.⁶⁸

Such frameworks pertaining to behavioral health in human spaceflight largely do not yet exist, but behavioral health policies may become relevant as more people participate in space travel. More than 500 people have now flown into space and this number continues to grow.⁵⁹ Over 18,300 people applied for 12 positions in the 2017 astronaut class at the National Aeronautics and Space Administration (NASA), signifying extensive interest in human spaceflight.⁶⁷ Countries including the United States,⁷⁵ Russia,⁸¹ Japan,⁸³ and China⁸⁵ have announced preparations for human missions to the Moon and/or Mars. Companies including SpaceX and Virgin Galactic are also seeking to expand the reach of human spaceflight and are developing opportunities for space tourism.^{5,79}

More people traveling into space translates into greater risks of behavioral health incidents occurring during spaceflight. Surveys suggest approximately 30% of people worldwide experience a common mental disorder during their lifetime on Earth,⁷¹ and there is still a great deal to learn about the relationship between space travel and behavioral health. The impact of even short-duration weightlessness on the brain continues to generate surprises, such as the potential role of intracranial pressure shifts in the visual changes now identified in some astronauts.⁸⁸

From the Stanford University School of Medicine, Stanford, CA.

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Address correspondence to: Nathaniel P. Morris, M.D., 401 Quarry Road, Stanford, CA 94305; npm@stanford.edu.

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A 2016 NASA report stated, “even with excellent selection methods, the potential for behavioral problems among space flight crews remain [sic] a threat to mission success.”⁷⁰ Aerospace physicians have also warned that behavioral emergencies pose considerable risks to commercial spaceflight.⁴²

The need for policies to support behavioral health in human spaceflight is an emerging issue, and this article reviews existing international and U.S. space policy with relevance to behavioral health. This article examines policies for preflight behavioral health procedures, in-flight behavioral emergencies, and routine behavioral health services in space. Finally, this article proposes a set of principles to guide future development of behavioral health policies pertaining to human spaceflight.

Defining Behavioral Health Policy

Behavioral health policy in human spaceflight can come in many forms, three of which are described in this section. At one end of the spectrum, there are regulations, which may be defined as “a rule or order issued by an executive authority or regulatory agency of a government and having the force of law.”²⁷ Regulations are among the most rigid forms of behavioral health policy for human spaceflight, as violation of these rules may lead to government retribution via a range of civil or even criminal penalties. By comparison, guidelines may be a less strict, but also useful, form of behavioral health policy for human spaceflight. Guidelines may consist of an “outline of policy or conduct” regarding behavioral health in spaceflight,²⁶ generally as recommended practices developed by aerospace organizations and other stakeholders. Violation of guidelines may or may not incur government retribution depending on the extent of the deviation from recommended practices. In addition, standard operating procedures may include accepted practices that spaceflight operators commonly adhere to regarding behavioral health and space travel. These types of standards may develop outside government regulation as a result of “self-regulation” and incentives to avoid adverse behavioral health outcomes during manned spaceflight.⁸⁷

As the aerospace industry is poised to expand the horizons of human spaceflight, there is considerable debate about the extent to which government authorities should impose safety regulations on spaceflight operators, as opposed to allowing spaceflight operators to rely on best-practice guidelines and self-regulation.^{78,87} Some have argued that limited regulation at this time may promote growth for the burgeoning spaceflight industry.^{78,87} While this may be true during the early stages of human spaceflight development, a combination of regulations, guidelines, and standard operating procedures regarding behavioral health and space travel in the coming years may be essential to ensure the wellbeing of spaceflight crews and passengers in both state-sponsored and commercial space ventures.

Relevant Legal Frameworks

A 1995 article by Keefe remarked, “historically, there was no need to extend the realm of legal regulation beyond the planet.”⁴¹ Yet rising exploration of space in the last century, including the

launches of satellites, space probes, and crewed missions, has altered this reality. Twibell noted in a 1997 paper that “space law is becoming more complex daily,”⁷⁶ and legal oversight of human spaceflight can now seem like a labyrinth. In the United States, state and federal regulations may dictate rules for governmental agencies, such as NASA, and private organizations, such as SpaceX, seeking to send humans into space. International agreements further govern human activities in space. Some space endeavors, such as the International Space Station (ISS), involve multinational cooperation where jurisdictions and laws from a number of countries may intertwine.

Several international agreements carry implications for behavioral health in space. For instance, more than 100 state parties have agreed to the Outer Space Treaty of 1967, which calls for “freedom of scientific investigation in outer space,” rendering “all possible assistance [to astronauts] in the event of accident, distress, or emergency landing,” and holding states “internationally liable for damage” caused by their own objects launched into space.⁷⁴ About 90 state parties have ratified the Rescue Agreement of 1968 and the Liability Convention of 1972, which further delineated international duties to aid space travelers in need of rescue and liability in outer space, respectively.^{11,24} In 1998, more than a dozen countries signed agreements that laid out legal frameworks for operations on the ISS.¹⁰ The United States also signed a series of bilateral memoranda of understanding with ISS partners such as Russia, Canada, and Europe.⁴⁸ One part of these bilateral agreements directed the creation of multilateral medical support for crewmembers and established that the “principle of consensus” would guide medical decision-making regarding crew on the ISS.³⁰ Another part called for the formation of a multilateral review board to oversee human research protocols during ISS missions.⁴⁸

In the United States, federal legislation created NASA in 1958⁵² and recurring NASA Authorization Acts have provided funding for the agency and included a number of directives related to behavioral health during human spaceflight. Legislation in 1985 tasked NASA with conducting research “to ensure flight opportunities for a diverse segment of the American public, including a physically disabled American.”⁵³ Authorization acts for 1989 and 1992 reinforced that NASA workplaces should be free of illegal drugs and ordered the agency to create procedures to screen employees for alcohol and controlled substances.^{56,57} An authorization act for 1993 recognized that space programs can “make significant contributions to selected areas of health-related research,” sought to establish frameworks for biomedical research in space, and ordered the creation of international emergency telemedicine consultation satellite capabilities.⁵⁸ A 2005 act instructed NASA to study the “longitudinal health effects of space flight on humans” and to examine “the need for the establishment of a lifetime healthcare program for NASA astronauts and their families.”⁵⁴ Legislation in 2008 called for research into the “space weather impacts on . . . human health in flight” and a survey regarding astronaut health care.⁵⁵ In 2017, a NASA authorization act directed the agency to monitor and treat former astronauts for medical and psychological conditions related to spaceflight.⁶⁰

With regard to commercial spaceflight, U.S. laws since the 1980s have sought to spur private space ventures and to establish licensing requirements for commercial space travel.^{20–23,76,77,80} The Commercial Space Launch Amendments Act of 2004 addressed medical safety regulations, stating that commercial spaceflights should launch only if “the crew has received training and has satisfied medical or other standards ... in accordance with regulations promulgated by the Secretary [of Transportation].”²³ The law also stated, “the Secretary may issue additional regulations setting reasonable requirements for space flight participants, including medical and training requirements.”²³ Nonetheless, legislators have repeatedly delayed implementation of most safety regulations on commercial spaceflight operators with the hope that doing so might avoid stifling innovation.³⁵ In 2015, Congress passed the U.S. Commercial Space Launch Competitiveness Act, which extended this “learning period” and limited the Federal Aviation Administration’s (FAA’s) ability to implement certain safety regulations on commercial spaceflight operators until 2023.⁷⁷

Still, the U.S. Code of Federal Regulations includes some relevant regulations that have been issued by federal agencies for human spaceflight. For example, 14 CFR Part 1214 addresses spaceflight conducted by NASA, including regulations that astronaut candidates must be “medically qualified,” that medical information of the ISS crew warrants privacy protections, and that the ISS crew surgeon is responsible for the health of crewmembers.¹ 14 CFR Part 460 includes basic standards for licensing of commercial spaceflight ventures, requiring that crew with “safety-critical roles” must carry specific medical certificates, spaceflight operators must inform crew and participants of the risks of spaceflight, and spaceflight participants cannot carry weapons on board with them.³

Every White House administration over the last 30 yr has also unveiled policy initiatives for space exploration.⁴⁴ These directives have not necessarily addressed specific behavioral health policies related to human spaceflight, but have repeatedly called for expansion of human spaceflight. In 2017, President Trump signed Space Policy Directive 1, which amended President Obama’s directives and emphasized “the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations.”⁷⁵

Pre-Flight Procedures

Space policy in the United States and abroad has become more defined over the last several decades, but policies regarding behavioral health and space travel are still in their nascent stages. For instance, as governments and companies vie to expand human spaceflight, there are a number of uncertainties regarding preflight procedures, such as whether all spaceflight participants should undergo behavioral health screening, the degree of mental illness that might disqualify someone from spaceflight, the need for preflight training programs, and the kinds of safety measures that should be put in place to manage behavioral problems during human spaceflight.

Some standards currently exist for preflight behavioral health screening of spaceflight participants. In particular, NASA

conducts extensive psychiatric examinations on its prospective astronauts prior to selecting them.⁷⁰ U.S. federal regulations require that commercial spaceflight crew with “safety-critical” roles obtain an FAA second-class airman medical certificate, which generally disqualifies individuals with psychosis, bipolar disorder, substance dependence, or severe personality disorders.^{3,4}

Commercial spaceflight operators have not been required to adopt uniform screening procedures for spaceflight participants and, within this context, spaceflight companies may develop independent behavioral health screening policies. If commercial spaceflight becomes widely accessible, preflight behavioral health screening of travelers may become a point of future legal contention. Commercial spaceflight operators could theoretically ban people with severe mental disorders, such as schizophrenia or bipolar disorder, from participating in spaceflight. People with histories of suicide attempts, self-harm, substance abuse, or violence may be prevented from traveling on space vehicles.

Existing policies for airline travel provide some insights that might be useful in this regard. U.S. regulations prohibit airlines from refusing transportation to disabled passengers unless passengers’ disabilities pose safety risks that cannot be accommodated “by means short of refusal.”² Guidelines for airline travel by the Aerospace Medical Association (AsMA) state “persons with psychiatric disorders whose behavior is unpredictable, aggressive, disorganized, disruptive or unsafe should not travel by air.”⁸ However, the AsMA also maintains that precautionary measures may permit passengers with psychiatric conditions to fly on airplanes and also prevent in-flight medical events. Examples of such measures include using preflight medical clearance by a physician, medications to stabilize psychiatric symptoms, and reliable companions to travel with individuals with severe mental disorders.

For human spaceflight, the AsMA published guidelines in 2001 that psychiatric histories such as a prior psychotic episode, bipolar disorder, or suicide attempts should generally disqualify prospective passengers.⁹ In 2006, the FAA issued guidance on medical screening of commercial spaceflight passengers, stating that psychiatric conditions “that would cause an individual to become a potential hazard to him/herself or to others” may contraindicate spaceflight and should be reviewed on a case-by-case basis.¹² A 2012 report by the Center of Excellence for Commercial Space Transportation recommended that prospective space passengers should undergo screening for common mental disorders, substance abuse, and past suicide attempts.³⁸ The International Academy of Astronautics has also advocated for psychiatric screening of commercial space travelers.³⁷

Informing spaceflight participants of the risks of space travel prior to launch may also help prevent in-flight problems related to behavioral health. While professional astronauts learn extensively about the risks of spaceflight during their training,^{69,70} the FAA has mandated that commercial spaceflight operators must inform both crew and participants in writing about the risks of spaceflight.³ When introducing these regulations, the FAA wrote, “informing space flight participants of mission hazards and risks may help mitigate any behavior or reaction

during space flight that would jeopardize mission success and consequently public safety. For example, a surprise noise or abrupt vehicle motion during flight could frighten an “uninformed” space flight participant, causing that person to behave or act (e.g., panic) in a manner that could adversely impact mission performance ... Informing candidate space flight participants of risks may deter an individual from participating in spaceflight who otherwise would panic during flight and possibly create a situation that would jeopardize public safety.”¹⁶ These regulations include fairly specific language about the informed consent process, requiring that commercial spaceflight operators notify participants about known hazards, vehicle safety records, and opportunities to request additional information, among other details.³ Still, what constitutes a medical hazard in space travel and how much spaceflight operators must inform potential travelers about behavioral health risks during spaceflight has yet to be determined.⁷⁸

Beyond preflight medical screening and informed consent, the degree to which spaceflight operators should provide training exercises and/or simulate stressors associated with spaceflight for potential travelers remains unclear. For instance, NASA astronaut candidates undergo years of preparation prior to flight assignment, including training in conflict management, stress management, cross-cultural competency, flight simulation, and wilderness survival.^{69,70} U.S. federal regulations currently state that commercial spaceflight crewmembers “must demonstrate an ability to withstand the stresses of space flight, which may include high acceleration or deceleration, microgravity, and vibration,”³ but do not require similar qualifications for noncrew passengers.³⁴ Researchers are exploring whether training programs, such as providing laypeople with centrifuge exposure prior to simulated spaceflights,¹⁷ coaching,⁵⁰ instruction in guided imagery,³⁹ or virtual reality exposure,⁴⁹ may reduce psychological stress associated with space travel. One study suggested that a suborbital flight simulation might also be useful for medical screening purposes, as several individuals who initially passed general medical screening were unable to complete the centrifuge simulation as a result of anxiety reactions.⁶⁴

Whether spaceflight crew and passengers should undergo specific medical training related to behavioral health remains unsettled as well. NASA and other space agencies have developed extensive medical support for human space missions, including training crew medical officers to serve on space vehicles, providing 24-h telemedicine capabilities, and utilizing multinational medical advisory groups.^{30,47,70} U.S. federal regulations require that commercial spaceflight crewmembers complete training for “emergency operations” and to prevent the vehicle from harming the public.³ These regulations also require that spaceflight passengers must train for emergency situations, such as smoke or fire in the space vehicle. Existing regulations do not require further medical training of passengers or crew, though a 2014 report by the FAA recommended additional measures.³¹ For commercial spaceflight crews, the FAA report recommended training in aerospace physiology, fatigue management, the use of onboard emergency survival and medical

equipment, and “recognition of when an occupant requires medical attention that exceeds the capability of the flight crew and onboard equipment.”³¹ For commercial space passengers, the FAA report recommended training in the hazards of interacting with the space vehicle, aerospace physiology “commensurate with the expected flight and operational environment,” and how to respond to emergency situations.³¹

Space vehicle design is another example of preparatory planning that may mitigate the risks of in-flight behavioral problems, but where policies may vary. As an example, the ISS has an onboard medical kit with psychiatric medications, including aripiprazole, sertraline, and diazepam,³³ and “for extreme situations, a physical restraint system is available.”⁷⁰ U.S. federal regulations require commercial spaceflight operators “take the precautions necessary to account for human factors that can affect a crew’s ability to perform safety-critical roles.”³ Yet these regulations are lacking in specifics. It remains undecided the extent to which spaceflight operators should make available medical care systems for psychiatric management, such as telemedicine technologies, medications, or restraints.

The U.S. airline industry again provides useful lessons about the importance of preparation for in-flight behavioral emergencies. Airlines commonly stock planes with limited medical kits; oral and injectable antihistamines are often the sole medications available that might be helpful during an in-flight psychiatric emergency.⁵¹ The AsMA has recommended that airlines add an antipsychotic and a sedative anticonvulsant to their medical kits, but these guidelines have not been universally adopted.⁷ Further, airlines lack standardized physical restraint systems, which often forces crew and passengers to rely on improvisation during in-flight behavioral events.⁵¹ In several cases, airline travelers have resorted to duct tape or zip ties to restrain agitated passengers.^{19,32,62}

Preflight procedures pertinent to behavioral health warrant some degree of adaptation to the circumstances of specific spaceflight operations. For example, a brief commercial suborbital spaceflight may require different preflight procedures compared to orbital spaceflights or prolonged space missions. Similarly, commercial space passengers may have different preflight behavioral health needs compared to commercial spaceflight crewmembers or professional astronauts.

Nevertheless, space travel carries greater safety risks, costs, and isolation from ground-based medical support compared to most other forms of travel. To the extent possible within comparable spaceflight operations, standardizing preflight medical preparations, such as developing uniform screening protocols for passengers, medication kits, and crew medical training requirements, could help mitigate the risks of behavioral emergencies during spaceflight.

Behavioral Emergencies

“To date, no behavioral emergencies have occurred before or during any U.S. space flight,” according to a 2016 NASA report.⁷⁰ However, if human spaceflight becomes a widespread and stable enterprise, a behavioral emergency will eventually occur in space. An astronaut might begin hallucinating during a space

mission. A crewmember of a commercial spaceflight could become highly anxious, delirious, or manic. A commercial space passenger may become suicidal or homicidal after a space vehicle launches. Developing clear policies for these kinds of situations is essential in light of the inherent risks of human spaceflight.

The notion of behavioral emergencies occurring in spaceflight is not purely theoretical. Between 1981 and 1998, U.S. astronauts experienced approximately 1900 in-flight medical events during the Space Shuttle program—behavioral signs and symptoms represented 1.8% of these events, with “anxiety and annoyance” representing the most frequently reported behavioral events.⁷⁰ Studies of airline travel have found that in-flight behavioral emergencies are rare but still occur. Researchers have estimated that 2 to 4% of in-flight medical calls relate to psychiatric incidents and, among such calls, as many as 6% require aircraft diversion.^{29,46,65,82,84} One study recorded 287 in-flight medical calls for agitation or psychiatric emergencies out of 7,198,118 flights between 2008 and 2010, suggesting that approximately 1 in-flight behavioral emergency occurred for every 25,000 flights.⁶⁵

NASA has published guidelines pertaining to behavioral emergencies during spaceflight missions; in particular, if an astronaut were to become acutely psychotic or suicidal, the ISS Integrated Medical Group has developed step-by-step protocols for crewmembers to follow, including how to restrain agitated individuals and how to deliver sedating medications.⁶¹ The ISS multilateral medical operations have also developed protocols for responding to nonemergent and emergent medical situations aboard the space station.³⁰ For instance, nonemergent medical situations undergo review by multilateral medical groups to obtain response recommendations. When these reviews are not feasible in emergency medical situations, the crew surgeon at the primary ISS mission control center is responsible for providing recommendations to the ISS flight director.

ISS medical operations generally rely on consensus between multinational partners,³⁰ but how commercial spaceflight operators might approach in-flight psychiatric emergencies remains largely unknown. These ambiguities raise questions about space passengers’ rights and the criteria used for managing acute behavioral emergencies that occur during spaceflight, such as the administration of sedating medications or application of restraints to a highly agitated passenger.

One proposal might be that distressed space passengers posing a safety risk to themselves, to others, or to space vehicles warrant emergency treatment using the least invasive means required for stabilization. Using these kinds of criteria could help clarify when emergency treatment can be used in the management of behavioral health incidents during spaceflight. Developing explicit policies about who can make decisions for management of psychiatric emergencies, when different interventions (e.g., medications, restraints) might be indicated, and how to carry out these procedures could avert confusion and prevent adverse outcomes in human spaceflight.

Another complexity related to behavioral emergencies in spaceflight surrounds any potential transition of care for a distressed passenger or crewmember upon return to Earth. For example, if a space traveler were to be restrained in-flight,

receive emergent medications, or require spacecraft diversion as a result of a behavioral emergency, the distressed traveler would likely require urgent medical attention after landing. Government space agencies may have dedicated behavioral health teams that could urgently respond and provide support to professional astronauts under these circumstances;⁷⁰ however, it is unknown how commercial spaceflight operators might respond to such situations. A 2012 paper pointed out that spaceports for commercial spaceflight may be located in remote areas, far away from most medical institutions, and that emergency medical planning for commercial spaceflight events has been sparse.⁴³ The article provided recommendations regarding emergency medical planning for these situations, including establishing clear chains of command and the creation of charts for nearby hospital capabilities (e.g., availability of any helipad, emergency department, psychiatric unit).⁴³ Transitions in emergency behavioral management from spaceflight to ground-based care systems still raise unique questions around legal jurisdiction for involuntary treatment, medicolegal documentation, and patient confidentiality that may need to be addressed.

Routine Behavioral Health Services

Human space exploration has not yet progressed to the point where advanced medical capabilities, such as hospitals or clinics, exist in space. Yet routine behavioral health monitoring and the provision of supportive behavioral health services already exist for human spaceflight. U.S. astronauts undergo preflight, in-flight, and postflight behavioral health assessments to monitor their condition over time and to proactively respond to any issues of concern.¹⁸ On the ISS, crewmembers participate in private psychological conferences with ground-based behavioral health specialists every 2 wk, as well as undergo monthly neurocognitive assessments.¹⁵ U.S. crewmembers also have access to, and regularly use, sleep medications, including zolpidem or zaleplon, to treat intermittent insomnia and the effects of circadian dyssynchrony on the ISS.⁸⁶

If human spaceflight continues to grow more common, policies for routine behavioral health services may also attract scrutiny. While space agencies require periodic behavioral health assessments for their passengers and crew,⁷⁰ it is not yet clear whether commercial spaceflight operators would implement similar procedures for their space travelers. Varying lengths of space travel in terms of both time and distance may warrant varying intensities of behavioral health monitoring and supportive care for space travelers.

Similar to transitions in care for behavioral emergency situations, it is not yet clear how spaceflight operators might integrate routine behavioral health services between Earth and spaceflight. For example, the AsMA has noted, “it is not feasible to provide on a commercial airliner the equivalent of a ground-based medical care facility.”⁷⁷ This discrepancy currently holds true for space vehicles as well and carries uncertainties with regards to behavioral health policy. Spaceflight participants may wish to bring their home medications aboard space vehicles. Whether behavioral health data from spaceflight become part of someone’s medical record after returning home remains

unknown. Commercial spaceflight companies may or may not establish procedures for follow-up behavioral health care after passengers participate in human spaceflight. Further attention to these issues could help clarify the extent to which spaceflight operators should provide behavioral health support to space passengers and could potentially prevent escalation of in-flight behavioral problems.

Suggested Principles

As human space exploration expands, stakeholders, including government agencies, commercial spaceflight companies, aerospace medicine organizations, and legislators, can work together to develop clear policy frameworks for behavioral health in human spaceflight. In doing so, policymakers should consider the following principles.

First, behavioral health policy should promote crew and passenger safety and wellbeing in human spaceflight. The potential for behavioral emergencies remains a continual risk during human spaceflight and spaceflight operators should prepare for this reality. Amid growing interest in human space exploration, policymakers have the opportunity to develop regulations, guidelines, and standard operating procedures that enhance the likelihood of safe and successful space travel. These policies should ideally focus not only on maintaining the safety of the crew, passengers, and space vehicles, but also on proactively providing behavioral health support to maintain wellness among spaceflight participants.

Second, behavioral health policy should provide organized frameworks for handling behavioral problems during spaceflight. Behavioral health policy for human spaceflight remains in its nascent stages at this time and ambiguity can foster chaos during high-stakes situations. By creating clear regulations, guidelines, and standard operating procedures for behavioral health in human spaceflight, policymakers can address these ambiguities and help prevent adverse outcomes in space related to behavioral health. To the extent possible, standardization of behavioral health policies for comparable spaceflight operations can further achieve these aims.

Third, behavioral health policy for human spaceflight should avoid blanket rejection of participants solely because of a past history of behavioral or psychiatric conditions, wherever possible. If having ever experienced a behavioral or psychiatric condition is permanently disqualifying for human spaceflight, as much as 30% of Earth's human population will never be permitted to experience the benefits of space travel.⁷¹ Certainly, some individuals actively suffering from severe mental disorders, including conditions that cause hallucinations, delusions, disorganized behaviors, or suicidality, may be contraindicated from participating in spaceflight for safety reasons. However, current health status and the feasibility of accommodating behavioral health conditions should be considered during spaceflight participant screening. Publishing explicit medical criteria for partaking in space travel and rationales for these criteria, as the AsMA, Center of Excellence for Commercial Space Transportation, and other aerospace organizations have done, is one way to avoid unnecessary discriminatory practices.

Conclusions

Humans are poised to explore new frontiers in our solar system and the behavioral health of spaceflight crew and passengers is a key factor in ensuring successful space travel. Yet policy frameworks to support behavioral health in human spaceflight are just beginning to emerge. Government space agencies often address medical issues of their crewmembers through the principle of consensus, while commercial spaceflight companies have considerable autonomy at this time to decide how behavioral health will be addressed for their human spaceflight crewmembers and participants.

Every aspect of behavioral health in human spaceflight does not require legislative or regulatory oversight.⁷⁸ Still, human spaceflight is a growing and bold enterprise where clear behavioral health regulations, guidelines, and standard operating procedures could promote safe and successful space exploration in the coming years. This article provides a brief overview of some of the salient issues at stake regarding behavioral health policies in human spaceflight, including preflight procedures, behavioral emergencies, and the provision of routine behavioral health services. However, many more topics such as medicolegal liability, research participation, and psychiatric advance directives also deserve future attention in this regard.

Policymakers would be wise to begin crafting more explicit frameworks to support behavioral health in human spaceflight. As written in a 1962 paper on the legal oversight of space exploration, "time is of the essence, for space conquests will not await the will of the legislator."²⁸

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Author and affiliation: Nathaniel P. Morris, M.D., Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine, Stanford, CA.

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