e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

PROSPECTS FOR 5G IN MEDICAL SECTOR

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ABSTRACT

The fifth-generation of cellular wireless technology can revolutionize healthcare by levereging its ability to provide high speed speeds up to 10 gigabits per second – 100 times faster than 4G. wireless connectivity. Along with its several other fields, it also has the potential to empower medical sector by integrating its usecases to the latest technologies that will be made possible to operate with the introduction of 5G connectivity such as extended reality (augmented/virtual/mixed reality), artificial intelligence, remote medical learning, patient care, and monitoring, to name a few. The requirement of information in near real-time for the improvement in functioning of the Healthcare system makes it a salient sector in the application of 5G technology.

Keywords: Remote Surgery, Internet Of Medical Things (IOMT), VR-Therapy, Telemedical Monitoring, Smart Hospitals.

I. INTRODUCTION

The introduction of 5G technology has created a lot of potential for imrovement in every aspect of commercial and personal sector. And Healthcare, being one of the most important aspects of any country or civilization, can also benefit hugely from this new advancement in technology. Most of the fields of moedrn healthcare sector rely on technology such as genome sequencing using cloud computing, emergency response in case of accidents, health and disease diagnostics through real-time patient monitoring, transfer of information about the patient among hospitals across the globe, remote health assistance using portable wearable health gear like smart watches, sensors such as ECG (Electrocardiography) working instantaneously, etc. All these technologies depend heavily on the speed of data transfer, and any flaw in the connectivity may prove to be fatal to the patient. So, with the 5G technology acting as the backbone of all these processes' communication, the entire process can benefit greatly, and function with more accuracy and effect. 5G even opens the door for new endevors in this field which were previously hindered by the limitations of connectivity capabilitoes of the netoworks, for instance, with 5G technology, now the the concepts like remote surgery, real-time and remote health monitoring, at-home health assistance, Internet of Medical Things(IoMT) integration in everyday life, and many more can be realised.

Usecases of 5G in Heathcare:

- 5G is projected to contribute $12 Tn in global economy
- It can lead to more jobs in Healthcare dept.
- 5G is almopst 40-50 times faster than its predecessor with a higher bandwidth and lower latency
- In 2023, Heathcare sector alone produced ~2300 Exabytes of data, which, when handled correctly, can prove to be of a very high value [ref. 1]
- Compared to 4G with about 4000 IOT device spport/square kilometer, 5G can support upto a million devices

Telehealth Monitoring:

- 5G can enable remote monitoring of patients from their homes by their physician using IoMT devices, like samrt watches, pacemakers, prosthetics etc.
- Patients can recieve their check-ups and prescription from their homes, which would reduce the risk of infections from in-person visits.
- People living in remote can recieve assistance without having to travel in far and unnecssarily.

Sensor Innovation:

- 5G has enabled the development of technologies that enable patient to perform basic health screening at their homes

- The information acquired in these screenings is transmitted to the hospitals for further inspections and communication between the sensors

Handling Big Data:

- With wearable devices, there is a large amount of data continuously being generated
- Massive amounts of data, such as this, requires systematic organisation, administration and analysis.
- With no limitation in regards to connectivity, doctors will be able to recieve necessary information on the patient, especially with more processes being handled online

Artificial Intelligence:

- Many medical services use AI for assessing and diagnosing the disease of a patient
- All these services rely on data to perform effectively, which is collected from all over the globe, and transmiited where it needs to be
- This transfer of data can be done efficiently using 5G technology without any delay or overhead
- This data can also be accessed remotely by the doctors on personal devices like thier smartphones, connected to the network, via 5G.

Virtual and Augmented Reality:

- Application of VR/AR in healthcare can introduce new methods for treatement leading to more efficiency and accessibility.
- It can help surgeons in their training for operations, or aid the surgeons during the actual surgery to increase accuracy and quality of treatment.
- 5G connnectivity will also ensure smooth and timely visualisation of images making the idea of remote surgery possible.
- In VR-therapy, patients face their problems in an emmersive environment, which lead has shown to improve quality of life and reduce depression.

4 P-medicine from 5G:

- **Predictive**: Constant flow of instantaneous data on patient's vitals along with lifestyle behaviour will help better predict risks to the patient
- **Preventive**: The ability to track and trace with unprecedented accuracy the trends and behaviour of large masses, especially in context to the current Covid-19 outbreak will help prevent avoidable health risks.
- **Personalised**: Real-time monitoring over 5G will help provide a more personalised healthcare experience and intervention.
- **Participatory**: 5G-enabled health ecosystem will help patients become more active in managing their own wellbeing and healthcare, enabling them to be more independent in taking actions and make lifestyle, and reduce overall costs in healthcare system.

Contemporary Challenges:

- 5G produces more radiation because it operates on a higher freaquency that can not travel very far. So, more numbers of cell towers are required for its operation.
- This is a major factor at play in dislike of the 5G technology, which leads some people to believe that there may be health risks associated with the operation of this technolgy due to higher radiation, such as cancer caused by the radiation. The Belgium governament had halted testing of 5G technology over rediation concern. Switzerland is set up a council to test the effect of 5G on people.
- However, according to WHO's agency for research on Cancer classifed some radio frequency radiation as possibly carcinogenic to humas, but the data was limited. And even pickled vegentables and coffee comes under this possibly carcinogenic radiation range.Hence, there is no actual danger from radiation of the frequency band used in mobile networks.
- Apart from these problems, there is also the obvious problem of infrastructural limitation. The coverage of 5G is very limited presently and the cost of infrastructure installation is expensive and possibly unaffordable for many countires.

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Technical Difficulties:

- There is also slighlty more heating in the towers due to higher frequency and more number of towers, but this factor is already taken in account during the manufacturing of these towers.
- Unlike the download speed which is over 1 Gb/sec, the upload speed in 5G is also lower than compared to 4G at only under 100Mbps. Furthermore, mobile phone devices will require better battery technology while operating on 5G thechnology, as it uses higher power and can cause heating effect in the mobile devices.
- There is also the issue of cybersecuriy introduced by the presence of high volumes of data over a 5G network. Currently, there is a lack of encryption methodologies specific to the 5G technology. This can enable malicious hackers to target their attacks more accurately and and to a larger extent. Moreover, the higher bandwidth will increase security monitoring strain on the network servers. Security patches are being integrated with each roll-out of the 5G technology, and there are several measure that are to be folowed to avoid any cyber threat.

Recent Developments:

- The Healthcare market is estimated to reach $3,667 million by 2026, at a CAGR of 76.3% during the forecast season. This can be attributed to adoption of IoMT-enabled medical devices and government activities.
- In May 2020, China-Japan Friendship Hospital became the first to deploy 5G indoor network, laying a foundation for exploration in 5G for telemedical services. This Hospital assists more than 5,000 hospitals across China.
- The connected Medical Devices segment accounted for the largest market share of 5G in 2020. These segments included ambulances, asset tracking for medical devices, AR/VR, connected medical devices such as smart watches. The segement is projected to reach $1,871.7 million by 2026 from $91 million in 2021.
- It is estimated that there will be 3.7 million robotic procedures in 2022, which is likely to be followed by a rush to adopt this technology by the rest of the hospital entities and publc-based healthcare.
- First ever remote surgery was conducted in 2019, in China. The operation was done by a collaboration of tech companies Huawei, China Mobile, and Chinese PLA General Hospital. The surgeon, Ling Zhipei, conductred the surgery from South China's Hainan Province on patient with Parkinson's disease at Chinese PLA General Hospital in Beijing.

How Corporations are capitalising on the opportunity:

- KT Corporation and Samsung Medical Centre in South Kroea have envisioned Smart Hospitals with 5G-connected cameras to allow high-quality video and audio stream to help resident doctors improve their education.
- Apacer's latest PCIe Gen4 x4 SSD is stepping up to the task of providing storages that can keep up with high speed network and provide high-speed, low-latency and stable operation during data transmission to be effectively used in AI image recognition for diagnosis.
- MagicLeap, a leading tech company ni the field of headsets for VR/AR, has recently decided to grant healthcare startups with early access to its second-gen AR headsets. One of the companies, SentiAR, allow doctors to see a 3D model of patient's heart while they operate.

II. CONCLUSION

With the improvement in connectivity abilities brough about by the 5G technology, every sector has something to gain. Healthcare being one of the most important parts of society, making the most out of this new technologiy's potentail will only lead to betterment of everyone everywhere. There are many opportuniteis for the healthcare sector to exploit this development, including integration of IoMT devices on a single network,analysing big data for training and development of AI for healthcare. Realtime monitoring of patients for pre-emptive risk management. Fast connectivity for audio-video streaming will help in implementing AR/VR applications in training and surgical processes, as well as for improving AI systems to detect, predict, and diagnose diseases. The Healthcare sector's integration also presents many opportunities for corporations and governments in creating jobs and making profits while making the whole process of healthcare more efficient, accurate, effective and accessible.

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