The Promotion of Space-Based Telemedicine via UNISPACE and Looking Ahead

*Edward Burger**

1. Introduction

Looking to the past, this presentation describes the actions taken by the United Nations (UN) which have promoted space-based telemedicine and telehealth. It pays particular attention to the UNISPACE conferences (Conferences on the Exploration and Peaceful Uses of Outer Space) and additionally looks to what steps UN bodies are preparing for the future to further implement this technology.

The implementation of telemedicine applications, and increasingly via or integrating space-based systems, is a critical topic because of the wide-reaching benefits of these applications and their potential to improve the delivery of healthcare services. In particular, telemedicine enables medical services to bridge large distances and provide better healthcare outcomes where needed. It is the employment of Information and Communications Technology, and increasingly satellite remote sensing and communications technology, to enable healthcare professionals to communicate, transmit data, interact with patients, and conduct trainings, in myriad ways.

This topic is additionally important in light of the UN's potential to facilitate States to cement international cooperation in implementing this technology in existing or new public health programmes. As highlighted below, the UN in general and UNISPACE conferences in particular offer a forum for diverse stakeholders to organise around these issues. Moreover, the expanded use of these technologies will likewise contribute to the United Nations' *Sustainable Development Goal* n° 3, which aims to "Ensure healthy lives and promote well-being for all at all ages".[1] Ultimately, telemedicine deserves greater

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1 Sustainable Development Goal 3. United Nations, https://sustainabledevelopment.un.org/sdg3, (accessed 10.9.18)

implementation for all reasons referenced above. And given the growing affordability of these systems, the benefits of telemedicine become increasingly accessible for healthcare stakeholders, including clinics, health ministries, and humanitarian organisations.[2]

2. Definitions

The World Health Organization has defined telemedicine as:

> *The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities.*[3]

Concerning the **integration of space-based systems** into telemedicine, the 2011 *Final report of the Action Team on Public Health* of the Scientific and Technical Subcommittee (STSC) of the UN Committee on Peaceful Uses of Outer Spaces (COPUOS) adds that: *"There are three broad areas of space technology with direct operational applications and significant potential benefits for public health: satellite communication, global positioning systems and remote sensing space technologies."* [4]

It additionally states that:

> *The delivery of health and public health services through satellite communication applications is often focused in areas such as e-health, telehealth and telemedicine, through which health resources and health care are provided at a distance by electronic means. Although they have certain differences in their areas of focus, e-health, telehealth and telemedicine all work to provide health-care services using information and communications technology. Communication satellites have the potential to overcome the barriers posed by distance, time and lack of resources at hand in situations where immediate on-site care is not available.*

2 The Ultimate Telemedicine Guide – What Is Telemedicine? 25 May 2018, https://evisit.com/resources/what-is-telemedicine/, (accessed 10.9.18)

3 Telemedicine – Opportunities and Developments in Member States, Report on the second global survey on eHealth. 13 January 2011, http://apps.who.int/iris/bitstream/handle/10665/44497/9789241564144_eng.pdf;jsessionid=4CD9DB2DC9D63E81BA97EC0600E0AC10?sequence=1, (accessed 10.9.18)

4 Final report of the Action Team on Public Health: the use of space technology to improve public health. Committee on the Peaceful Uses of Outer Space – Scientific and Technical Subcommittee, 11 January 2011, http://www.unoosa.org/pdf/limited/c1/AC105_C1_L305E.pdf, (accessed 10.9.18)

3. Background

3.1 UN activity from the 1980s to 2000s

The UNISPACE conferences have closely followed telemedicine, and it has been promoted in numerous related documents: Although raised at UNISPACE II in 1982, it received its first significant discussion at UNISPACE III in 1999, and the expansion of telemedicine via space-based services was listed as one of 33 recommendations in the Vienna Declaration on Space and Human Development (itself a UNISPACE III outcome document).[5] Moreover, the UNISPACE III Report of 1999 lists the uses of remote sensing satellites in disease prevention, control, and monitoring; provides practical examples of telemedicine using mobile satellite communications for epidemic control; and recommends capacity-building and awareness-raising.[6] It finds:

> *States should raise awareness about the possibilities of remote sensing technology and the action required to meet the need for education at the highest level. In that context, the involvement of trained personnel, such as statisticians and epidemiologists, is an efficient and necessary way to speed up the process of capacity-building.*

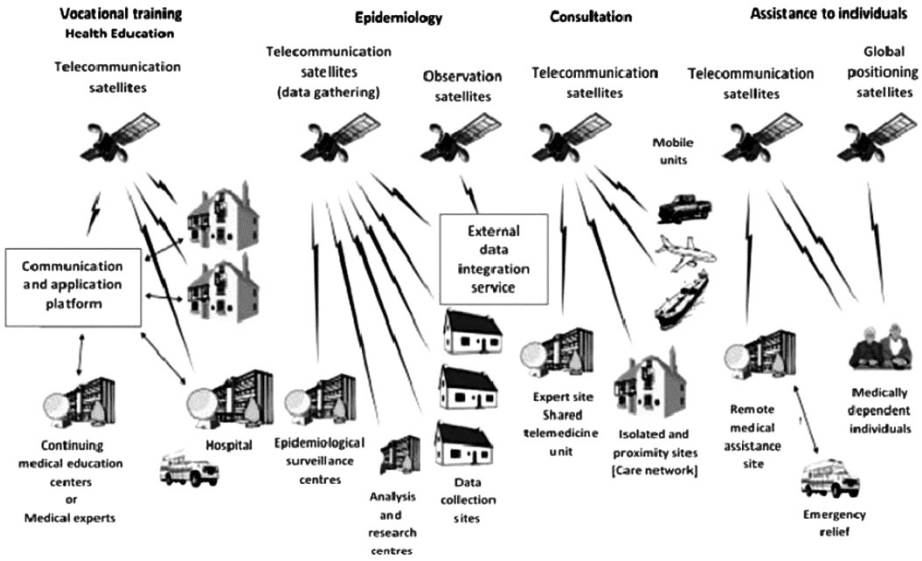
The UNISPACE III+5 Report of 2004 highlights that the COPUOS STSC adopted a space-based telemedicine work plan for 2004 to 2006, aiming to "identify ways and means of enhancing the capacity of developing countries to use space-based telemedicine systems and possible bilateral or multilateral projects to develop further space-based telemedicine applications through international cooperation."[7]

5 The Space Millennium: Vienna Declaration on Space and Human Development. United Nations Office for Outer Space Affairs, 30 July 1999, para. 1(b)(i) on pg. 2, http://www.unoosa.org/pdf/reports/unispace/viennadeclE.pdf, (accessed 10.9.18)

6 Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space. United Nations General Assembly, para. 126-129 on pp. 41-42, 18 October 1999, http://www.unoosa.org/pdf/reports/unispace/ACONF184_6E.pdf, (accessed 10.9.18)

7 Review of the implementation of the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space. United Nations General Assembly, para. 43 on pg. 11, 23 July 2004, http://www.unoosa.org/pdf/reports/unispace/A_59_174E.pdf, (accessed 10.9.18)

Figure 1. The roles of telecommunications, observation, and navigation satellites.[8]



The same report additionally refers to the five priority themes of the UN Programme on Space Applications adopted after UNISPACE III which include "satellite communications for tele-education and telemedicine applications" and describes the related work of COPUOS' Action Team on Public Health, whose stated mission was "To improve public health services by expanding and coordinating space-based services for telemedicine."[9]

3.2 Activities Since 2014

More recently, a number of official UN-related meetings and events have raised the role of space technology in telehealth:

8 **Retrieved in**: A. Bonnefoy & D. Gionet-Landry, Humanitarian Telemedicine – Potential Telemedicine Applications to Assist Developing Countries in Primary and Secondary Care. February 2014, https://espi.or.at/publications/espi-public-reports/send/2-public-espi-reports/150-humanitarian-telemedicine-potential-telemedicine-applications-to-assist-developing-countries-in-primary-and-secondary-care, (accessed 10.9.18)
Original source: The first operational networks monitoring re-emergent diseases. 16 January 2014, http://www.cnes.fr/web/CNES-en/5078-the-firstoperational-networks-monitoring-re-emergentdiseases.php

9 *Op. Cit.* – Review of the implementation of the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, pg. 119

- The Inter-Agency Meeting on Outer Space Activities (UN-Space) decided in 2014 that a special report should be prepared focussing on space for global health, which was ultimately presented to COPUOS at its 58th session in 2015.[10, 11]
- The aforementioned report discusses "Selected areas in which United Nations entities focus on the use of space science and technology for public health" as well as, in particular, tele-epidemiology, E-health, telehealth, telemedicine, public health, air pollution, disease tracking, and the use of space technology in disasters, among other topics.[12]
- At its 59th session in 2016, COPUOS endorsed seven thematic priorities for UNISPACE+50, including n° 5: "*Strengthened Space Cooperation for Global Health",* whose multiple objectives include: To *"improve the use of space technologies and space-based information and systems in the global health domain. Promote enhanced cooperation and sharing of information in emergencies, epidemics and early warning events, as well as on environmental parameters. Enhance capability in integrating health data in disaster management plans. Strengthen capacity-building in advancing space technologies in global health efforts. Identify governance and cooperation mechanisms to support this objective.*"[13]
- In its 2017 reporting, the COPUOS STSC Expert Group on Space and Global Health discussed the means to increase cooperation between space and health organisations in preparation for UNISPACE+50.[14]

Additionally, the Government of Switzerland, the World Health Organization, and UNOOSA jointly held a conference on Strengthening Space Cooperation for Global Health in August 2017. The event's documentation refers to the conference as a flagship event organised "to strengthen the ongoing processes in the lead up to UNISPACE+50".

10 Space for Global Health. Committee on the Peaceful Uses of Outer Space, para. 3 on pg. 1, 30 April 2015, http://www.unoosa.org/pdf/reports/ac105/AC105_1091E.pdf, (accessed 10.9.18)

11 Report of the Committee on the Peaceful Uses of Outer Space, Fifty-eighth session (10-19 June 2015). United Nations, 26 June 2015, http://www.unoosa.org/res/oosadoc/data/documents/2015/a/a7020_0_html/A_70_20E.pdf, (accessed 10.9.18)

12 *Op. Cit.* – Space for Global Health.

13 Report of the Committee on the Peaceful Uses of Outer Space Fifty-ninth session (8-17 June 2016). United Nations, para. 5 on pg. 50, 28 June 2016, http://www.unoosa.org/oosa/oosadoc/data/documents/2016/a/a7120_0.html, (accessed 10.9.18)

14 Third Meeting of the Expert Group on Space and Global Health, held on 2 and 3 February 2017, and initial considerations in preparation towards UNISPACE+50. Committee on the Peaceful Uses of Outer Space – Scientific and Technical Subcommittee, para. 3-4 on pp. 1-2, 7 February 2017, http://www.unoosa.org/res/oosadoc/data/documents/2017/aac_105c_12017crp/aac_105c_12017crp_28_0_html/AC105_C1_2017_CRP28E.pdf, (accessed 10.9.18)

Moreover, the conference was conceived "to review and consider space cooperation for global health related activities, and to bring together the space and the global health communities to also explore potential future projects and collaborations."[15]

Topics raised at the conference include, among others:

- "The need for specific tools and support for data analysis related to Sustainable Development Goal 3 that can be delivered through space technology and its applications"
- "Technological limitations in the use of all types of space-derived technologies (for example, GNSS and remote sensing)"
- "References to high-level actions that should be taken to strengthen the use of space-derived data and tools to support the achievement of the Goals of relevance to the global health domain."

The conference report also made many recommendations, notably on creating a "global financing mechanism to support wider application of space solutions for global health" and that "Member States are strongly encouraged to promote open data-sharing policies and participatory approaches in developing and improving access to all geospatial information relevant to global health".[16]

Moreover, the conference findings were to feed into the report on the UNISPACE+50 thematic priority n° 5, "Strengthened Space Cooperation for Global Health"; the resulting report "outlines possible ways to strengthen future work in promoting the use of space science, technology and applications in the global health domain" and provides a comprehensive overview of historical activity on "Strengthening Space Cooperation for Global Health" across different topics.[17]

Most recently, UNISPACE+50 took place over 18 to 21 June 2018, featuring a symposium and a high-level segment that overlapped two days with the 2018 COPUOS session. Additionally, the UNGA Resolution 72/79 of 2017 called for a "draft resolution on the outcomes of UNISPACE+50".[18]

15 Strengthening Space Cooperation for Global Health. United Nations Office for Outer Space Affairs, http://www.unoosa.org/oosa/en/ourwork/psa/schedule/2017/conference_who_tp5.html, (accessed 10.9.18)

16 Report on the United Nations/World Health Organization/Switzerland Conference on Strengthening Space Cooperation for Global Health. Committee on the Peaceful Uses of Outer Space, 18 September 2017, http://www.unoosa.org/oosa/oosadoc/data/documents/2018/aac.105/aac.1051161_0.html, (accessed 10.9.18)

17 Thematic priority 5. Strengthened space cooperation for global health. Committee on the Peaceful Uses of Outer Space, 31 October 2017, https://cms.unov.org/dcpms2/api/finaldocuments?Language=en&Symbol=A/AC.105/1172, (accessed 10.9.18)

18 UN General Assembly Resolution 72/79 Consideration of the fiftieth anniversary of the United Nations Conference on the Exploration and Peaceful Uses of Outer Space.

Ultimately, though, neither this Draft Resolution nor conference proceedings directly contributed to new decisions or activity on space-based technology and telemedicine.[19, 20]

4. Looking Ahead

However, the Report of the concurrent COPUOS session of 2018 states that the COPUOS' STSC introduced a new agenda item and working group on "space and global health" and that an associated work plan is to be presented at the next STSC in 2019.[21, 22]

Further, the draft resolution on UNISPACE+50 calls on COPUOS to develop a so-called Space2030 agenda and implementation plan for the UN General Assembly's 73rd session (beginning September 2018).[23] As such, the Space2030 agenda will be a UNISPACE+50 outcome.[24] The COPUOS note on "The 'Space2030' Agenda and the Global Governance of Outer Space Activities" states "The 'Space2030' agenda outlines a comprehensive and inclusive long-term vision for space as one of the key drivers for development". Moreover, the agenda is broken into four pillars:

- "Space economy: development of space-derived economic benefits;
- Space society: advancement of the societal benefits of space-related activities;

United Nations General Assembly, 14 December 2017, http://undocs.org/A/RES/72/79, (accessed 10.9.18)

19 Draft resolution entitled "Fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space: space as a driver of sustainable development". Committee on the Peaceful Uses of Outer Space, 16 May 2018, http://www.unoosa.org/res/oosadoc/data/documents/2018/aac_105l/aac_105l_313_0_html/V1803310.pdf, (accessed 10.9.18)

20 UNISPACE+50 Programme. United Nations Office for Outer Space Affairs, http://www.unoosa.org/documents/pdf/unispace/plus50/UNISPACE50_Programme_Overview.pdf, (accessed 10.9.18)

21 Report of the Scientific and Technical Subcommittee on its fifty-fifth session. Committee on the Peaceful Uses of Outer Space, para. 12-14 on p. 42, 14 February 2018, https://cms.unov.org/dcpms2/api/finaldocuments?Language=en&Symbol=A/AC.105/1167, (accessed 10.9.18)

22 Report of the Committee on the Peaceful Uses of Outer Space, Sixty-first session (20–29 June 2018). United Nations, para. 217 on pg. 29, 5 July 2018, https://cms.unov.org/dcpms2/api/finaldocuments?Language=en&Symbol=A/73/20, (accessed 10.9.18)

23 *Op. cit.* – Draft resolution entitled "Fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space: space as a driver of sustainable development". para. 2

24 L. St-Pierre, The UNISPACE+50 process and the Space 2030 Agenda. United Nations Office for Outer Space Affairs, pg. 16, http://www.un-spider.org/sites/default/files/Keynote-LucStPierre-UNOOSA_0.pdf, (accessed 10.9.18)

- Space accessibility: access to space for all;
- Space diplomacy: building partnerships and strengthening international cooperation and the governance of space activities."[25]

The second of these, concerning "space society", includes Objective 2.1 – Space for Global Health, which finds "there should be enhanced cooperation and sharing of information in emergencies, epidemics and early warning events, as well as on environmental parameters, and enhanced capability in terms of integrating health data in disaster management plans"; it additionally offers a range of implementation recommendations. Chief among these, "A dedicated platform should be established for effective coordination among United Nations entities, other international organizations and relevant actors, on space and global health issues."[26]

5. Conclusion

This paper only scratches the surface of the UNISPACE and, more broadly, UN-related work that has happened in the integration of space technology in telemedicine and telehealth activity. However, the above reveals the large priority UN space-related stakeholders place on the integration of space-based telemedicine and telehealth systems in working towards their healthcare objectives. With the adoption in 2015 of the 2030 Agenda for Sustainable Development, and the introduction of the Space2030 agenda, the UN has defined a clear role for space systems in global development activities.[27] Looking ahead, further research will assess the efficacy of past and recent policies concerning the adoption of space-based systems towards the related objectives.

25 The "Space2030" agenda and the global governance of outer space activities. Committee on the Peaceful Uses of Outer Space, pg. 2, 13 December 2017, https://cms.unov.org/dcpms2/api/finaldocuments?Language=en&Symbol=A/AC.105/1166, (accessed 10.9.18)

26 *Idem*, para. 94 on pg. 16

27 The Sustainable Development Agenda. United Nations, https://www.un.org/sustainabledevelopment/development-agenda/, (accessed 10.9.18)