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Tele-medicine Legislation and Ethics Research of UK and Hong Kong

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Abstract. This paper aims to concretely analyze the latest telemedicine legislation innovations and make a concrete comparison between Hong Kong and UK. The medicine information encryption, data security rules, block-chain technique innovation and 5G technology should be applied. The purpose of this paper is to analyze the advantages of the telemedicine mode compared with the traditional treatment mode and give suggestions for the future telemedicine industry development.

Keywords: Telemedicine; Online treatment; Comparative study; Information technique; Block-chain; Technology innovation; Profit comparison.

1. Introduction

Telemedicine service refers to provide the internet-based information and service under remote medical conditions, and it is suitable for special environments by utilizing the advantages of remote diagnosis, treatment technology, data security protection, instant prescription, and special disease treatment. In large medical centers, the holographic imaging technology, new electronic technology, and computer multimedia technology are widely applied.

2. Telemedicine legislation of UK

The Great Britain's public health system operates in different ways owing to the varied community frameworks and public attitudes. The Quarantine Control for Covid-19 is one of the main measures for the prevention and control of the virus epidemic for the whole country, therefore, the telemedicine treatment involves the patients who are restricted on the personal freedom and will be implemented efficiently for the next decade.

According to the published medical bill in 1984, the public health, disease control act in 2008, and the health and social care act of UK in 2020, many local governments have to shoulder statutory duties in order to control the spread of infectious diseases Covid-19. The Home Secretary of UK is entitled the legal right to formulate laws and regulations in order to prevent and control events or accelerate the wide use of tele-medicine technologies. For the personnel in violation of the law concerning tele-medicine treatments, it will be up to the UK legal courts to enforce the specific punishments.

3. Legislation characteristics of UK

3.1 Remote disease surveillance

According to the UK telemedicine mode, remote patient disease monitoring is the mainstream, and this mode will continue to lead the expansion of remote clinic industries. This is because the medicine size for UK is comparatively large, and some areas have few residents and get relatively less accesses to the health care.

Especially for the medical institutions where patients are concentrated, minimizing the relationship between doctors and patients is undoubtedly an effective way to avoid cross infection and wide spread of virus. However, during the outbreak, many patients still need to seek medical service suggestions and guidance from doctors.

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3.2 Real-time interactive communication

The real-time interactive mode is the most rapidly growing medicine mode in UK, and this is mainly due to the efficient government legislation. The hospitals have gained the policy supports and real-time communication techniques between patients and the disease management system. The health care institutions can also set up this kind of remote medical consultation services and disease managements innovatively.

In addition, carrying out real-time interactive consultation and communication between general practitioners and specialists can also significantly improve the quality of medical services and the efficiency of medical treatments. Meanwhile, the patient satisfaction condition has also been greatly improved. Actually, the health department can update the triage plan in the system through the smart online system, which helps effectively control the spread of diseases and provide patients with advanced cares.

3.3 Storage-transfer information exchange service

In addition to the structured information, the database also provides a personalized approach for patients who need extra attention or care. The typical applied service is the storage-transfer information exchange service in UK. For example, for elderly people with bad physical conditions, patients with respiratory problems, and those with chronically underlying diseases, the database records their age, address, past medical records and other information, enabling medical staff to give them targeted care.

In UK, the mode of providing services can be decomposed into: Internet +, cloud storage, and intelligent terminal. Of the three technology models to enable remote services, Internet + will continue to lead the expansion of treatment service technologies. Cloud storage is the most rapidly developing technology, because it not only provides easy access to the information storage platforms, but also various hardwares and remote information communication systems.

4. Telemedicine legislation of Hongkong

Telemedicine service is well developed in Hongkong. The Hongkong Hospital Authority's electronic medical record (EMR) software system won the top prize in the Asia Pacific Information Technology Competition in early 2006. The advantages of the telemedicine system are that even if patients have been treated in different hospitals or public clinics, the diagnostic data can be accessed by different doctors through the remote computer system. The system will be extended to 500 private clinics, private hospitals and homes for the aged persons of Hongkong in 2021.

As early as 1998, the Hongkong Hospital Authority (HHA) began to provide telemedicine services for patients living in residential care homes through video conferences to replace the traditional outreaching or clinic-based services for the elderly. Although the telemedicine service scheme has brought many benefits, such as the reduced medical expenditure, better patient accesses and reduced attendances at the emergency cases.

5. Legislation characteristics of HongKong

5.1 Efficient legislation since 2018

In general, the development of telemedicine services in Hong Kong has been accused of falling behind in many aspects by the public, such as the lack of a fully-regulated framework for the use of new technologies, and the lack of openness by medical service providers to adopt innovative medical approaches. Therefore, the government and relevant health authorities have been called upon to take the lead quickly in planning and supporting the telemedicine services in Hong Kong since 2018.

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Since 2018, the measures published by Hongkong include: (a) exploring the wider use of telemedicine services in patient care through the "HA Go" APP application; (b) developing smart hospital measures to optimize the process of serving patients, such as plans for smart wards using mobile and internet technologies as a real-time data base; (c) to launch a big data analysis platform in December 2020 to support medical-related research projects. We should refer to the Hongkong Food and Health Bureau (2019) and GovHK (2020) for the recent progress of telemedicine care.

5.2 Ethics for telemedicine practice

he Hongkong Guidelines on Ethics in Telemedicine Practice set out a number of general principles for doctors who choose to replace the traditional mode of patient care or medical advice. It also reminds doctors that they have full responsibility of deciding whether telemedicine service is appropriate for treating heavy diseases. For this reason, as well as the lack of specific details and criteria, many doctors are cautious about providing telemedicine services.

Some qualified hospitals and medical schools in HongKong have also carried out this work. The medical school of HongKong University has established the "Telemedicine Center" with the support of the professional government funds. The telemedicine process enables patients in remote areas to obtain instant diagnosis and treatment, such as rural areas, mountainous areas, field survey sites, and battlefield, etc. It also enables medical experts to consult patients under different ethical conditions simultaneously.

6. Comparison of HongKong and UK

6.1 Diagnosis system design

According to HongKong’ s law, adopting an open source framework for keeping health records, so if you move these records from one hospital or organization to another one, you can see what they are used for the doctors and the patients. Remote patients can choose a doctor, schedule a video consultation.

It allows patients to make quick appointments on a mobile app, meet a doctor anywhere, and obtain the appointment report after each consultation. The first phase of the pilot project will focus on improving patient access to remote services and reducing management time for clinicians and administrators. After this first phase, the Hongkong doctors will provide the feedback to help the medical-chain refinement and develop the clinic products. The next version will integrate a set of blockchain-enabled security services that patients can safely use remotely.

The medical chain should be built on Hyper-ledger Fabric, an open source block-chain framework. The UK clinics and hospitals decide to go down this path because the healthcare industry is inherently complex. If they intend to build a block-chain from scratch and integrate it with healthcare service institutions, there would be a lot of benefits for the patients of UK.

6.2 Ethical standards

Traditional medicine requires high ethical standards, as does tele-medicine. Patient privacy, the data security, and the exchange of information between care teams are no less important than that of traditional medicine. The telemedicine also adds a dimension of making sure a doctor is aware of the truth that he or she is in screen, or seeing if patients are allowed to appear when they are conscious about their privacy security.

Compared with that of HongKong, several ethical considerations of UK are neither specific alone nor different from traditional applications. In terms of users, most of Hongkong's mobile medical enterprises regard patients or healthy people as the center of their business. In UK, patients, doctors, clinics, hospitals can be divided into three levels and serving for different levels of remote diseases.

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7. Technology innovation of telemedicine service

7.1 Data privacy technique legal rules

More and more patients are seeking medical treatments through online data systems. For example, by installing apps on mobile phones, they are able to contact doctors in corresponding departments to remotely submit their conditional descriptions and related materials to obtain diagnosis and medication suggestions. Actually, the telemedicine process involves a wide range of patients, doctors, hospitals and other private data, therefore, the data security are critical for the patients and doctors.

Compared with UK, the progress of telemedicine services in Hongkong has been accused of falling behind in many aspects, such as the lack of a regulatory framework for the use of new technologies in the provision of medical services, and the lack of openness by medical service providers to adopt innovative approaches to care for patients. Therefore, the government and relevant health authorities have been called upon to take the lead in planning and supporting the development of telemedicine services.

By encrypting the ledger, patient data can be turned into a healthy data stream. In addition, the decentralization of block-chain can open up the database of major hospitals that can be taken out and used. In this way, we can obtain a large amount of data, and form a super-ledger that is fast and high-throughput enough to meet the data processing needs of smart medicine. A decentralized medical database of records ensures the decentralized responsibility of medical data and the integrity of the data system

7.2 Block-chain technology legislation

The blockchain is a decentralized distributed ledger database that sequentially connects data blocks into a chain structure and uses cryptography technology to ensure that data cannot be tampered with and forged with high security. By encrypting the ledger, patient data can be turned into a healthy data stream. In addition, the decentralization of blockchain can open up the database of major hospitals that can be taken out and used. In this way, we can obtain a large amount of data, and form a super-ledger that is fast and high-throughput enough to meet the data processing needs of smart medicine.

For the healthcare industry, block-chain technology application has three important advantages: the first is high redundancy, because every node has a backup, which makes a single point of failure not compromise data integrity; the second is that data on the block-chain cannot be tampered with, and any tampering on the block-chain leaves cryptographic evidence that can be quickly discovered. In recent years, the block-chain technology is reshaping the medical industry. No matter for personal or medical institutions, block chain + deep development and application of the health care in the health industry effectively activate the medical data, linking the needs of the patient, the medical institutions drug firms, insurers, etc., at the same time, simplify processes, reduce costs, to improve medical and other industries environment has the practical significance, is a new exploration of multi-win-win situation.

7.3 5G technology legal rules

5G information technology refers to the Fifth Generation of Mobile Phone Mobile Communications Standard and it is an extension of 4G technology. The theoretical downlink speed is 10Gitb/s (up to 1.25GB/s under load). It can not only realize high-quality transmission of THREE-DIMENSIONAL images, so as to provide high-quality video services for high-speed mobile users, but also provide convergence functions such as data collection, real-time positioning and remote diagnosis and treatment in addition to communication information.

In terms of design concept, the core goal of traditional communication system design is the technology of information coding and decoding, physical transmission between dots, etc. 5G mobile system focuses on the mutual cooperation and networking of a wide range of multi-points,

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multi-antennas, multi-users and multi-cells, and deepens the key points to greatly improve the performance of the communication system. Its core objective is to improve the coverage performance and service support ability of indoor wireless network.

The telemedicine service based on 5G communication integrates the wireless communication technology of small devices and high-speed mobile communication technology in various modes, which can realize the operation of remote surgery, wireless remote consultation, patient monitoring and real-time follow-up, and the command and decision-making of emergency rescue events. The new technique not only integrates multimedia network and wireless communication technology, but also can support the safe and high-speed transmission of massive multimedia medical data.

8. The Regression Calculating Mode

An ideal road traffic environment is with only 3 patients and 2 doctors autonomously. Each time 3 patients take turns to be treated by these 2 doctors, one doctor for 2 patients and the other doctor for 1 patient. Each day before they set off, they decided how the tele-medicine would behave in the face of the patients. Also, assuming that everyone gets in the same times, then the author needs to make an informed moral decision by mathematical calculation . To be clear, TDD refers to the telemedicine diagnosis decisions and ITD refers to individual traditional diagnosis decisions[i]in the process of tele-medicine treatments.

The ITD probability is $0\times2+0.2\times0.2=0.04$. If everyone decides to set the detailed number, the expected death value TDD is: $0.2\times2+0.2\times1=0.6$. Obviously, and the calculation result of ITD is much smaller than that of TDD. Of course, the social consequences of the ITD approach are much worse than the TDD approach when the patients are in danger. The above calculations are made from the perspective of society as a whole, but we also need to think from the perspective of an individual comparing the advantages. If IMD is calculated, ITD $=1\times0.5+2\times0.5=1.5$; If TDD is used, the expected probability of collective moral decision TDD$=2\times1+2\times0=2$, and the death risk of instant telemedicine decision is smaller, therefore, the telemedicine diagnosis treatment mode is more profitable. The results calculated by the two algorithms are the same.

It can be seen that the adoption of the telemedicine environment leads to increased survival rates from both social and individual perspectives. In a society where all members of society choose the individual ethical setting mode, if an individual unilaterally maximizes his or her own safety by going to the hospitals, then the selfish individual moral decision mode will be his best choice,.

As a result, once the rest of society learns thatsomeone is choosing a selfish, self-interested calculating model, they are likely to abandon the moral public choice mode in favor of the strategy that will do the least harm to them by the means of traditional medicine treatments. The principles of minimum harm and general safety will gradually fail, resulting in an increase in the likelihood that each individual will be harmed because of the delay and insufficiency through traditional diagnosis. In a society where no one is willing to sacrifice himself for more patients and the actual number of medical accidents is bound to be higher.

9. Conclusion

In summary, the regression calculation mode proves the advantages taken by the TDD mode (tele-medicine decision mode) compared with the traditional diagnosis mode. Positively speaking, the policy guidelines of telemedicine service should be formulated to encourage the use of innovative technologies in the medical sector.

The author also recommend these measures as the research conclusion : (a) exploring the wider use of telemedicine services in patient care through the 5G technology application; (b) developing smart hospital measures to optimize the process of serving patients, such as plans for smart wards using mob data base; (c) To launch a big data analysis platform to support medical-related research project.

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10. Research expectation

The smart health system enables a new understanding of people's immunization status from a geographical perspective. If all medical data are concentrated in a few places, the wisdom of the clinical system is able to provide the patient information and specific treatement data accurately and efficiently. The tele-medicine legislation aims to find out the difference of immunization, the area of high incidence of disease, the targeted diseases, diagnostic resources and effective remote treatments and computer technology progress through the further research.

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