

# Construction of Telemedicine Service System along the Belt and Road

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**Abstract:** This paper analyzes the demands for medical and health cooperation along the Belt and Road, and proposes to establish a telemedicine service system along the Belt and Road by using the natural advantage of telemedicine in overcoming geographical distance limitations. The construction objectives and implementation path of the telemedicine service system are also proposed. Subsequently, implementation challenges in funding, language, talents, and technology are analyzed. Specific countermeasures and suggestions are proposed, including (1) building a multi-level and all-round financial support system; (2) applying a multiple language strategy where English is the common language, professional language talents are cultivated, and Chinese is timely promoted; (3) establishing a multi-disciplinary and new mode of talent training mechanism, and a tailor-made talent export mechanism; and (4) forming a continuous investment and operation mechanism through the establishment of a professional team.

**Keywords:** the Belt and Road; telemedicine; medical health; implementation path

## 1 Introduction

The construction of the Silk Road Economic Belt and the 21st Century Maritime Silk Road is a major decision made by the Party Central Committee and the State Council, for the benefit of people of all countries. Health is the foundation of the all-round development and livelihood of a person. For this reason, cooperation and mutual understanding in the field of health will surely become an important part of the construction of the Belt and Road. In June 2016, President Xi Jinping proposed in Uzbekistan that China is willing to work with countries along the route to create a “healthy Silk Road” and officially regards health as an important part of the Belt and Road Initiative (BRI). The BRI was first proposed five years ago, and the vision of the “healthy Silk Road” is becoming a reality with the cooperation with Central and Eastern European countries, in the fields of prevention and control of infectious and chronic diseases, vaccination, etc.; cooperation with Southeast Asian countries such as Myanmar, Vietnam, Laos, Cambodia, and Thailand in carrying out drug resistance prevention projects for the treatment of malaria; and cooperation with Central Asian countries in tuberculosis control. However, the BRI runs through Asia, Europe, and Africa. The countries along the route are widely dispersed. This geographical limitation and the

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differences in medical level and medical infrastructure among the countries create barriers to the interconnection of information and resources to a certain extent. Traditional medical cooperation has been greatly limited. In recent years, with the rapid development of information, communication, Internet of Things, and other technologies, and their integration with medical technology, the use of telemedicine has become widespread in the field of medical and health care [1–3]. Telemedicine integrates communication, computer, and network technologies; builds a networked information platform; connects medical institutions and patients in different regions; and conducts medical activities such as cross-regional medical services, education and training, and peer exchanges [4,5]. Moreover, it can overcome limitations of time, region, and geographical restrictions; integrate high quality medical resources; and extend the scope of medical services to provide new kinetic energy for medical cooperation among the BRI countries.

## 2 The demand analysis for medical and health cooperation along the Belt and Road

With the implementation of the BRI, China's exchanges with countries along the route have become increasingly close. Further, the health needs of people who participate in the BRI's construction have dramatically increased. Therefore, a sustainable Belt and Road health service system must be urgently established. To ensure the smooth progress of construction and long-term operation after the completion of construction, this paper systematically analyzes the needs of the Belt and Road medical health cooperation through literature review and expert consultation.

### 2.1 The health needs of Chinese people stationed abroad and the people along the Belt and Road countries

Since the BRI was launched in 2013, China's cooperation with countries along the Belt and Road has steadily advanced. According to the Commerce Department, the total volume of trade in goods from 2013 to 2018 between China and the Belt and Road countries exceeded US\$6 trillion, with an average annual growth rate of 4%. With the deepening of cooperation and exchanges with countries along the route, the number of personnel dispatched from China has continued to increase. According to the Commerce Department and International Health Exchange and Cooperation Center NHC PRC, by the end of December 2018, there were 997 000 Chinese laborers stationed abroad and 1 042 members from 53 Chinese medical teams distributed in 53 countries and regions. They face multiple health threats such as infectious diseases, traffic accident injuries, chronic diseases, and mental health risks; their health needs are increasing. In addition, the Belt and Road runs through Asia, Europe, and Africa, covering a population of 4.4 billion (about 2/3 of the world's population). Furthermore, health resources are unevenly distributed among the Belt and Road countries. Most countries in Central and Eastern Europe, some Commonwealth of Independent States (CIS) countries, and Central Asian countries have relatively abundant health resources, while most South and Southeast Asian countries, and some countries in West Asia and North Africa, still lack sufficient health resources [6]. The number of medical staff per thousand people in Afghanistan and India reaches only 0.7%–2.6%, far below the world average, and the number of beds per thousand people is lower than that of the average level of low-income countries (1.5%) [7]. There is an urgent need for high-quality health resources to meet the health needs of citizens. Both the Chinese personnel stationed abroad and the residents of cooperating countries along the Belt and Road have huge health needs.

### 2.2 Public health needs such as joint prevention and control of infectious diseases

Infectious diseases pose an important burden for public health and economic stability in the world. Old infectious diseases are “regaining tides,” and new infectious diseases are constantly occurring. Among the 23 infectious diseases regularly reported by the World Health Organization, there are 16 cases in the region and countries along the route, with higher incidence rates than those of China [8], especially in Southeast Asia and South Asia. Furthermore, the standardized disease mortality rate [9] and the disease burden [10] is also higher. The BRI has deepened China's trade relationships with the countries along the route, and the concept of the port has become more diminished. Various viruses may spread every day with developed international trade, transportation, and infected travelers. The increased risk of input and output among the Belt and Road countries has brought about a huge demand in international joint prevention and control of infectious diseases.

### 2.3 Demand for health care industry cooperation

China is the second largest producer and the largest exporter of active pharmaceutical ingredients (APIs). The

overall technical strength of China's pharmaceutical industry is constantly improving, and the health care industry is also in a stage of rapid development. In 2020, the total scale of China's health industry will exceed 8 trillion yuan. The Belt and Road runs through three continents of Asia, Europe, and Africa and constitutes a promising international health care industry market. At the same time, a survey of 217 Chinese and foreign guests invited to participate in the Belt and Road and the Healthy Silk Road high-level seminar showed that [11] the Belt and Road health cooperation will account for 91.7% of the foreign respondents and that the health care industry comprises the highest proportion of cooperation needs, accounting for 46.7% of the total.

Telemedicine is a new medical service model that combines modern medicine and computer and communication technologies. It can overcome the limitations of geographical distances through long-distance medical services including remote consultation, remote diagnosis, distance education, remote surgery teaching, remote monitoring, and remote Chinese medicine. Further, it is of great significance to promote the international flow of quality medical resources, cross-border joint prevention and control of infectious diseases, and medical and health industry cooperation.

### 3 Objectives and the implementation path of the Belt and Road telemedicine service system

#### 3.1 Objectives

The construction of the Belt and Road telemedicine service system aims to build an international telemedicine network covering many countries along the route through the deployment and normalization of telemedicine services to provide high-quality health care, and through the expansion of telemedicine services to provide platform support for cross-border joint prevention and control of infectious diseases and international emergency rescue operations.

#### 3.2 The implementation path

##### 3.2.1 Political consultation for building a telemedicine cooperation mechanism

For the construction of the Belt and Road telemedicine service system, we must first overcome political barriers and form a good political consultation system. Through political consultations, exchanges of high-level visits between the two sides should be strengthened in the health field; strategic cooperation agreements should be signed at the national level; and cooperation mechanisms for the construction of the telemedicine service system should be established. The construction and long-term cooperation of the Belt and Road telemedicine service system must consider policy support such as the provision of access to medical equipment, the promotion of telemedicine services and regulatory policies, and cooperation in international research projects. Simultaneously, participating countries should set up full-time management and regulatory agencies to coordinate the construction of the Belt and Road telemedicine service system. In addition, since the equipment and network input costs of the Belt and Road telemedicine service system construction are relatively high, China and countries along the route must agree on the proportion of funding input and appropriate special funds, based on the principle of friendly negotiation. The government's appeal and influence must also be exerted to attract social capital into the construction of the Belt and Road telemedicine service system.

##### 3.2.2 Setting up a platform to coordinate the construction of the system

The construction of the Belt and Road telemedicine service system involves many countries. Although the geographical distances between these countries are large, operations can be carried out through an integrated service platform: that is, the Belt and Road telemedicine integrated service cloud platform. The platform would be embedded with the service platform of the national telemedicine center and the regional telemedicine platforms. The overall architecture of such an integrated service platform is shown in Fig. 1. Medical institutions at all levels can access the telemedicine cloud platform through private networks, the Internet, etc., and allocate and coordinate international telemedicine services through the platform, including remote comprehensive consultation, remote imaging-electrocardiogram (ECG)-pathology diagnosis, telemedicine education, remote outpatient, remote monitoring, and joint treatment of international health emergency and emergency medical assistance.

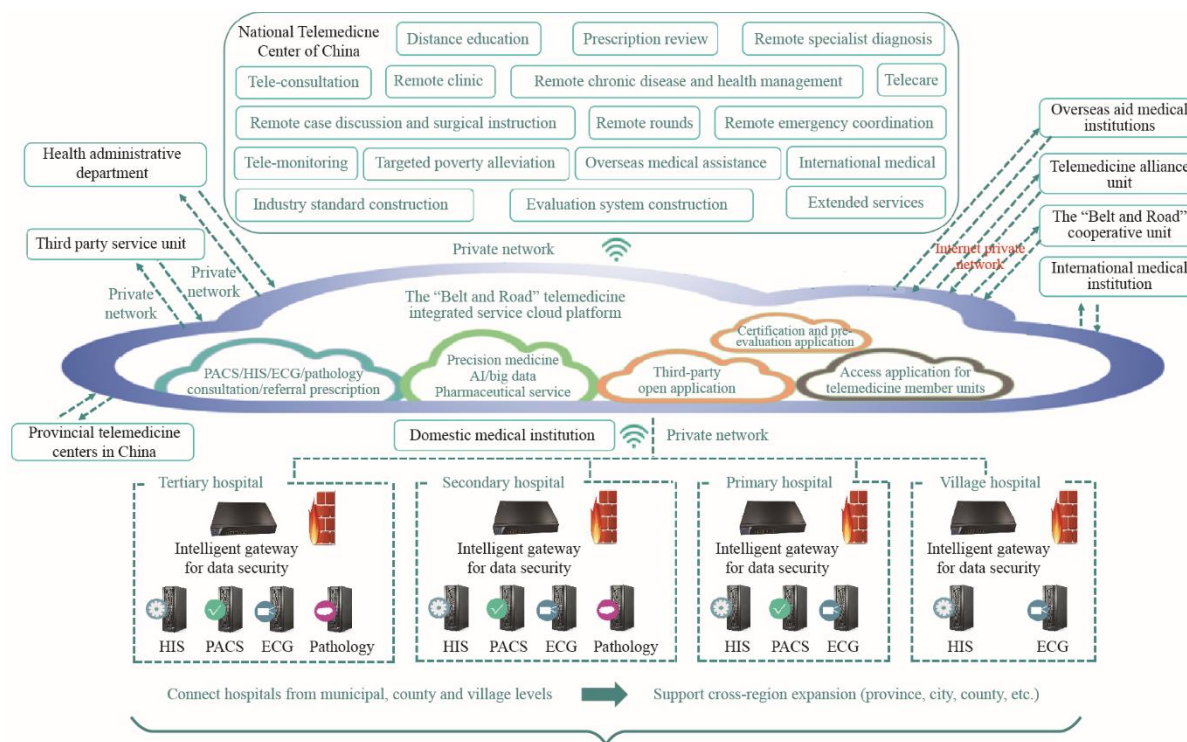


Fig. 1. The “Belt and Road” telemedicine cloud platform architecture.

Note: HIS is a computer application system for information management and online operation in hospital management and medical activities. PACS is a picture archiving and communication system.

### 3.2.3 A sound model to form a telemedicine operation mechanism

To ensure the healthy and sustainable operation of the Belt and Road telemedicine service system, different operational modes should be adopted for the different stages, forming the “two-stage” operation model. In the construction phase, focus should be on the investment from governments and the implementation of special management to ensure public welfare. In the operational phase, professional attributes of medical services should be followed, and professional operation should be implemented, as shown in Fig. 2. Simultaneously, a price mechanism that suits local conditions should be formulated, which takes into account the social and economic benefits of the Belt and Road telemedicine service system according to the actual situation of the economic and medical development of each country.

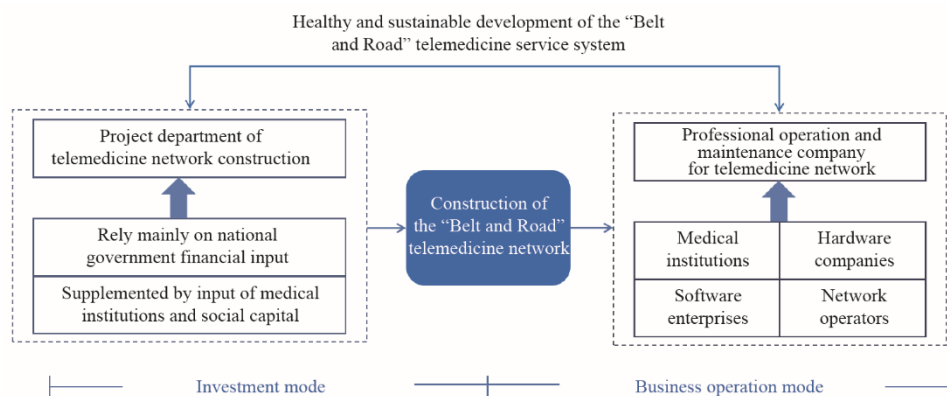


Fig. 2. The “two-stage” model of the Belt and Road telemedicine network construction and operation.

### 3.2.4 Developing standards to promote telemedicine promotion mechanisms

To ensure the promotion and application of telemedicine in countries along the route, it is necessary to clarify the standards for the construction of the Belt and Road telemedicine, including hardware and software standards, network link standards, data standards, clinical application standards, and management and security standards, to form a perfect Belt and Road telemedicine standardization system. Simultaneously, we should build a four-in-one

service support system of “policy, management, talents, and industrialization”, and establish a benefit evaluation system, including a “technology–economy–time–social” benefit evaluation system and a performance management system, to promote the benign operation of the Belt and Road telemedicine service system.

## 4 Challenges and countermeasures

### 4.1 Challenges

The international telemedicine field has accumulated more than 20 years of practical experience and come up with a set of effective norms and guidelines. After years of practice and operation, China’s telemedicine has gradually matured its technology system and improved its standard and management systems. Simultaneously, international cooperation experience in telemedicine has been accumulated through the telemedicine operations that began with some hospitals along the route in countries such as Kyrgyzstan, Kazakhstan, and Georgia. However, there are many countries along the Belt and Road where the political, economic, cultural, social, and other environments are unique. The implementation and operation of the Belt and Road telemedicine service system will inevitably encounter challenges in terms of funding, language, and talent as described below.

First, funding is one of the main bottlenecks restricting the construction of the Belt and Road telemedicine service system. For the project’s construction, the purchase of telemedicine video terminals, computer room-related facilities, development of business systems, maintenance and upgrade of software and hardware, network links, training of relevant personnel, etc., all require a large number of capital investment. Such expensive investment is difficult for some countries to bear, especially for low-income countries or regions who need telemedicine support the most.

The second major problem is language. There are 53 official languages in the 65 countries along the route [12]. The region has the most linguistic diversity and cultural differences in the world. The region’s official languages are mostly non-universal languages, and regional features are more obvious. In the co-construction and operations of telemedicine with countries along the route, multiple language problems will be inevitably encountered.

The third major issue is that of talent. The construction of the Belt and Road telemedicine service system involves more telemedicine hardware terminals and software systems to be deployed in many countries along the route. Both in the early phase of construction and in the later operation and maintenance phases, a large amount of technology, management, and language talents are required.

The fourth major issue involves technology updates, and operation and maintenance. The Belt and Road telemedicine service system requires the construction of telemedicine networks, computer rooms, etc., and the deployment of video terminals in countries along the route. The coverage is large, and the environment of each country is complex. Advanced technologies such as cloud storage, big data, artificial intelligence (AI), and the Internet of Things need to be integrated into the system. These technologies are diverse and complex, and most of them are emerging technologies. The update speed is fast, and the operation and maintenance after the completion of construction and the subsequent technical updates will be inevitable.

### 4.2 Countermeasures

#### 4.2.1 Building a multi-level, all-round financial support system

The Belt and Road telemedicine system construction needs to raise funds from multiple sources to cover the huge gaps. First, it should attract a wide range of financial institutions such as policy-based financial institutions, commercial banks, multilateral development finance institutions, special investment funds, and some international financial institutions. Second, innovative financial products should be developed, and the application of the government- and social-capital partnership (PPP) model for the Belt and Road telemedicine construction should be promoted. Once again, we should make full use of special investment funds including the Silk Road Fund, supporting funds, guarantee funds, and sovereign funds. We should further promote cross-regional equity cooperation, syndicated loans, financing agencies, and other cooperation with multilateral and bilateral financial institutions. Further, we should design scientific and rational investment and financing programs. With the above aspects, we would be able to build a multi-level and all-round Belt and Road telemedicine financial support system along the route.

#### 4.2.2 Simultaneously applying multiple-language strategies

The following solutions should be simultaneously applied to meet the huge language needs of the construction

and operation of the Belt and Road telemedicine service system. First, The Belt and Road telemedicine exchange and cooperation should be based on a humanitarian spirit and transcend cultural, religious, and institutional differences. Therefore, English should be universally accepted as the language of communication. Second, professional language talents can be cultivated among Chinese and international students. Third, Chinese should be promoted in a timely manner. If Chinese talents have more reserves in the countries along the route, it will be very convenient for medical personnel from countries along the route and China to conduct telemedicine service in Chinese.

### 4.2.3 Improving the talent training and output mechanisms

The development of the Belt and Road telemedicine service system must pay attention to the cultivation of talents. Only by perfecting the personnel training mechanism can the sustainable development of the Belt and Road telemedicine service system be promoted. A large number of professional and technical personnel in telemedicine should be trained, and the application and construction of telemedicine as a profession should be promoted to put forward the cultivation of telemedicine talents. In terms of personnel training, with the advantage of Internet technology, a combination of online and offline talent training mode could be adopted. In addition, we should respond to the strategic talent needs of countries along the route by training advanced telemedicine talents with international competitiveness, posting applicability criteria according to local conditions, outputting telemedicine talents, and establishing and improving the protection policy for talent output. We should encourage key hospitals and research universities to “go global” to carry out multi-level overseas education programs to establish an effective and lasting export mechanism for telemedicine talents.

### 4.2.4 Establishing a professional team to form a continuous investment and operation mechanism

The Belt and Road telemedicine construction technology is complex and rapidly updates. Therefore, it is necessary to bring together talents in technology, management, and language for telemedicine service system construction and operation; set up professional teams in the construction and operation phases; expand the talent team through technical training and practice; and promote the deep integration of AI, 5G, big data, cloud computing, and other technologies into the Belt and Road international telemedicine service system. Simultaneously, we should establish a sound supervision and evaluation system, form a long-term mechanism for continuous investment and operation, and ensure the sustainable operation of the Belt and Road telemedicine service system.

## 5 Conclusion

Cooperation in the field of health care is an important part of the BRI. As a new type of medical service model, telemedicine has the natural advantage of overcoming geographical distance and communication blocks. The Belt and Road telemedicine service system can overcome the time and space constraints of traditional medical cooperation to promote the international flow of quality medical resources and provide medical services for Chinese people living abroad. The system can also provide medical technology and service output to countries with poor medical care and improve local medical security conditions to provide solid guarantees for Chinese people abroad, provide quality medical services to people along the route, and further promote cooperation in health care industries. The construction of The Belt and Road telemedicine service system will actively establish a communication mechanism among neighboring countries along the route for common and sudden acute infectious diseases and strengthen the cross-border joint prevention and control mechanism for infectious diseases in neighboring countries.

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