



Cite this as: *BMJ* 2023;383:p2726  
<http://dx.doi.org/10.1136/bmj.p2726>  
 Published: 12 December 2023

## CHRISTMAS 2023: WORKFORCE CRISIS

### The space doctors

Few doctors get to go on real space missions, but they do conduct space research, often in extreme locations, **Mun-Keat Looi** reports

Mun-Keat Looi *The BMJ*

#### Biographies

##### Mission control: Sushmita Ramanujam

Radiology specialty registrar at Guys and St Thomas' NHS Foundation Trust.

Sushmita has worked for the independent UK organisation Space Health Research as first aider in the Mission Control team for analogue missions.

##### Antarctic explorer: Beth Healey

Emergency medicine doctor working in Switzerland.

As research MD for the European Space Agency (ESA), Beth spent a winter at the Concordia base in Antarctica, known as "White Mars."

##### Chief medical officer: Rochelle Velho

Clinical teaching fellow with experience in acute medicine, anaesthesia, and intensive care medicine.

Rochelle was chief medical officer for the Austrian Space Forum and has participated in expeditions to test space suits in extreme environments such as the Dhofar desert in Oman.

#### How did you get into space research?

RV: "I've always been interested in space. From the age of 11, my mum used to put me into a summer space camp—it was next to her PhD lab. We built rockets and competed to see whether physics translated into application.

"In my second year of medical school, I was Googling space medicine randomly at 3 am. I found the ESA website and what was the first course in aerospace medicine for medical students. I decided to apply.

"I spent a week at ESA's base in Cologne testing novel ideas for doing CPR in space, which we presented to a bunch of flight surgeons. This course opened doors: I found mentors, colleagues, and friends to collaborate with."

SR: "As I was nearing the end of my Foundation Year 2 (F2), I came across aerospace medicine—it's only been a thing in the UK since around 2016.

"I went to a couple of conferences and signed up to the London Space Network, a monthly networking event for people from all different disciplines. That's how I found out about the opportunity at Space Health Research. They had an open call for applications to take part in their missions, so I applied to be the first aider."

BH: "I've always been active and outdoorsy—my dad took me on my kayaking trip when I was four or five. I was inspired by the kids' TV show *Thunderbirds*. The whole idea of search and rescue, saving people, that's pretty much why I became a doctor in the first place.

"While at Bristol Medical School I did a week long space medicine physiology course at the European Astronaut Centre. Until that point I hadn't really been interested in space, but I'd always been interested in extreme environment physiology, mountain medicine, and expedition medicine.

"I went straight from foundation training in London to a job with the ESA in Antarctica. I knew about it from the course and a colleague at Chelsea and Westminster Hospital who had also worked in this post."

#### What do you actually do on a mission?

SR: "You're trying to simulate the conditions in an environment like the Moon or Mars or anywhere in space so that you can test out technologies and see how they stand up and whether they're appropriate to be used by a group of isolated people. But you also train future astronauts."

RV: "When I started in analogue missions (where researchers carry out field tests in places with physical similarities to space environments<sup>1</sup>) there was me and two other doctors in the whole discipline and that was it. Now analogue space medicine has grown into a bigger specialty, and I think that may be because of the Lunar Gateway (the planned extraterrestrial space station to orbit the Moon) plus multiagency/international collaboration planning an extraterrestrial space station on Mars. For that we need to have more testbeds for doing what we call 'quick, fast, and fail' to learn what works. To do that you need analogues."

SR: "Health and safety is the number one priority. Mission control teams are there to keep astronauts safe. Our task was to make sure we could always check on them (without them seeing us) at least twice a day to reduce their risk as well as for the whole mission."

BH: "In Antarctica, my day-to-day job as ESA doctor was to carry out experiments as directed by the scientists who'd designed them. Another non-ESA doctor was like the base GP. You have clear roles in case of emergency, where doctors work in collaboration, so there was some clinical role."

RV: "Much of my work with the Austrian Space Forum has been testing space suits in analogue environments. Suits weigh about 70 kg and take four to six hours to put on or take off. In some extreme Earth environments these suits have to reliably provide the wearer with oxygen and other life support.

"I've done four missions since 2013. The first time, I didn't realise it was going to be in the middle of nowhere on a glacier. I was terrified and excited in equal measure, as it was my first time on expedition as a doctor. A consultant cardiothoracic surgeon (Christian Lüthen) with me had all the knowledge and prior experience.

"Suits are expensive and take years to design and make. They had only two suits between them all for the mission, and one was compressing the shoulder and the brachial plexus in a way that could cause injury. We had to say they couldn't use it. And with one fewer suit, the astronauts could do fewer experiments.

"For someone who was an F2 doctor, I was making challenging decisions. When I was an F2 [in hospital] we were doing all the ward work but not making the high level medical decisions. We were told what to do by our senior consultants. Whereas in the space sector and on expedition, what was really refreshing was that I felt part of the conversation."

### Does the work translate to Earth based medicine?

SR: "An analogue mission this year included a study by the ESA about surgical decision making. For example, the astronauts had scenarios to act out, using an ultrasound machine to guide decisions. Another experiment involved monitoring the astronauts' heart rate variability and other physiological changes before, during, and after the study and mission.

"There was also an anthropology study about how extreme journeys affect personal identities. That's useful not only to understand the psychology that affects astronauts, but also the effects on refugees who make extreme journeys and are then isolated in new environments [in terms of] personal identity."

BH: "In Antarctica, we looked at the effects of artificial lighting on eyesight, which is relevant to shift and factory workers.

"I'm part of a UN Working group that looks at how we can exploit space R&D for global health, especially where medical care isn't accessible in developing healthcare systems. We use satellite monitoring to make predictions about outbreaks such as malaria, so mosquito nets can be distributed, for example."

RV: "On my aerospace medicine course as a student, I did a systematic review in CPR in space.

"It showed gender differences in delivery of CPR—you need to consider whether the person delivering CPR (or rescuer) is a man or woman.<sup>2</sup> This is because physiological differences (eg, a smaller body mass index) affect your ability to do CPR. Also, you can't just keep doing cycles because CPR is exercise and is unsustainable. I recommended that deliverers swap after two cycles of CPR to save more lives. That's now in the European Resuscitation Council handbook to be more aware of rescuer physiology during team-led CPR, and is also part of the guidelines for astronauts.<sup>3</sup> It's nice to see that what you think is a small piece of research makes a difference to people in real life."

Competing interests: none.

Provenance and peer review: commissioned; not externally peer reviewed.

1 NASA. Analogue missions. <https://www.nasa.gov/analogue-missions/>

2 Rehnberg L, Russomano T, Baers J, et al. What can CPR in simulated hypogravity teach us about CPR on Earth? *Resuscitation* 2014;85:doi: 10.1016/j.resuscitation.2014.03.025

3 Hinkelbein J, Kerkhoff S, Adler C, et al. Cardiopulmonary resuscitation (CPR) during spaceflight - a guideline for CPR in microgravity from the German Society of Aerospace Medicine (DGLRM) and the European Society of Aerospace Medicine Space Medicine Group (ESAM-SMG). *Scand J Trauma Resusc Emerg Med* 2020;28: doi: 10.1186/s13049-020-00793-y PMID: 33138865