Technology in Telehealth

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When I was invited to submit an article on Technology in Telehealth for this issue my immediate response was to subdivide "Technology" into its various components as enumerated in Fig 1 and elaborate each one of them, spelling out advantages, disadvantages, limitations of each component, necessity to integrate the devices etc. This would be followed by a ritualistic description of the basic components necessary for facilitating a teleconsultation (Fig 2), the primary objective being to produce a "wow" effect for the beneficiary. To complete the article and show the potential of technology I would use Fig 3 to illustrate technology at its highest. However, I subsequently felt that readers of this issue should not be exposed to technology *per se* particularly from a non-technologist!! Rather they need to know the views of a medical doctor, a clinician who belonging to the BC era (Not Before Covid but Before Computers!) has during the last 46 years, been convinced that technology in health care is only a tool, a means to an end and not an end by itself. Solutions should not go in search of problems. Statistically significant scientific evidence is required to prove that use of the technology has made a difference in the ultimate outcome and was better than intervention with reduced or no technology. To quote Lars Leksell the inventor of the Gamma Knife, which 50 years ago was the most sophisticated technology in healthcare. "A fool with a tool is still a fool". After all, when one has a hammer everything around you looks like a nail, particularly if it is an expensive hammer!!

One needs to be future ready, complying and adhering to all technical standards and regulations. All components need to be interoperable and scalable. Use cases in deployment of technology include care coordination during a Natural Disaster, a pandemic and routine health care. First aid kits today should have rugged *Tablets* which can improve communication, clinical decision support and data capture. Wireless devices can capture pulse rate, BP, Oxygen saturation, transmit heart sounds, lung sounds, ECG etc. Healthcare providers and response teams need to set up a broadband network to facilitate communications and share data, from the disaster area with health systems providing emergency care from a distance. In early 2018, AMD Global Telemedicine and Jenisys Global joined forces to create a rapid response telehealth clinic – basically a specially equipped storage container – that could be either transported on a truck or ship or airlifted into a disaster zone. The so-called "specialized health pods" come with their own power source and satellite-based broadband connection, HVAC (Heating, Ventilation and Air Conditioning systems) and waste disposal units and clean water source. The pods can be set up in 15 minutes.

It has been estimated that at least 300 million wearable devices were sold in 2020. Varying from sensors during pregnancy through baby monitors and fitness trackers the scale of digital health devices for the family is widening. Smart textiles monitoring ECG, respiration, and movement have been used to provide virtual remote health care in extreme environments. In one study signal quality was adequate in 111 out of 115 recordings and 90% of the subjects found the vest comfortable. We now have access to more data than ever. A smart watch displays heart rhythm and oxygen saturation levels. Non-invasive methods for determining blood sugar are now available. Blue tooth enabled POCD (Point of Care Diagnostics) can with a drop of blood estimate renal, liver and cardiac functions. 42 tests can be done with results similar to those obtained with giant analysers. 12 years ago, I had written articles on "A doctor in your pocket, a lab in your pocket, a hospital in your home". I would never have foreseen that this would be a reality in my home town in my life time and the best is yet to come!! Useful and actionable data is everywhere. A truly integrated experience is now possible, by connecting the dots leading to predictive analysis.

The Teleconsultation Process: Teleconsultation refers to the process of linking a patient and a doctor who are physically separated using Information and Communication Technology. I have repeatedly stressed that virtual interaction on any health-related issue cannot be compared to an eCommerce transaction. It is essential to know as much as possible about the individual having the problem as dissecting the problem itself. A live real time consultation should simulate to the maximum extent possible what the patient has been accustomed to so far. Lighting of the teleconsultant's chambers, professional attire and a body language which assures the beneficiary, that for the next 10 minutes the reason for the teleconsultant's existence, is only the patient! History taking, clinical examination and review of investigations all needs to be from a distance. Compliance and adherence to regulations will require getting an informed consent and ensuring privacy and security. Documentation of the teleconsultation process, with permission, is recommended. The patient needs to have basic digital literacy. Most are familiar with digital payment. To individuals like me, trained in the 20th century, the terms "client" "consumer" "health care industry" appear to diminish the sacrosanct individualised *one is to one* doctor patient relationship. In the last century health care was never viewed as an industry!!

There is an erroneous perception that widespread adoption, upscaling and deployment of Telehealth is solely related to availability of cost effective, affordable, accessible, user-friendly technology. There is no doubt that technology acceptance and behavioral modification, which we are witnessing particularly after the onset of Covid-19, has a major role to play. "Customer delight" is what every e Commerce platform aims for. The Amazons, Flipkarts and Googles of the world package their products in such a way that even octogenarians from rural backgrounds get hooked to an incredible experience. Whom

are we selling telehealth to? Who needs to get "hooked on" to experience virtual remote health care? How do you convince a worried or sick patient tens, hundreds, thousands of kilometers away that the specialist on the screen can do as good a job or even better than if he is holding your hands directly? How do you excite every individual doctor to evangelise Telehealth? This will happen only when his/her patient is convinced that telehealth is as good or better than a face-to-face consultation. 5G, bandwidth of 100 Mbps, a 55" hi resolution screen, a future ready voice activated EMR where images uploaded with ease at the remote end and digitally manipulated by the consultant, playing videos, a wide choice of highly secured payment gateways etc – the list can be never ending. All this hi tech no doubt will help, but are we not missing the wood for the trees.

What does a patient using Telemedicine really want, even in 2021? He wants TLC (Tender Loving Care) "Listen, listen, listen he is telling you the diagnosis" said Sir William Osler 150 years ago. When I give a teleconsult I still listen!! ***Patients do not care how much you know. They want to know how much you care***. Healthcare is personal - it is very hard to feel your experience was excellent, when those treating you don't introduce themselves, or make eye contact, or say what they are doing to you and why. The doctor's body language says it all. No AI, no technology will ever substitute for a doctor who empathises, sympathises with his far away patient, wiping the patients tears albeit virtually.

Alas the powers that be, including teleconsultants forget that providing remote health care is not like selling/ buying a pizza online or booking a train ticket. Technology helps in producing remarkable solutions. Telehealth will come centre stage in the core of the health care delivery system only if there is "Customer delight". No doubt technological advances are critical. An app a day may keep the doctor far away but I would still like my tech savvy doctor to be commiserating, to understand what *I* the patient wants, so that the right apps will be prescribed! Worldwide remote health care is driven by technologists, software/ hardware entrepreneurs, communication engineers, mobile network operators, CEOs of startups. manufacturers of peripheral medical devices, wearables etc. During the last 21 years 95% of the numerous talks, I have given and articles contributed (including IEEE!) have been requested not by health care providers *per se* but by the equally important support system stakeholders in the Telehealth ecosystem!! Medical colleges, medical associations, clinical societies seldom include Telehealth in a CME program. IEEE is more interested in Telehealth than IMA!! It is unusual to find a clinician giving up a lucrative medical or surgical career to embrace and evangelize telehealth. Mad Doctors and their happy patients propagating Telehealth can do wonders in promoting acceptance.

The clinician should be the first among equals if patients are to get excited about telehealth. It is the clinician and the patient who should primarily be taking the initiative to promote virtual consultants. Today it is the telehealth "industry" that is in the forefront for promoting digital health. A reproducible business model which takes into account "WiiFM" of every stakeholder in the Telehealth ecosystem is essential. "**W**hat **i**s **i**n it **F**or **M**e" cannot be brushed aside. Technology developers get their payment upfront. The success of a Telemedicine project – does not depend on technology alone. Behavioural modification and technology acceptance by senior citizens primarily depends on the enthusiasm of the teleconsultant.

When users are presented with a new technology, several factors influence their decision about how and when, they will use it. These include Perceived Usefulness (PU) – "the degree to which a person believes that using a particular aid would enhance his/her efficiency. Perceived ease-of-use (PEOU) is "the degree to which a person believes that using a particular system would be free from effort", If the technology is easy to use, then it is more accepted Perceptions are individualistic, depending on age, gender, circumstances and time to device use. People over 65 generally use fewer new technologies—including the Internet, smartphones, and other digital devices—and use them less frequently than younger people. Older, less educated, and less affluent people, as well as people with disabilities, appear to use them even less often.

A recent McKinsey report (https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/telehealth-a-quarter-trillion-dollar-post-covid-19-reality) indicates that strong continued uptake, favourable beneficiary perception and tangible investment in Telehealth is resulting in exponential growth of telehealth. Analysis in July 2021, indicates telehealth use has increased 38x from the pre-COVID-19 baseline. This stabilisation was after an all-time high of 78x in April 2020 compared to February 2020. This dramatic *necessity enforced change,* was enabled by increased consumer and provider willingness to use telehealth and regulatory changes enabling greater access and reimbursement. Perceptions of technology security needs to be addressed to sustain consumer and provider virtual health adoption. Models are likely to evolve to optimize hybrid virtual and in-person care delivery. In the USA maximum use of virtual consults is in psychiatry (50 %) and substance abuse treatment (30 %) .40 % opined that they would continue to use telehealth compared to 11% in the pre COVID-19 era. As of April 2021, 84 % of physicians in the USA were offering virtual visits. 57 % opined that they would prefer to continue offering virtual care. Venture capitalist digital health investment in 2020 was 3x the level in 2017. In the first half of 2021 alone it was $14.7 billion, compared to $14.6 billion in whole of 2020 and $7.7 billion in 2019.

"Customer delight" is not just a cliché used as marketing ploy. We need to develop tools to address specific problems never forgetting that the world has turned upside down. Digital natives and millennials need to get into the minds of octogenarians who appear to have come from another planet! The ultimate illustration of technology in Telehealth would be monitoring and providing healthcare 200 km above the earth to India's three Vyomanauts during the Gaganyaan mission (Fig **3** shows the author @ the Johnson Space Centre in Houston in Dec 2019). Circumstances and necessity will make all players understand that telehealth a tool for connecting and ensuring a continuum of care, will no longer be a choice but

will become a differentiator. Once a new technology rolls over you, if you are not part of the steamroller, you are part of the road. The writing is on the wall! Distance today is meaningless. Geography has become History! The sky is no longer the limit for Telehealth!

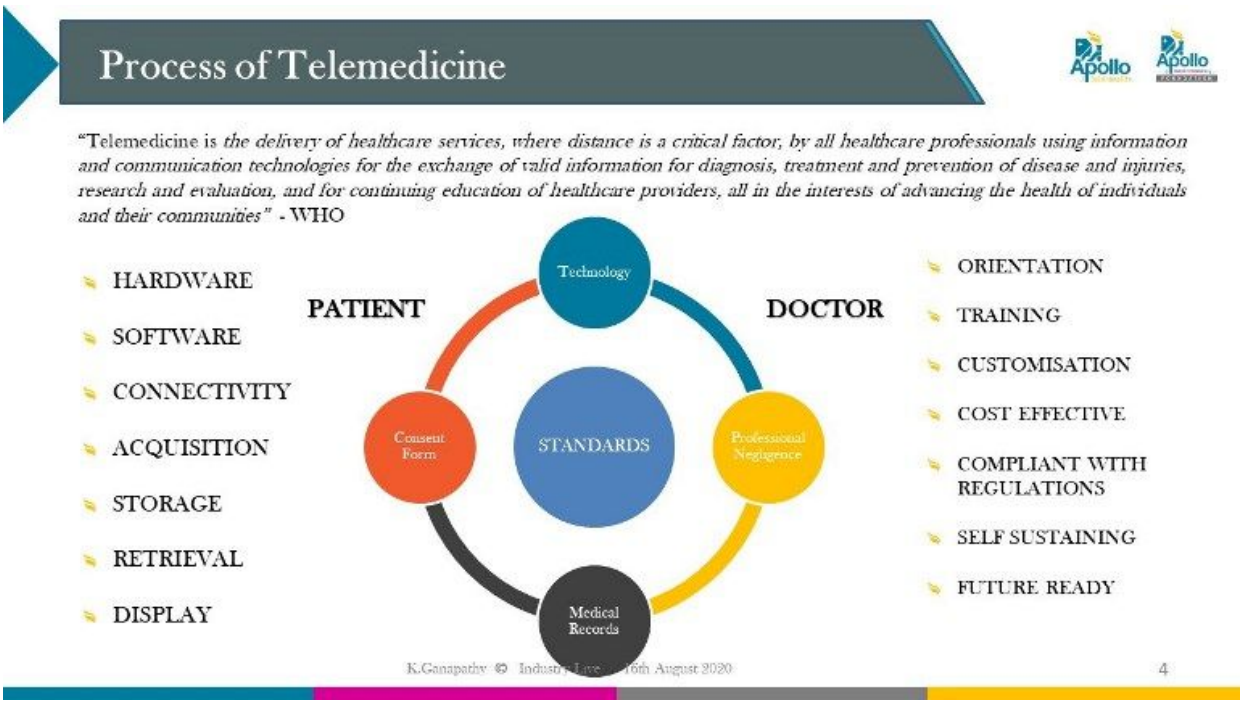

Fig 1 enumerates various components required to facilitate a teleconsultation

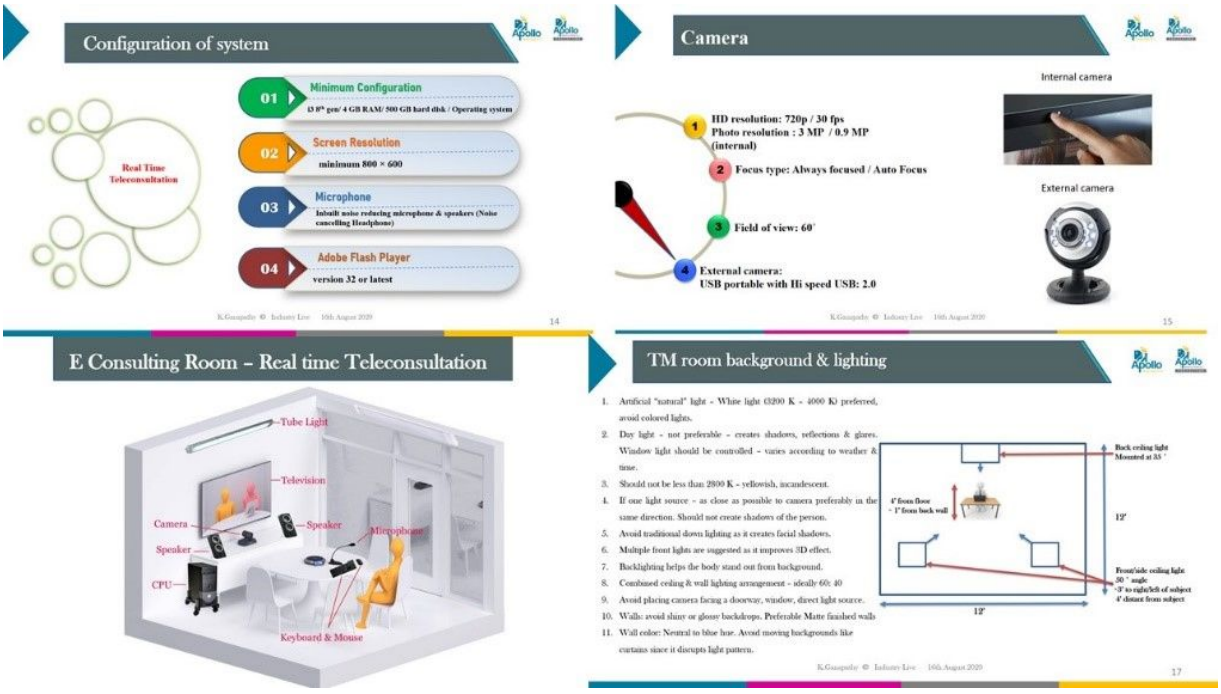

Fig 2 shows basic technical requirements and set up required to ensure "customer delight" during a Teleconsult

Closely interacting with Flight Surgeons monitoring the healthcare of astronauts on board the ISS and later with other astronauts who had stayed for months on the ISS was indeed a memorable experience - Astronaut on ISS seen live on the middle panel

Ultimate in deploying technology in Telehealth would be monitoring astronauts on mission to Mars

Fig 3 Author @ Johnson Space Center Houston in Dec 2019

About the author

Dr. Krishnan Ganapathy Former Secretary and Past President Neurological Society of India, Telemedicine Society of India & Indian Society for Stereotactic & Functional Neurosurgery is a Hon Distinguished Professor @ The TamilNadu Dr. MGR Medical University. Member Roster of Experts Digital Health WHO. Director, Apollo Telemedicine Networking Foundation & Apollo Tele Health Services. During the last 46 years, he has presented 558 papers in national conferences and 175 in international meetings. He has published 268 scientific papers & 21 chapters in books URL: www.drkganapathy.com EMail: drkganapathy@gmail.com

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