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| ITU Logo | INTERNATIONAL TELECOMMUNICATION UNION**TELECOMMUNICATIONSTANDARDIZATION SECTOR**STUDY PERIOD 2017-2020 | FG-AI4H-H-002-R01 |
| **ITU-T Focus Group on AI for Health** |
| **Original: English** |
| **WG(s):** | Plenary | Brasilia, 22-24 January 2020 |
| **DOCUMENT** |
| **Source:** | TSB |
| **Title:** | Summary notes – 8th ITU-WHO Workshop on Artificial Intelligence for Health (Brasilia, Brazil, 21 January 2020) |
| **Purpose:** | Information |
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| **Abstract:** | This document contains highlights of the presentations and discussions at the 8th ITU-WHO Workshop on Artificial Intelligence for Health (Brasilia, Brazil, 21 January 2020). The background and programme is found at [https://itu.int/en/‌ITU-T/Workshops-and-Seminars/ai4h/202001](https://itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001). This revision corrects a typo in the document. |

# Session 1

Mr Simão Campos (ITU) performed as master of ceremony for the opening session.

## Leonardo Euler de Morais

As a regulator one of ANATEL's duties is to promote connectivity. We should foster humanistic connections.

Ethical issues are very important, just like standardization issues related to AI.

AI is a convergence of multiple technologies, but people should be at the centre.

## Maria Claudia Ferrari de Castro

We need to bring back to the benefits to patients.

UNESCO is working with Brazil on their AI strategy.

AI should be promoted towards a humanistic approach

The government will regulate the use of AI in Brazil.

AI4H is not a new area, but recently has been enabled by technological advancement. AI can help efficiency in health systems, at the same time that it opens many areas of concern. To make best use of these developments and ensure that they are person-centric in a meaningful way, international dialogue is fundamental.

## Alberto Tomasi Diniz Tiefensee

AI has the potential to improve the quality of health services provided to the population. It is important to invest in capacitation of medical professionals so they can cope with the advancements in technology. The Ministry of Health in Brazil is committed to that vision and with cooperating with the Ministry of Science, Technology, Innovation and Communications (MCTIC) to take advantage of the benefits these tech innovations will bring.

## Maria Almiron

AI is more than just robots and automated driving, applications in areas such as health. She encouraged the meeting to discuss the very relevant challenges around the use of AI for health, and said PAHO was happy to host this meeting.

## Thomas Wiegand

AI for Good is the idea that you CAN use AI for bad but you should use it for good. A big question for us was how to move forward once research is done, hence the need for benchmarking, etc.

The AI and Health communities speak different languages and part of the work of the FG-AUI4H is to promote common understanding.

We need digital health at scale around the world - the FG is designed to help achieve that.

FG-AI4H is looking for more leaders and drivers to get the work done.

FG-AI4H is planning a meeting with medical device regulators (IMDRF) in Singapore, March 2020.

The FG is also investigating AI4H within digital epidemiology.

# Session 2

Moderator: Monique Kuglitsch (Fraunhofer HHI, Germany).

## Lina Porras, 1DOC3, Colombia: 1DOC3, Healthcare for the rest of us [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/Lina_Poras_Presentation.pdf) ]

In Latin America, it can be expensive and difficult to access health services.

9 out of 10 people can’t access a doctor when they want

There is opportunity for virtual care in emerging economies to improve

* Long wait times
* Shortage doctors
* Lack of primary care systems
* Growing private markets

Only 5% have private insurance; sometimes for the 95% of the ER is the only primary care they can get if they don’t want to wait for months

Resources tend to be concentrated in urban areas/cities

14 million unintended pregnancies each year in Colombia because of misinformation, stigma, lack of access to contraceptives, etc

1Doc3 works by 1) User answers questions 2) AI powered digital triage 3) resolution

* The human doctor receives info from the questionnaire without having to spend time asking them him/herself
* Saves time for the doctor and the patient
* Also, the patient benefits as sometimes people don’t feel comfortable telling things to a person, would rather write it down or tell it to a machine

### Questions

* Should the patient privacy be protected from the insurer?
	+ The patient approaches the insurer, 1doc3 is the backend
* How are the demographics
	+ Millennials
	+ Somewhat more women than men
* How many users?
	+ 1 million per month

## Mauricio Farez, CEO and Co-Founder, Entelai, Argentina [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/Mauricio_Farez_Presentation.pdf)]

Focus on image of image analysis (like radiology) to lower costs and increase results throughput.

In Medicine it can be important to have back-ups when assessing and/or diagnosing images, records, etc, especially when it is outside of your direct training

Cost is a pressing issue.

### Questions

Darlington: details of architecture, data, etc used? Can’t disclose, but treats each solution development case differently to deliver a working solution to the customers. Use public datasets. How much localization needed for Latin America (bias). Main factors impacting precision of the models: gender; demographics seems not to play a role for X-rays (not studied yet for cancer).

Impact of system in patient outcomes? Still working on it.

HR challenges?

* We generally don’t find much resistance from doctors, we expected higher resistance.
* Most of them, once they try it and see that it can be of help, have a good perception of the technology.
* One main comment that we get is that doctors didn’t think these kinds of services in Latin America.
* Sometimes some concerns over data protection. Doctors sometimes don’t want their patients’ data in the cloud

## Jose Luis Nuno Ayala, CEO, Unima, Mexico [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/Jose_Luis_Nuno_Ayala_Presentation.pdf)]

Current diagnostic technologies not suited for universal coverage

Unima is a start-up company in Mexico developing an approach to provide localized analysis, uploaded to a cloud server, rather than relying on centralized labs. Outbreak and pandemics detection. Blood sample taken into a card and analysed. Uses chimeric recombinant shark antibodies on paper; the microfluids provoke a reaction (colour, fluorescence) that is analysed by AI on a smartphone (instead of relying on a medical professional to interpret the results on the card). Immune reaction generates visual patterns in paper device. DIagnostics Platform as a Service. Specific tests are developed according to the interest for a particular customer (eg MSF). Uses supervised training at the beginning.

How to validate results and avoid false positives? Do clinical trials and use “golden standards”, and optimized for a particular in the diagnostics protocol. For example, Dengue analysis is for pre-screening.

Dependency on camera quality? Developed with a low res camera, important that the pj=hone be able to do the processing. Before one can use a phone there is a qualification process (take pic from card and send to cloud server; this is analysed and a decision to enable or not is taken). Bad shots are rejected.

## Saul Calderon Ramirez, Instituto Tecnologico de Costa Rica; De Montfort University: Artificial Intelligence for medical imaging applications: experiences in Costa Rica [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/Sa%C3%BAl_Calder%C3%B3n_Ram%C3%ADrez_Presentation.pdf)]

Q Why has Costa Rica had such success with AI to bolster the health system as compared to other countries?

A We still are having conversations with our national health system administrators, we have over a year of having the Eagle(?) system.

## Panel Discussion

From the technical perspective there is a lack of metrics to measure how good the data is, a systematic way to compare performance with other architectures...especially in a field as sensitive as health

A problem with finding enough Spanish language resources, as well as finding representative data (e.g. sometimes only have data of mostly millennials)

# Session 3: Regulations and Country Priorities

Moderator: Ana Riviere-Cinnamond (PAHO)

## Juliano Accioly Tesser, Anvisa, Brazil: "Software as Medical Devices Regulation in Brazil" [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/Juliano_Accioly_Tesser_Presentation.pdf)]

Medical device regulations in Brazil - New regulation to be issued in early in 2020. The definition of medical devices include software devices. The review process of a license application takes about 60 days. ANVISA works follows the work of IMDRF.

Software as Medical Devices Regulation in Brazil

* Brazil is the 5 largest country about size and population
* The country hopes an increasing of 1.1bi to 1.8 bi in MD market
* Brazil actually has 41 medical robots
* Anvisa is the Brazilian regulation agency, that is responsible to regulate medical devices, including AI
* Licence of medical devices is represented: 26% national MD and 74% international MD
* Development of regulation for software as medical device and medical software (publication forecast for first semester 2020)

Some new challenges:

* How to regulate AI as software-as-medical-device?
* Traditional paradigm of medical device regulation was not designed for adaptive AI technologies
* How to submit to Anvisa AI in SaMD changes

## Alejandro Lopez Osornio, Health Informatics Specialist, Observatorio de la Salud, School of Law, University of Buenos Aires, Argentina: Argentina: Advances of AI implementations in healthcare [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/Alejandro_Lopez_Osornio_Presentation.pdf)]

Process for certification of software medical devices cannot follow the traditional model as many of the traditional aspects are irrelevant (eg casing, expiration date, etc). Few countries are evolving their medical device certification regulations, like Brazil.

There is an ongoing discussion that started in 2017 around Digital Health and AI in Argentina.

There are many lingering issues in Argentina around AI, eg privacy (can patient data be sold?), data interoperability to allow data use by AI.

## Marcos Lacayo, Estacion Vital, Nicaragua [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/Marcos_Lacayo_Presentation.pdf)]

Briefly presentation about non communicable diseases (NCD) in Central-America (60% of deaths), justifying the necessity of a different kind of health access.

Estación Vital are kiosks where people can have access to preventive tools, eg tensiometer, scale, eye sight check, telemedicine platform, access to doctors, nurses, etc. It is simple, but many people do not have access to the basics. Will do referred to doctors that work with them. First step gateway to health care. Combination of analogue, digital and a person assisting in the data collection. So far, 300,000 preventive evaluations, more than 95,000 users. Some improvement indicators provided. Tool uses AI-based questionnaire. Knowledge-based algorithm, not yet using correlation methods.

## Andrés Valdivieso, Director de Innovación, Nuevos Negocios, Fundador, Chile [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/Andr%C3%A9s_Valdivieso_Presentation.pdf)]

The inflection point for AI already happened (2017), regulations are needed. Various countries preparing roadmaps for AI, Chile has started the process in 2020.

## Panel:

Speed of change brings the biggest challenge to regulatory frameworks of “software as medical device”.

FG-AI4H is preparing some documents for discussion with IMDRF members at the collocated meeting in Singapore, March 2020. Invitation for regulators to join the FG-AI4H WG on Regulatory Considerations.

# Session 4: Fundamentals of AI in Health

Moderator: Andreas Reis (WHO)

AI is transforming health à diagnosis, public health and some other areas. Besides its revolutionary evolution in health care, AI also poses risks and ethical dilemmas:

* Bias in the design and output of algorithms
* Responsibilities and accountability of technologies companies within the delivery and administration of health care
* Safeguarding individual patient rights (privacy, autonomy, informed consent)

Timeline:

* 2017: Ethics in Big Data and AI for UHC
* 2018: world congress of Bioethics Special Symposium
* Upcoming: 2020 – Who bulletin on machine learning, big data and AI; guidance on ethics and governance of AI for health

Looking for practical guidance with case studies and use cases.

Are special ethics guidance needed specifically for the AI case?

2nd meeting in Copenhagen WHO office, 5-6 March 2020. Some topics: should there be a “patient’s bill of rights”? Open for observers.

### Questions:

How to handle different ethical norms? Cultures agree on broad ethical principles, they are quite universal. The divergence comes in the specific implementation within the many cultural contexts.

Will formal frameworks be used to define Ethics? Use cases can help make . Have a quite diverse group of experts that subscribe to the different ethics schools.

## Alexandre Chiavegatto Filho, Laboratory of Big Data and Predictive Health Analysis (LABDAPS) of FSP / Universidade de São Paulo, Brazil: Machine learning in healthcare in Brazil [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/A_Filho.pdf)]

Review of a number of machine learning projects in their lab in USP.

Using little data amount was able to have good prediction of death risk in SP.

The predict studies of the USP group associated life expectancy, quality of life, risk of death, etc. As variables, it also was considered socioeconomics and demographics information to compose the algorithms.

Use structured, annotated data to feed the predictive algorithm.

## Mario Barbe Abrigo, Clinica Alemana de Santiago, Chile: Evaluation of an automated bone age estimation method [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/Mario_Barbe_Abrigo_Presentation.pdf)]

Specific project for predicting bone age and growth.

Used 1500 x-ray images (carpal) for children under 16 years of age

Measured correlation of the algorithm results with experts (0.91~0.93), difference observed of about 2 months.

## Milan Didara, Founder, CEO and CTO, Eniax, Chile: Healthcare Communication [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/Milan_Didara_Presentation.pdf)]

Creation of “Patricia”: communication in health, an AI solution using NLP and ML to summarize / classify patient issues and contact a human being to handle the problem using a number of communications means. Also used to manage appointments, eg reduce no-shows. Created bonding between patient and system, reduced no-shows by 50% and increased satisfaction by 80%.

First project of the team group was to create a mechanism to remember the patients about their consult. By communicating the patients, up to 50% decreased of no show and increased 12% of the clinical occupational.

Now a days, Patricia monitors the patient journey and follow-up

Situation Numbers: 3 years of training, 4 countries, and 5 couches (3.2mi patients)

## Jhonatan Tirado, University of San Marco, Peru: Cardiopulmonary diseases diagnosis using chest x-ray images and deep learning [[Presentation](https://www.itu.int/en/ITU-T/Workshops-and-Seminars/ai4h/202001/Documents/Jhonatan.pdf)]

Winning project of a Panamerican Organization contest.

Low rate of doctors per inhabitants in Peru.

Peru in general (urban and rural) doesn’t have enough physicians for the population, as result in long lines and less specialists into the public healthcare.

Use of chest xrays to detect cardiopulmonary diseases.

The group uses the public dataset to diagnosis 14 cardiopulmonary diseases. 112,120 frontal thorax x-rays, 51,708 of which contain up 14 cardiopulmonary disease patterns, the others 61,000 didn’t present any pattern.

There is great potential with this technology, recognizing the challenges to make the applications reliable.

## Panel

Questions were mainly directed to the type of data and methodologies applied into the studies presented.

AI it’s a mechanism to help the healthcare, not to replace

# Closing session

Moderator: Thomas Wiegand (Fraunhofer HHI, Germany)

This was a long and informative day. Highlighted three key areas:

Medical devices: Clear that we need standards that help people around the world to help people develop medical devices with quality / performance. Continuous requests. Safety is essential. All invited to join this effort.

Digital epidemiology: topic highly connected. Looking at data of patients as a group. There is a large need to progress and bring new methods

Health and delivery systems: Transform data and make delivery of health more effective. Data collection and annotation App project in the FG. WHO is very supportive of this effort, areas of initial interest of outbreaks.

There are different types of AI, each with their particularities. Nevertheless, it became clear that AI needs methodology to guarantee the quality and applicability. This workshop is to bring together academy, states and companies to develop intelligent solutions to AI in healthcare.

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