

Advances of Space Medicine Applied to Epidemics and Pandemics on Earth

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Introduction

Background

- International Health Regulations [A]
- Preparedness [B,D], containing measures [C] (face masks [E])
- Precision global health [F]

Perceived

- Mixed information, need of more
- Research become more “democratic”
- Gaps: preparation vs reality -> implementation

[A] Gostin et al. 2015, The Lancet.

[B] Nuzzo et al. 2019, Johns Hopkins University

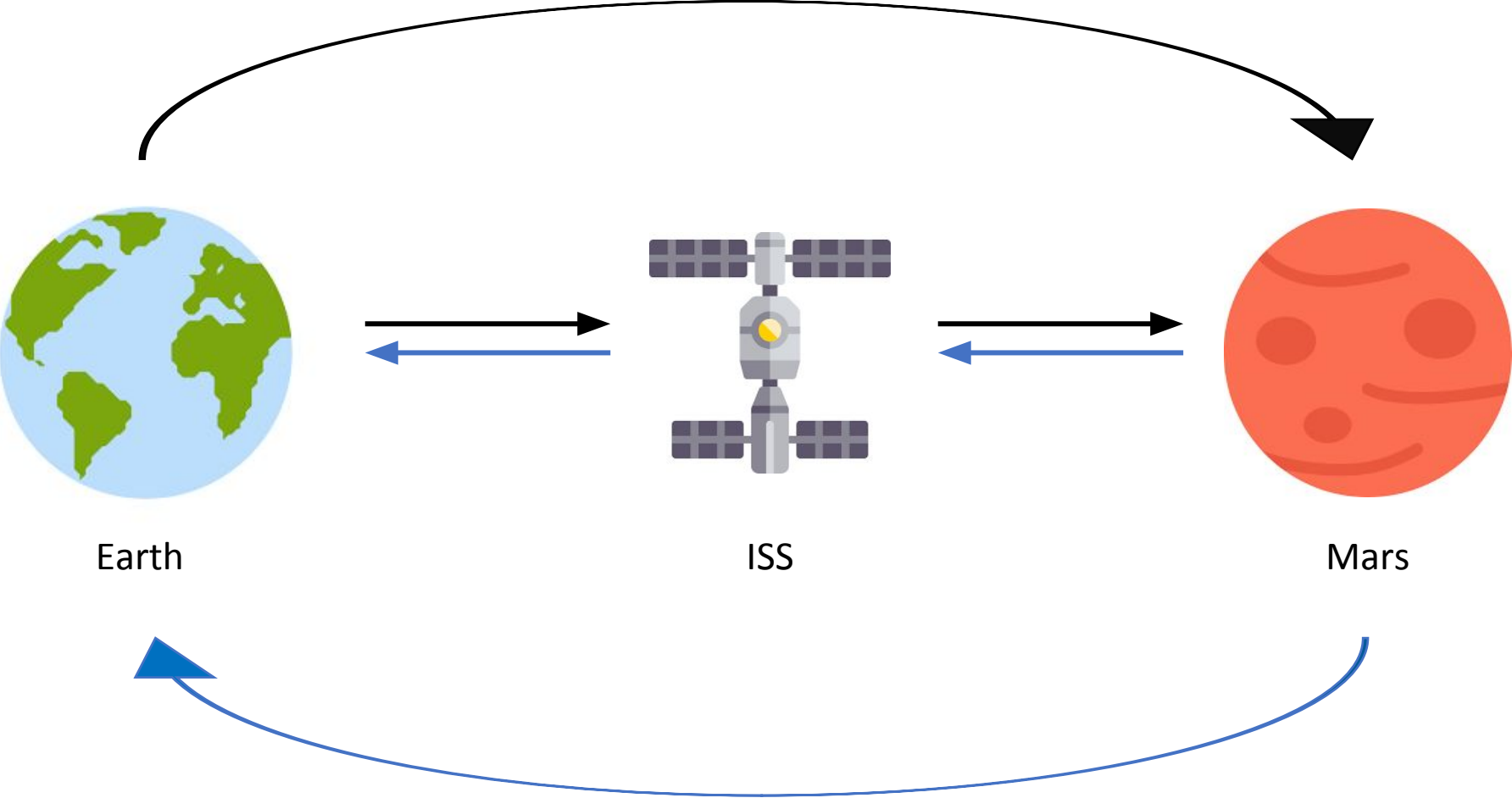
[C] WHO 2019

[D] GPMB 2019

[E] Feng 2020, The Lancet Respiratory

[F] Castaneda 2020, Journal of Global Health

Methods



Results

	Epidemic	Epidemic	Epidemic	Ground-based space missions	Spaceflights
<i>Challenges in healthcare</i>	<i>Health care personnel</i>	<i>People positive to COVID</i>	<i>People potentially exposed</i>	<i>Analogue crew</i>	<i>In-flight Crew</i>
Lack of medical supplies	Yes ¹	Yes	Case dependent	Yes ³	Yes ^{3,4}
Lack of natural supplies	Yes ¹	Case dependent	Case dependent	Yes ³	Yes ^{3,4}
Lack of man-made/artificial supplies	Yes ¹	Case dependent	Case dependent	Yes ³	Yes ^{3,4}
Lack of potential rescue	Case dependent	Case dependent	Case dependent	Yes ³	Yes ^{3,4}
Lack of food supplies	Yes ¹	Case dependent	Case dependent	Yes ³	Yes ^{3,4}
Lack of personal protective equipment	Yes ¹	Yes	Case dependent	Case dependent	Case dependent
Limited healthcare personnel	Yes ¹	Yes	Yes	Yes ³	Yes ^{3,4}
Life-threatening conditions	Yes ¹	Yes	Case dependent	Yes ³	Yes ^{3,4}

[2] Cinelli I. 2020, Handbook of Life Support Systems for Spacecraft and Extra-terrestrial Habitats

[3] Brooks et al. 2020, The Lancet

[5] Li et al. 2008, Infectious Diseases Poverty

[7] Xiang et al. 2020, The Lancet Psychiatry

[8] Geuna et al. 1995, Acta Astronautica

Results

	Epidemic	Epidemic	Epidemic	Ground-based space missions	Spaceflights
<i>Stressors</i>	<i>Health care personnel</i>	<i>People positive to COVID</i>	<i>People potentially exposed</i>	<i>Analogue crew</i>	<i>In-flight Crew</i>
Isolation	Case dependent	Yes	Case dependent	Yes ²	Yes ^{2,8}
Confinement	Case dependent	Yes	Case dependent	Yes ²	Yes ^{2,8}
<i>Stresses</i>					
Depression	Yes ^{5,7}	Yes ⁷	Yes	Yes ²	Yes ^{2,8}
Psychosis	Case dependent	Case dependent	Yes	Yes ²	Yes ^{2,8}
Anxiety	Yes ^{5,7}	Yes ⁷	Yes	Yes ²	Yes ^{2,8}

[2] Cinelli I. 2020, Handbook of Life Support Systems for Spacecraft and Extra-terrestrial Habitats

[3] Brooks et al. 2020, The Lancet

[5] Li et al. 2008, Infectious Diseases Poverty

[7] Xiang et al. 2020, The Lancet Psychiatry

[8] Geuna et al. 1995, Acta Astronautica

Conclusion

- Gap -> transfer of knowledge, technology and clinical routine from space medicine
 - (Operational) stressors, stresses, environment and challenges are similar
- Advances of space medicine can boost existing efforts to contain epidemics and pandemics
 - Implementation
- Space-inspired (national) preparedness programme
 - Education in space medicine and infrastructure
- Research
 - Management, business



References

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- [3] S. K. Brooks et al., “Rapid Review The psychological impact of quarantine and how to reduce it : rapid review of the evidence,” *Lancet*, vol. 395, no. 10227, pp. 912–920, 2020.
- [5] Y. Li et al., “Experiences and challenges in the health protection of medical teams in the Chinese Ebola treatment center, Liberia: a qualitative study,” *Infect. Dis. Poverty*, vol. 7, no. 92, pp. 1–12, 2018.
- [7] Y. Xiang et al., “Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed,” *The Lancet Psychiatry*, vol. 7, no. 3, pp. 228–229, 2020.
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