TECH IN CHINA

THE FUTURE OF CHINESE HEALTHCARE

COLLECTIVE RESPONSIBILITY

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Collective Responsibility
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INTRODUCTION

China has undergone concerted development over the last two decades to improve healthcare access through insurance reform, infrastructure investments, and market expansion of private hospitals and insurance. In 2014, China spent 5.5% of the country's gross domestic product (GDP) on healthcare, a significant increase from 3.5% in 1985 (China State Council). The Chinese healthcare market has also been experiencing rapid growth and was worth a total of 5,670 billion RMB ($854 billion) in 2016 (Plan of Health China, Shira, 2018).

With China's rapidly changing demographics, including an expanding middle class, rapid urbanization, and an aging population, a significant shift in the country's healthcare needs is expected to occur. Despite health sector expansion, major disparities still exist, affecting both rural and urban settings. While urban hospitals have undergone positive shifts towards advanced medical care, many still struggle with overcrowding and lack of patient-centered care. On the other end of the spectrum, rural clinics are becoming increasingly understaffed, undersupplied, and underutilized. Government investments have largely been concentrated in large cities and provincial capitals, with healthcare expenditure a total of four-fold larger in urban areas (Chen et al., 2014). The uneven access to medical care has a drastic impact on the health of Chinese citizens, with the male life expectancy 5.7 years greater in urban areas compared to rural areas in 2010 (Li et al., 2015).

A novel solution to address these national disparities lies in health technology - technology designed to aid and streamline the healthcare system. From mobile applications to electronic health records, every aspect of healthcare has room for technological growth. Technology will play a major transformative role in the future of healthcare and help to equalize care across rural and urban divides.

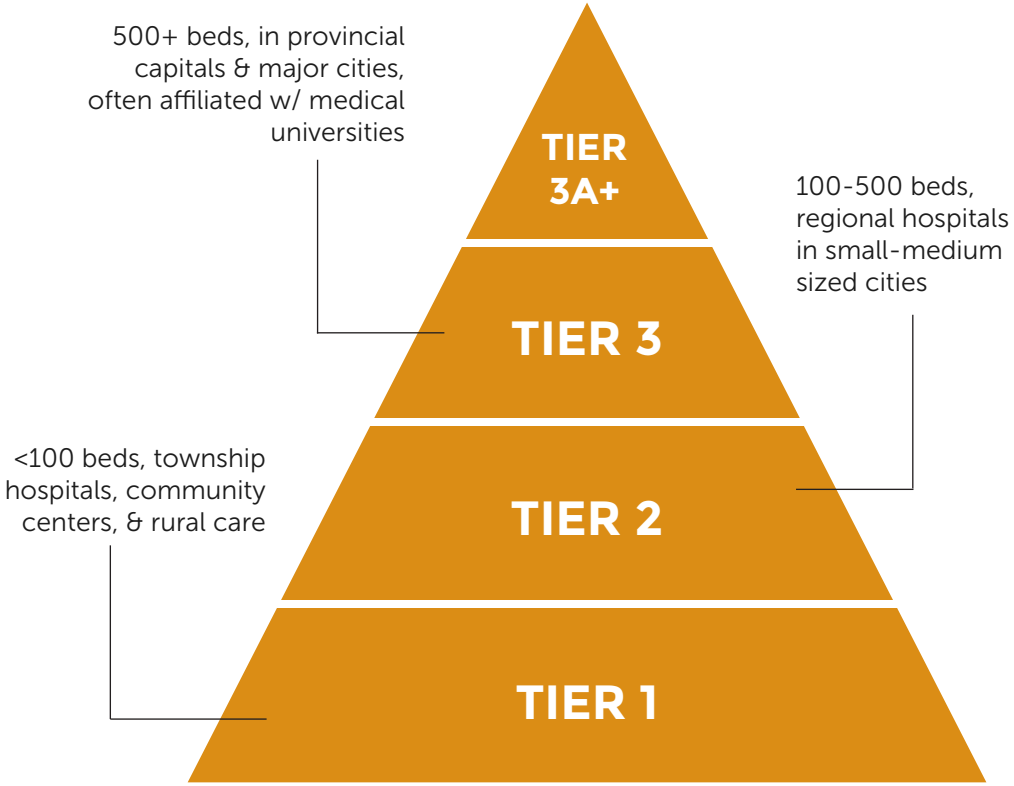
This report aims to: 1) assess major issues affecting both urban and rural Chinese healthcare, 2) analyze how health technology solutions, both established and developing, can address these gaps, and 3) provide insights on trends and opportunities for key stakeholders.

Crowded first floor in a typical large Chinese hospital

MODERN HEALTHCARE CHALLENGES

Chinese hospitals are organized according to the level of medical care provided, the quality and education of its medical providers, and the presence of medical research and/or clinical trials. Each hospital is classified into one of the following subtypes: Tier I, Tier II, Tier III, and Private. The current healthcare system is largely reliant on public medical insurance and infrastructure. A large majority of healthcare employees, 89.2%, work in public hospitals that provide 90% of the country's health services (Zhu, 2013). The major public insurance schemes are the Urban Employee Basic Medical Insurance (UEBMI), Urban Resident Basic Medical Insurance (URBMI), and New Rural Cooperative Medical Scheme (NRCMS), which cover over 95% of Chinese citizens (Commonwealth).

Despite the distinct differences between the hospital types, four specific challenges are observed across all hospital types: insufficient resources, public distrust, strains from migration, and uneven patient distribution. While each problem manifests itself in unique ways based on the hospital type, these issues act as barriers to providing equal and accessible healthcare in China. These issues are also intertwined in complex ways and all contribute to the overall issues in the medical system.



Each tier is further divided into three sub-tiers: A, B, and C

1 Insufficient Resources

Tier I hospitals in rural areas provide services with only rudimentary equipment and unskilled physicians, which often prevents these hospitals from treating anything beyond minor illnesses. Patients who come to these hospitals with more serious and rare illnesses are often referred to higher-tier hospitals further away. Tier II hospitals are usually better equipped than Tier I hospitals, but still only treat less specialized medical issues and are staffed by local physicians. The responsibility mostly lies on Tier III hospitals to treat illnesses requiring advanced specialists. Here, most doctors have received extended training in their field, such as PhD degrees for surgeons. Tier III hospitals also have access to state-of-the-art technology to assist them in treating the thousands of patients that pass through the hospital per day. Lack of consistency in physician training affects all hospitals because there is no national physician licensing system and every medical school has a different curriculum.

> *I treat patients with minor illnesses including the common cold, cough, arthritis, stomach aches, and basic trauma. I also do preventative care. We cannot do all of the procedures that we want to do, so we just focus on general medical treatment and health prevention in accordance with national regulations.*
>
> Medical Practitioner in Langshi Village, Guilin

An estimated 96% of rural physicians haven't received additional education beyond junior college, the minimum of 3 years required by the government (Li et al., 2015).

Patient receiving medical care in the lobby of Zhabei Hospital, a Tier II Hospital in Shanghai

Pathology lab in Zhongshan Hospital, a Tier III hospital in Shanghai

2 Public Distrust

Rural doctors in Tier I hospitals may only have a primary school education. Since rural physicians also don't have sufficient financial income, they usually have to work other jobs to support themselves and many newly educated doctors do not want to practice in these areas. As a result, rural doctors are not always respected or trusted by their patients. A common public perception facing doctors in all hospitals are that they are profit-seeking and incompetent. Doctors are assumed to be pursuing self-interest over professional ethics and patient wellbeing, and some are even known for accepting hongbao bribes for better or faster treatment. People favor Tier III hospitals for their prestige, associations with top universities, and public insurance coverage. However, this perception further contributes to the issue of overcrowding in these hospitals. Private Hospitals are a relatively recent development in Chinese healthcare and still face stigma from when these institutions were less prevalent and more associated with corrupt or illegitimate medical care. This

stigma is usually more widespread among elderly patients than younger citizens, as they are usually less familiar with new private hospitals that often have more resources available per patient and that provide more attention to patients, preventative care, and personalized services.

> *Not many doctors want to switch over to private hospitals due to the lack of prestige, big differences in environment, and the fact that China's private hospitals have bad reputations.*
>
> Laparoscopic Surgeon, Parkway Health Specialty and Inpatient Center (Private Hospital)

> *Why would I go to a private hospital? They are more expensive, while public hospitals are more accessible, cheaper, and still have good doctors.*
>
> 42 yr old patient from Nanjing, Jiangsu

3 Strain of Migration

There are 286.5 million Chinese migrants who have travelled from their hometowns to larger Chinese cities for employment opportunities (China Labour Bulletin, 2018). These patients face unique challenges in accessing medical care. Even though many migrants have lived and paid taxes for years in their new locality, their hukou or residence is still linked to their rural hometown. Without the proper hukou, migrants can only receive coverage by the New Rural Cooperative Medical Scheme, which results in inability to receive coverage at urban hospitals. Compared to urban residents who receive a 80% reimbursement rate of medical services, migrants pay nearly 5x more out-of-pocket while earning little more than half the average income (Sivadasan & Zhang, 2014). Thus, migrants needing healthcare have limited options: pay expensive out-of-pocket costs at urban tertiary hospitals or go back to their rural villages to receive reimbursement at Tier I hospitals and clinics with less resources. This countrywide migration contributes to the overcrowding of larger Tier II and Tier III hospitals. Additionally, this system widens the existing health disparities between rural and urban residents who face issues in all hospital types. Some cities, like Shanghai, have created migrant insurance where migrant workers can register through their labor contract. However, since a majority of migrant workers don't have an official labor contract, coverage is still low.

CASE STUDY

A family with a 9 year old boy has lived in Shanghai for a year and a half, seeking care for his brain cancer at Shanghai Children's Medical Center. They have spent over 300,000 RMB for surgeries and treatment, despite only earning 48,000 RMB a year growing rice, corn, and eggplant in their province. The boy hasn't learned how to read and barely interacts with children his age due to spending a majority of time in hospitals. The rural health insurance scheme will only cover ~30% of their costs.

CASE STUDY

An ophthalmologist in rural Shaanxi noted that his workload was notably higher during Chinese New Year, when many migrants return back to their native localities. Additionally, some migrants choose to self-medicate at local pharmacies, where many Chinese traditional medicines

Migrant patients are forced to decide to pay high costs & face long waits at urban hospitals or go home for care.

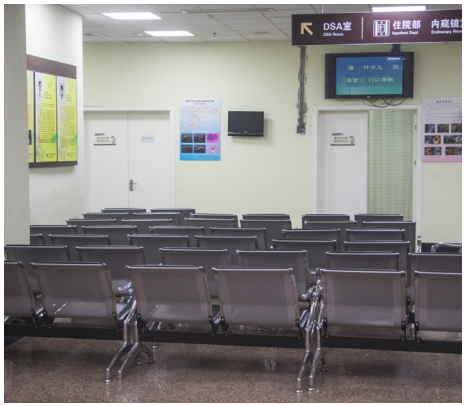
4 Uneven Patient Distribution

Since Tier I and Tier II hospitals are often unable to treat more serious illnesses, many local residents decide to go directly to a tertiary hospital, bypassing the process of primary and secondary hospitals. This can present an issue when patients pursue this pathway if they have common ailments that could have been treated elsewhere. In China, the lack of common usage of family practitioners who serve as gatekeepers to specialists can exacerbate this misuse of hospitals. Overcrowding presents itself as a major problem in Tier III hospitals and strains both doctors and patients alike to keep up with this demand. Doctors must work exhausting hours and see sometimes hundreds of patients each day. For patients seeking care, they must either make appointments a month in advance or wait in long lines in the early mornings. The large concentration of patients in Tier III hospitals leave lower-tiered hospitals and clinics increasingly underutilized.

> *In China, doctors have to see hundreds of patients each day, so they will only speak around 10 phrases to you. If they even gave you 3 min of their time, that would be considered extremely good.*
>
> 60 yr old patient in Shanghai

Hospitals that received a top "triple-A" ranking, makeup only 7.7% of the country's medical centers but handled 50% of outpatient visits in 2016 (Dai, 2018).

Crowded lobby of Huashan Hospital, a Tier III (AAA+) hospital in Shanghai.



Empty waiting room in Ruijin Hospital Luwan Central Branch, a Tier II Hospital in Shanghai.

THE MAJOR STAKEHOLDERS IN HEALTHCARE

Actions have already been taken by a number of stakeholders to address patient needs. For example, the government has undertaken extensive insurance reform, aiming for universal basic coverage by 2020. In the private sector, startups in the health technology field are focusing on greater, more sustainable access to care. If China is to equalize healthcare across the country, the next steps will require collaboration between all key stakeholders.

Government

The Chinese government has the ability to reshape the healthcare system both through policy reform, and as a key investor and partner. Insurance reimbursement policy, regulation on technological innovations like AI, and laws on foreign investment all have significant influence on the healthcare tech space. We identified four major trends in Chinese healthcare that have been largely driven by new governmental policies:

1. Privatization

The encouragement of the privatization of healthcare insurance and hospitals is a major trend in health policy. Tackling the shortage of licensed doctors, the government began permitting physicians to practice at multiple sites in 2017. Private hospitals are a promising way to ease the burdens of large public hospitals. In the 13th Five-Year Plan, the government allowed up to 100% foreign ownership in private hospitals and previously required a minimum 30% Chinese ownership. Additionally, in 2014, private investors were allowed to acquire and manage existing public hospitals.

2. Insurance Reform

Insurance is another focus for the government. The Ministry of Human Resources and Social Security (MOHRSS) has released an official inquiry on whether there ought to be a dynamic adjustment mechanism for what public health insurance schemes reimburse rather than updating a general list every five years (Best China News, 2016). Further insurance reform is anticipated in the upcoming years regarding payment methods and developing the private commercial insurance market.

3. Health Technology Investments

Major Chinese policies related to health technologies has been focused on regulating public hospital telemedicine initiatives and artificial intelligence (AI). The 13th Five-Year Plan identified "Smarter Healthcare" as a key area with a particular focus on telemedicine, big data, electronic health records (EHRs) and patient information systems, and regional population and patient health IT networks. Current telemedicine regulations allow medical providers to provide telemedicine as long as the physician's major employer consents and provides the platform. Three national databases with health profiles and medical records are planned to launch by 2020. Information will be integrated at the national, provincial, municipal, and county levels (Telemedicine Opinions, 2014).

4. Physician Reform

There are plans to standardize resident physician training programs, improve working environments, and promote general practitioners (GPs) as the first level of exposure for patients instead of directly seeking specialists. Employing a direct contracting model encourages patients to seek care from their local GP before heading directly to an overcrowded urban hospital. In particular, the government is planning to devote more resources to more rural central and western regions and community-level practices.

Companies

Insurance: As China tries to establish a commercial insurance market, private insurers will have an increasingly significant role in patient healthcare. What an insurer does or does not cover also influences what hospital and treatment a patient will seek out. Major companies include Ping An Insurance, Kunlun Health, and Hexie.

Healthcare Technology: Health technology corporations stand to benefit from the increased adoption of their technologies based on either users or revenue. A major way companies seek to advance their products are through building sustainable partnerships with hospitals and governments (see "The Future of Health Tech").

Pharmaceuticals: With the government attempting to transition pharmaceuticals from hospitals to a retail-oriented system, pharmaceutical companies are heavily investing in the O2O (Online-to-Offline) model of medication using e-commerce sites. Companies including Shanghai Pharmaceutical and Alibaba have already become major players in this market.

Hospitals

While public hospitals have been seen as the more practical source of healthcare, private hospitals are in the process of standardizing quality of care in order to become bigger players in the healthcare system. As demands for preventative and primary care increase, hospitals play the biggest role in providing the necessary resources to address these needs. Through collaborations with the government, academia, and health technology companies, hospitals have the potential to streamline efficiency while maximizing access to more affordable care.

Consumers

Health Professionals: Doctors, nurses, and other healthcare professionals will be at the forefront of any significant changes to the healthcare system; their attitudes towards new technology and policy will in turn shape patient perceptions. Increased collaboration between physicians and health technology companies could result in the creation of products more tailored to their specific needs. In the coming years, health professionals will also play a crucial role in standardizing medical care across the country.

Patients: For patients and their families, the market for healthcare can be broken down into several subsections based upon patient age, socioeconomic status, and residence (See 'Patient Case Studies'). Patients are seeking the highest possible level of care that can be provided considering financial or logistical constraints. Chinese cultural values and public perception highly dictate what is expected of the patient's medical care.

CHINESE PATIENTS: WHO ARE THEY?

Individuals, based on different demographic information, have unique experiences in the Chinese medical system. A crucial step to understanding the problems at hand is recognizing the diverse perceptions, challenges, and needs of China's citizens. Five major patient profiles emerged from our interviews; the following represents composite narratives of their experiences.

THE MIGRANT WORKER

These patients have travelled from their hometowns to larger cities for employment, creating unique challenges in accessing healthcare.

THE SKEPTICAL ELDER

These patients are accustomed to the traditional models of care and are reluctant to change their perceptions and ways.

	THE MIGRANT WORKER	THE SKEPTICAL ELDER
MEDICAL JOURNEY	Migrants will use services in their current cities only if truly necessary, however, they usually put off care until can go home due to travel expenses. Thus, many rural hospitals see increased patient traffic during busy holiday seasons such as Chinese New Year.	The elderly primarily seek care at big public hospitals based on their affordability and reputation. Many believe that private hospitals provide corrupt and a lower-quality of care.
MAJOR CHALLENGES	They often lack their current city's registration, or hukou, that lets patients gain access to urban insurance coverage. When they do try to go to medical professionals, they have low reimbursement rates and around five times higher out-of-pocket costs.	As the elderly population are largely burdened with chronic complications, these individuals may live in fear of having unexpected expensive illnesses or complications that would cause them to fall quickly into poverty.
HEALTH TECH	Depending on their status and level of success in their new residence, migrant workers may use health technologies like "The Young Urbanite" or "The Rural Inhabitant."	This demographic is often wary of new developments in health technology due to unfamiliarity, but many do use hospital appointment applications out of necessity.

THE YOUNG URBANITE

These patients largely make up China's growing middle class, and are usually educated and employed.

Individuals who fall into this category typically have government or employer-issued medical insurance. They don't encounter consistent preventative care and only go to hospitals for major illnesses or surgeries.

Their biggest obstacle is finding patient-centered care despite overcrowding in many hospitals. They want more facetime with their doctors, shorter wait times at hospitals, and would be willing to consider private options if their insurance was able to cover the cost or if they could afford the services out-of-pocket.

These individuals are more likely to use medical apps and wearable devices to track aspects of their health. However, for more sensitive health information they are concerned about the integrity of their medical data.

THE AFFLUENT CONSUMER

These patients will seek out the best care available without being deterred by the price tag. This may include both wealthy citizens and foreign expatriates.

Because many of these individuals purchase private insurance, they prefer to go to private hospitals to avoid long lines and wait times, while receiving more in-depth and comprehensive care.

These individuals want to use different methods to find the best quality of medical care for their money. This strategy encompasses their outlook on medications, insurance companies, hospitals, and doctors.

Affluent consumers are willing and able to invest in technologies that help them narrow down options (such as review sites for doctors) or that advertise ways to improve their health.

THE RURAL INHABITANT

These patients living in lower-tier cities and villages face the largest infrastructure barriers.

These patients go to local clinics for minor illnesses and are often prepared to travel to bigger cities for major illnesses and surgeries. This is especially true for any illness their child might develop or for giving birth.

Rural inhabitants tend to be more distrustful of the local doctor's experience and equipment, due to historical precedent and unstandardized current practices.

Many use hospital appointment apps (especially when booking appointments at urban hospitals far from their home). This demographic presents itself as a key target audience for current and future telemedicine and artificial intelligence (AI) development.

THE RURAL REALITY

One of the largest health disparities present in China is the inequality between rural and urban healthcare. Individuals living in rural areas have significantly lower health expectancy than their urban peers (Figure 2). One big issue these patients face is access to care. There are less than half as many medical institution beds and licensed physicians per 1,000 citizens in rural areas compared to urban areas. In even more isolated areas where there are only small township health centers and no hospitals, there are only 1.27 beds available for every 1,000 citizens (Figure 3). Also, rural patients are more likely to be significantly affected by medical costs. The New Rural Cooperative Medical Scheme covers most rural residents but this only reimburses a limited number of outpatient services and the reimbursement amount varies by county. Rural Chinese households with members who have chronic conditions have a 1.5x greater incidence of experiencing Catastrophic Healthcare Expenditures (CHEs), unexpected medical costs that can push patients into poverty, compared to the average population (Si, 2017). The national government has been actively investing in rural healthcare. For example, in 2009, the government invested $127 billion (850 billion RMB) to develop infrastructure and human resources in rural clinics and community health centers (Liu et al., 2011). Going forward, major changes to raise the physician training and quality of care available at the community level will alleviate burdens felt across the hospital system.

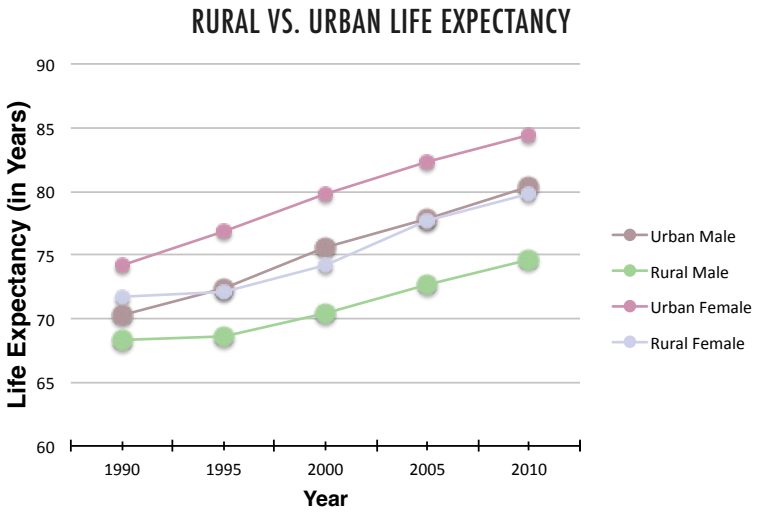


Figure 2: Differences in life expectancy between urban and rural individuals, Adapted from Li et al., 2015

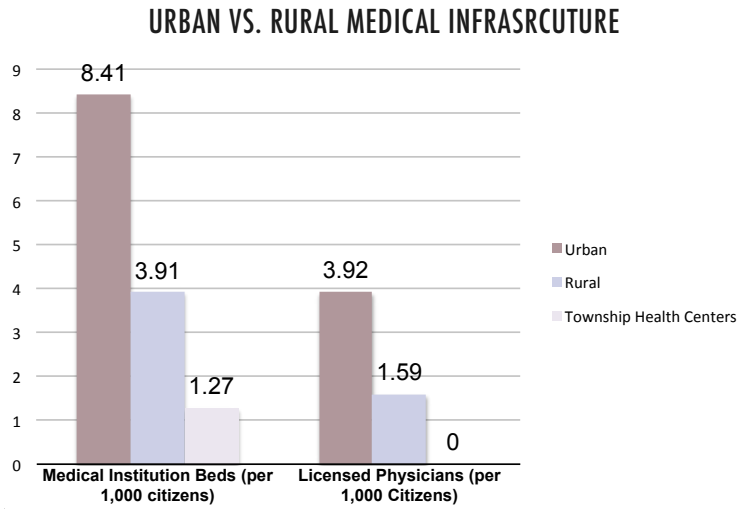


Figure 3: Differences in urban and rural area healthcare infrastructure, National Bureau of Statistics

Rural Community Clinics

In an ideal healthcare system, community clinics should serve as the first level of healthcare for citizens, treating minor illnesses and referring patients if the condition is more serious. However, most village clinics are limited in their ability to operate in this primary care role due to a lack of both training and compensation for physicians. Village doctors receive limited and unstandardized training, only three years of professional school but limited experiences otherwise. Legally, they also face restrictions on what treatment they can actually provide. Due to low compensation, many doctors must also hold other jobs to support themselves and their families. Understaffed and unequipped clinics continue the cycle of physician distrust and lead patients to go directly to Tier II and Tier III hospitals. Although telemedicine could support these doctors, many villages lack a stable Internet connection and advanced technology.

> *Young doctors do not want to work in the countryside as doctors, in rural medical conditions and live in hardship, so they choose to work in the city's large hospitals. The state does not arrange wages for rural doctors, let alone how much they earn each month. We live on our own labor, so we work in agriculture and also work as doctors. It's really hard work.*
>
> Rural Practitioner in Langshi Village, Guilin

Rural Tier II Hospitals

Rural Tier II hospitals have 100-500 beds and tend to treat patients at a county or small city level. These hospitals are responsible for providing more comprehensive health services than village clinics. As such, they employ specialized physicians and usually have sufficient technology to treat most local patients. However, because of underdeveloped primary hospitals and clinics, doctors here bear the burden of treating the majority of the local population. Recent government healthcare reform has drastically improved the standard of medical care at these hospitals. Technology like MRI and CT scanners can now be found at most institutions and reimbursement rates have also increased for residents that hold local hukou. Despite substantial progress, the problem of the lack of experienced physicians still persists. When asked what the biggest problem was for patients to receive medical care, a local county government official cited the "level of expertise of our specialists."

> *Today I worked from 6 pm - 8 am, saw 50 patients overnight, and didn't have any time to even lie down. Every 10 minutes someone new would come.*
>
> Doctor at a Tier II hospital in Shandong

> *Doctors here are more experienced with common diseases but are relatively unskilled in treating intractable diseases.*
>
> County Government Official

CASE STUDY

Wenshang County Renming Hospital

800,000+

residents the hospital must serve as the primary source of care for

646,000

total number of outpatient visits in 2017

5%

of patients were transfered to nearest Tier III hospital 40 mins. away

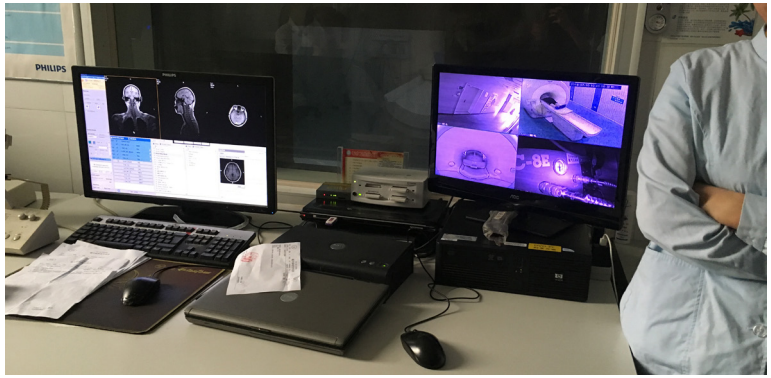
Most Common Illness Treated: Cardiovascular Disease

Appointments: WeChat or directly in Emergency Center

Physicians: Required 1 year residency at Tier III hospital

Telemedicine: Internet-based communication with Jining Renming Hospital, set-up and regulated by local government

Biggest Need: *"What would help us the most is if our doctors received the same opportunities as those in big cities to become experienced."*- **Hospital Administrator**



The physical rehabilitation room, MRI room, and outpatient building of Wenshang County Renming Hospital.

HEALTH TECH

With the breadth of the Chinese healthcare's issues, many startups and corporations are dedicating resources to develop novel health technologies to address many perceived problems. Major Chinese technology powerhouses have been actively investing in the healthcare industry in recent years (see "The Future of Health Tech"). The impact of digital technologies has been predicted to expand to grow up to 45% of Chinese healthcare expenditures by 2030 (McKinsey, 2017).

Health technologies encompass a vast array of medical products on the market that vary in target consumer, goals, and areas (see Figure 4). The various innovations in digital health differ based on their target consumer: the general public, medical providers, or health system entities such as hospitals and clinics. These products also reflect different goals whether to provide insights, assist clinical procedures, educate patients, or to improve efficiency along the patient journey. Finally, they can be delivered as mobile applications, electronic platforms, or technology-enhanced devices. Despite these products' diversity, many of them can be adopted towards social entrepreneurship objectives to target the major disparities present in Chinese healthcare.

CONSUMER HEALTH

Health Information
- Discussion Forums
- Medical Information Platforms

Wearable Technologies
- Fitness Trackers
- Sensors

Disease Management
- Remote Health Monitoring
- Medication Adherence
- Digitally-delivered Therapies and Interventions

Health Consumer Needs
- E-commerce Shops
- Review Websites

MEDICAL PROVIDER ASSISTANCE

Clinical Decision Support
- Artificial Intelligence
- Big Data Insights

Smart Devices
- Medical Robotics
- Smart tools (stethoscopes, imaging equipment, etc)

Training Tools
- Virtual Reality/ Augmented Reality/ Mixed Reality Simulations

COORDINATED HEALTH SYSTEMS

Appointment Scheduling Platforms
Patient Health Portals
Hospital Information Systems
- Electronic Health/ Medical Records
- Medical Billing Administration

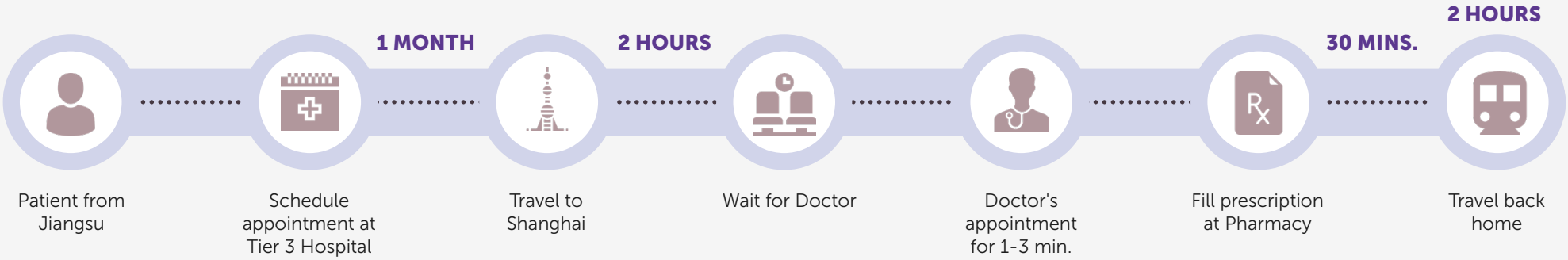
Telemedicine Software
- Video Conferencing Tools
- Patient Information Transfer

Figure 4: Categories of major health technology products based on the target consumer and purpose. Source: Collective Responsibility, 2018.

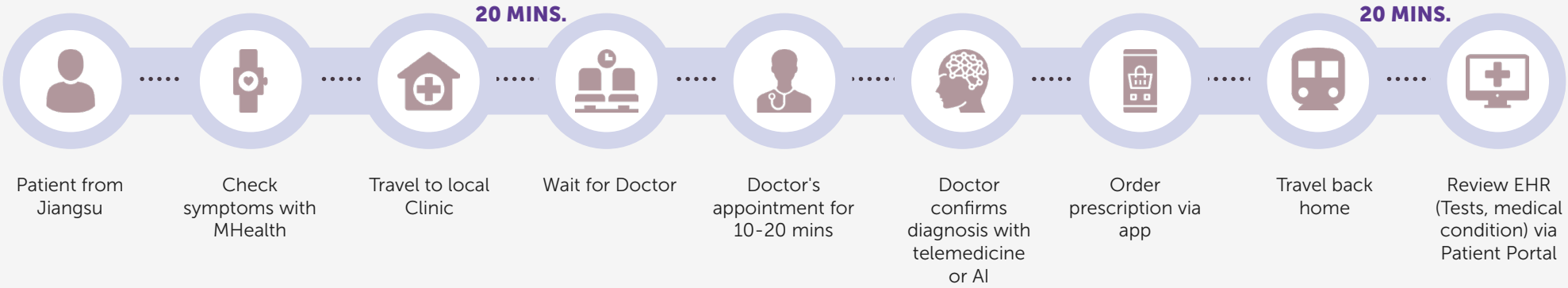
Transforming the Everyday Citizen's Healthcare Experience

Various health technologies can be used to address several pain points along a patient's interactions with the healthcare system to improve the efficiency and patient experience. In this infographic, we lay out a typical patient's journey with and without health technologies.

PATIENT JOURNEY W/O HEALTH TECHNOLOGY (TOTAL TIME = 1 MO, 4.5 HRS)



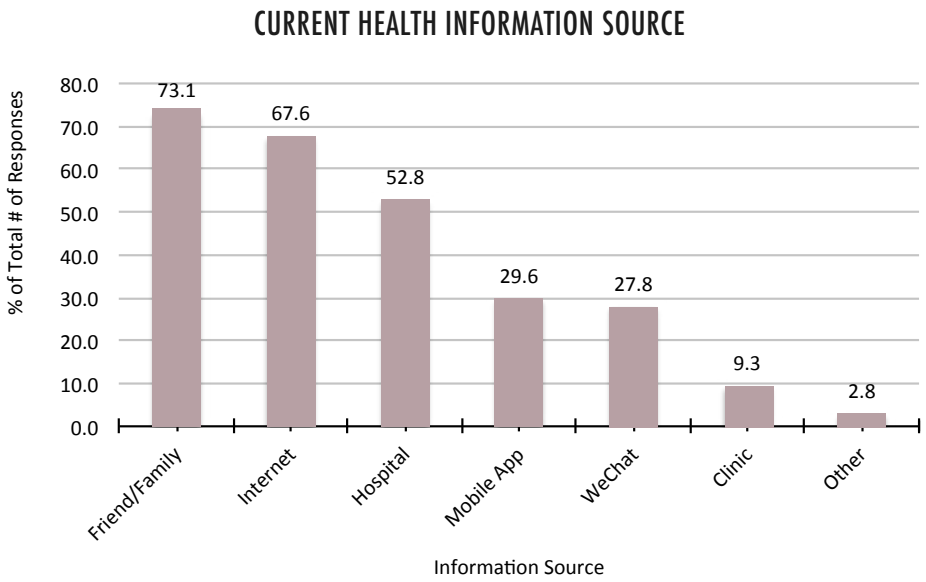
PATIENT JOURNEY W/ HEALTH TECHNOLOGY (TOTAL TIME = 2 HRS)



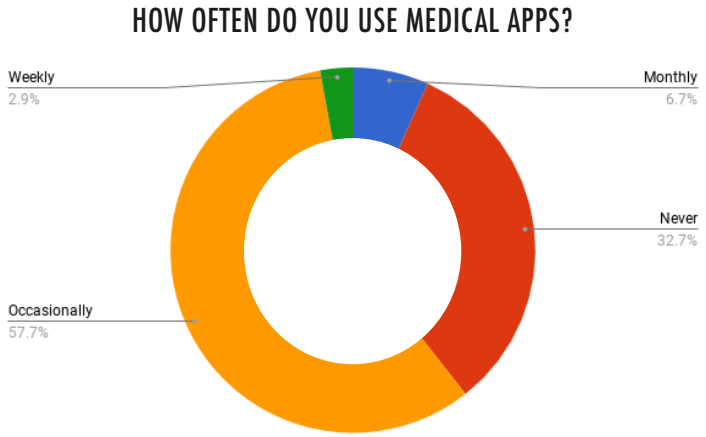
**mobile health technologies (mHealth) such as phone applications, wearables, or smart devices can be used to determine severity of symptoms or find appropriate specialists for medical care*

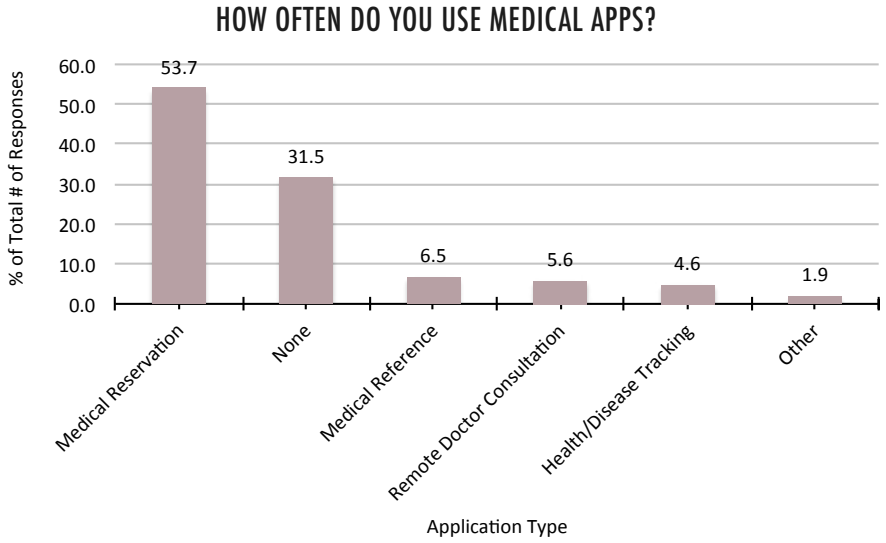
Survey Data Takeaways

In a 2018 survey we conducted on usage of health technology, 131 respondents representing all ages, socioeconomic status, and cities in China revealed interesting trends.



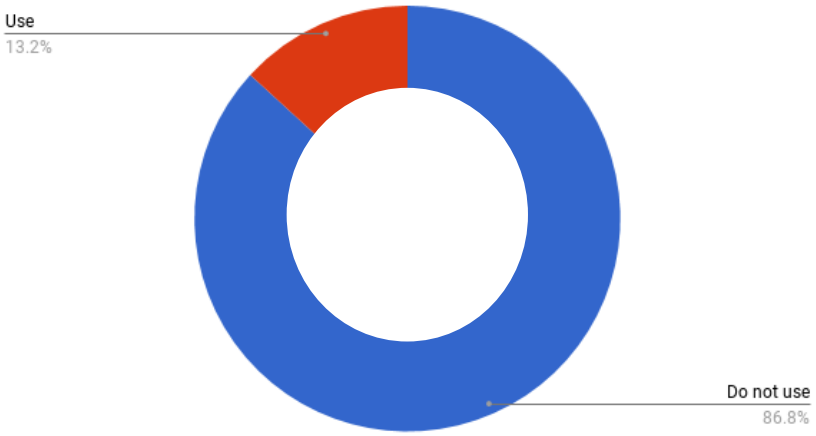
When asked where they received most of their health information, the majority of respondents selected "Friend/Family" and "Internet." A little over half selected "a hospital," and over a quarter selected "Mobile App" and "WeChat". While it seems that most people still get their information from word-of-mouth, the rise of the influence of mobile APPs and WeChat cannot be ignored.



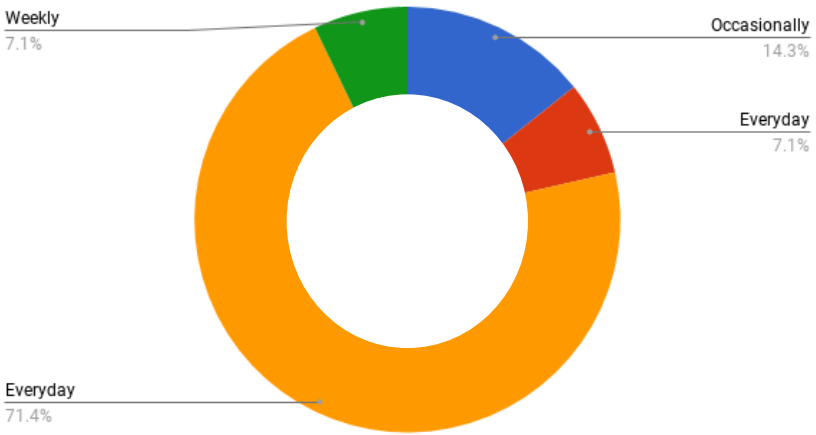


A little over half of respondents said they used medical apps "Occasionally." A third said they never did. The most common type of medical app used was medical appointment-booking. These appeared to be the most prevalent and well-known based on both our interviews and survey data. Medical reference, remote doctor consultation, and health/disease tracking trailed far behind. This may be due to a lack of public awareness or understanding of the function of other medical apps. Additionally, patients may be more likely to adopt usage if the app is used or recommended by their doctor.

DO YOU USE WEARABLES?



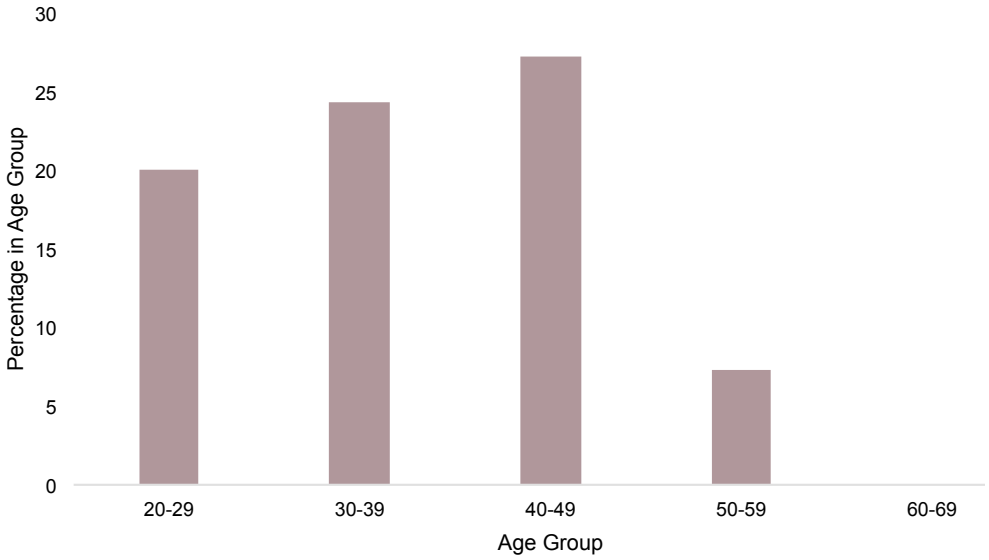
IF SO, HOW OFTEN?



Over 80% of respondents said they currently did not use wearable health technologies. By age, there was consistent usage of wearable across all age groups between 20-49. However, among the 50-59 age group only 7% of the surveyed population used wearables, and of the 60-69 age group, no one used wearables. This shows how popularity of wearables declines with age. However, individuals that do use wearable technologies will use them everyday. The most popular form of wearables currently is the smart watch or wristband, like the Xiaomi Mi Band and the Apple Watch.

These survey results point towards a gradual rise in the popularity of medical technologies. Many who are open to it might not yet be aware of the many uses and benefits of such devices or apps. For example, for wearable technologies, people generally think of tracking steps as the primary function, and may not be aware of the broader medical uses through remote patient monitoring.

WEARABLES AGE BREAKDOWN



HEALTH TECH CASE STUDIES

From patient-centered mobile-health devices (mHealth) to AI-based diagnostics, companies spanning every aspect of health technology are looking to revolutionize the Chinese healthcare system. The following case studies should illustrate the variety of products and goals in the health technology field while showing how different products can be used to address major concerns from Chinese patients, physicians, and organizations. Here are just a few examples of innovative startups that are currently succeeding in their respective fields:

CONSUMER HEALTH CASE STUDY

ChildCare - Intelligent Stethoscope

Size/Investment: Seed Funding (Crunchbase) Incubated by Bayer's Grants4Apps, with the Shanghai Children Hospital and Liaoning's Traditional Chinese Medicine (TCM) Hospital providing clinical data support

Function: This smart stethoscope provides families with the means to monitor heart and lung health using artificial intelligence algorithms and big data. The device has a current 98% accuracy rate for identifying abnormal heart/lung sounds and can diagnosis pneumonia, asthma, and heart disease. There is also a fetal heart movement monitoring device currently in sample development phase.

Potential Impact: This product attempts to empower patients to understand their own cardiovascular health. Parents without medical expertise can use the device to monitor and diagnose problems in their children with the help of AI. By putting their medical device directly in the hands of patients, this could help patients seek the proper medical hospital type for their needs and prevent misutilization of tertiary centers. If their condition is especially serious, which may require further specialist care at tertiary centers, or benign, which may only require basic medical care.

What's Next: The biggest challenge for consumer health products such as ChildCare is increasing public awareness and putting their product in the hands of patients and physicians. Strategic partnerships with physicians, hospitals, and cities can be a way to accomplish this goal. Some additional barriers that must be addressed include building trust that this is as effective as going to a doctor and making the product affordable to lower-income populations.

TRAINING PROGRAM CASE STUDY

Superb Medical Skills - VR surgery program

Size/Investment: Joint program with a Shanghai hospital, program is supported by over 3,700 medical practitioners.

Function: This program is China's first VR application for realistic surgery practice. The company is focused on the application of VR technology in the medical field and delivers clinical training to both doctors and trainees through VR headsets.

Potential Impact: Inconsistent physician training is an issue faced across the country and especially by rural physicians who may not be given the same amount of clinical exposure as their peers. However, if training can be standardized and given uniformly to the entire medical workforce, all physicians can be better equipped to deal with a range of medical issues. This VR program could help address this issue because it can allow physicians to learn in a simulated and controlled environment that doesn't require physical travel to other sites.

What's Next: The biggest challenge for medical training products is demonstrating its value, as many individuals may be skeptical about how the product can translate into real-world applications. These products, like Superb Medical Skills, will need to build relationships with China's medical schools and hospitals to achieve widespread use, especially as there have been efforts to standardize medical education nationally.

ARTIFICIAL INTELLIGENCE CASE STUDY

Artificial Intelligence Medical Innovation Systems (AIMIS)

Size/Investment: Endorsed as the national AI diagnostic medical platform, AIMIS labs in 10 hospitals across China, owned by Tencent.

Function: AIMIS focus is on using AI software to diagnosis medical conditions by simply analyzing different medical images. Initial studies on its effectiveness has shown a current 90% accuracy rate for diagnosis of esophageal cancer, 95% for lung sarcoidosis and 97% for diabetic retinopathy.

Potential Impact: Hospitals heavily rely on the results of medical imaging, including CT, magnetic resonance imaging (MRI), and ultrasounds, to diagnosis diseases. While radiologists currently interpret these images, they also face strains when they need to interpret huge volumes of images accurately and quickly. However, AI can use the power of big data to create fast diagnosis, transforming the field of radiology.

What's Next: AI platforms face the challenge of public perception, as patients and physicians may be unwilling to have diagnoses come solely from a machine instead of a human. Thus, if platforms be integrated the fastest on the provider side and used as an initial information source or second confirmation for physician opinions. AI solutions provide the potential to expand diagnostic capabilities in both accuracy and volume. With its government partnership AIMS will likely be established nationwide and in Tencent's DoctorWork clinics, develop new technologies, and acquire smaller existing startups.

Xingren Trusted Doctor

Size/Investment: $36.9M (Crunchbase)The certified medical practitioners covered 37,774 hospitals nationwide, and the total number of doctors reached 383,016.

Function: This platform facilitates direct patient-doctor communication with WeChat integration, patient management for follow-up care and status updates, collection of patient data, and long-term medical provider relationships.

Potential Impact: The Chinese patient-physician relationship has become increasingly strained as doctors have to see more and more patients. Xingren Trusted Doctor addresses this problem by serving as a patient management and communication tool to streamline communication. Patients can even contact doctors and seek advice using medical forums on the app, avoiding a lengthy wait to go to a clinic for minor concerns.

What's Next: Platform applications often face challenges in being sustainable and profitable. These companies must uphold consumer traffic and establish its role among the multitude of other healthcare platforms by establishing what makes their product unique. One way that companies seek to create this value is by integrating Online-to-Offline (O2O) services to facilitate physical appointments by online methods. To accomplish this, Xingren Trusted Doctor aims to build outpatient clinics to compliment their online network and establish credibility as a source of medical knowledge. Additionally, partnering with hospitals and pharmacies might speed up the process rather than individual doctor choosing to join.

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The Three Keys to Health Tech Success

We gathered insights from professionals in health technology startups, investment groups, and consulting practices to better understand the current market. For companies to ensure their success in the health technology field, they must prioritize the following: 1. focus on identifying the correct need of their target population, 2. ensure the sustainability of both the product and team, and 3. collaborate with government organizations, hospitals, and other companies.

1. Need Identification

Health technology companies must correctly identify the specific needs of their target end user. Investors and consultants have seen many companies who are too narrowly focused on the solution that their product will hypothetically provide. While this is important, companies often neglect to consider if their solution actually addresses the most predominant needs of the community. It is in this aspect that domestic startups may have the upper hand over foreign investments, especially in understanding the culture and on-the-ground needs. This understanding of the consumer and his or her needs is also important for marketing strategies. For example, health technology companies with products for China's elderly encounter issues effectively reaching this market or finding ways for elderly to accept modern technology-based products. Thus, these companies should focus on marketing to the younger population who buys and encourages their parents to use these products.

2. Product/Team Sustainability

Without demonstrated sustainability, there is no incentive for investors to invest. A product should address a clear need in the healthcare market, and consider external factors such as regulation and competition. This must be balanced with a robust monetization strategy to be sustainable financially. For example, medical platforms have been a popular product, but these companies usually struggle with finding effective ways to generate revenue and face high operational costs. In recent years, investors have also chosen to take a more holistic view of startup companies, screening both the product as well as the team behind it. An innovative product can be made more desirable by a team that demonstrates passion for the company's mission and shows good partnership dynamics with one another.

3. Key Partnerships

Few startup companies find widespread success in the Chinese healthcare industry on their own. Instead, most companies must collaborate with outside entities including government agencies, hospitals, or corporations, depending on the company's needs. Government agencies can provide a reliable pathway for a company's product to be integrated into the healthcare system. Hospitals can provide a company access to patient data or act as consumers themselves. If a partnership is created with an established Chinese hospital, this association also will provide prestige that patients will positively respond to. Finally, other corporations with expertise in specific fields can provide mentorship, valuable connections to other organizations, and access to their consumer base. These partnerships are crucial and may develop through pre-existing connections, networking, or pitches based on shared missions and benefits to both parties. For companies interested in entering the rural healthcare market, relationships with existing hospitals and local government agencies are the most important to establish early on.

The Future of Health Tech

Digital health is a powerful investment sector internationally, which is also translating into vast market potential in China. In the United States, the largest player in digital health startups, 2017 saw the highest venture funding ($6 billion) and number of mega deals ($100+ million) to date. This trend is part of the consistent growth of the sector, where over $23 billion was invested into digital health startups since 2011 (Rock Health, 2017). China is the third largest country in global deal shares for digital health startups, after US and India. However, this only represents 3% of the total deals, compared to 75% of the share for United States (CB Insights, 2016). This relatively low percentage represents potential growth for Chinese companies to expand into the health technology space.

The Chinese market is especially promising for health technology growth due to several factors. First, a technology-centered culture already permeates the Chinese market. At the end of 2017, there were 772 million Chinese internet users and 695 million mobile internet users, more than double of the population in the United States (CINIC, 2018). There are huge Chinese technology companies already revolutionizing commerce, transportation, media, and healthcare. This trend is why Chinese digital medical technologies have the potential for rapid acceptance into popular use, just as medical appointment applications already have already achieved. Secondly, powerful government agencies and fewer regulations mean that technologies can be rapidly integrated into the medical system if made a government priority. Finally, there are an abundance of substantial problems that the Chinese healthcare system is facing that can be solved with technology. These issues includes hospital overcrowding, number of chronic diseases, growing elderly population, and rural-urban disparities. However, due to the prevalence of these problems, Chinese patients and physicians are generally more receptive to digital health technologies, such as AI and telemedicine, than in other cultures because they are viewed as much-needed solutions.

Market forecasts show that the Chinese digital health market is already rapidly growing, especially in disease management, patient-physician communication, and health consultations (see Figure 5). China's digital health market recently had an estimated compound annual growth rate of 13.2% and its investments in the first half of 2016 of $1.1 billion matched the entire amount invested in the previous year (Statista, 2018; CB Insights, 2016). In line with chronic diseases, substantial revenue market segments were dedicated to diabetes, heart failure, and hypertension in descending order (Statista, 2018).

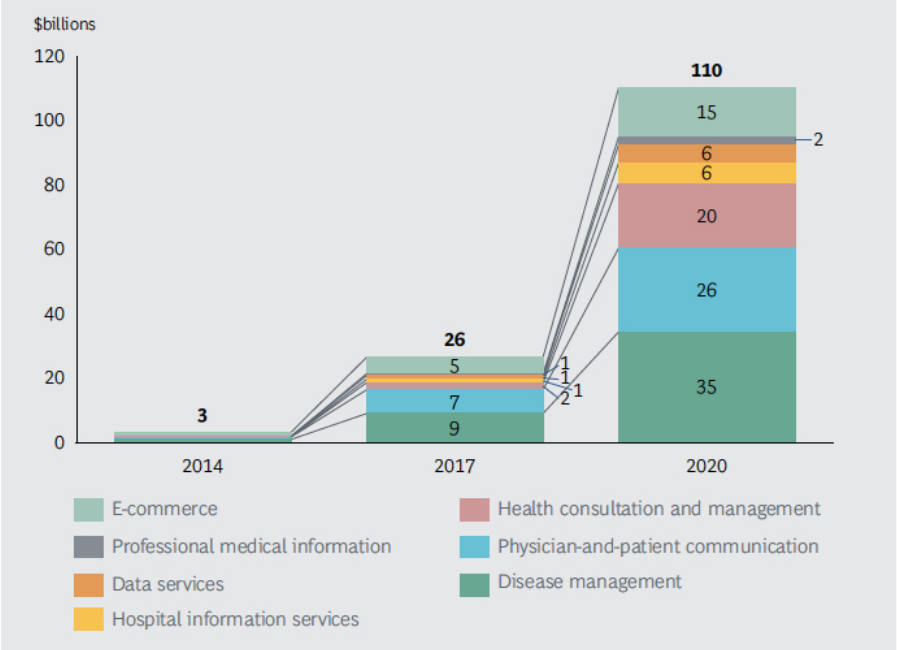

Figure 5: Modeled growth of the Chinese digital healthcare market. Source: BCG, 2015.

Major Chinese technology powerhouses, Tencent Holdings, Alibaba Group, and Baidu, have been actively investing into the healthcare industry. The 10 largest deals in China digital health from 2015-16 were worth over $1.5B (CB Insights, 2016). One example is Tencent, the conglomerate controlling China's largest messaging platform WeChat. Tencent's medical branch has the most name recognition for its health platform WeDoctor, which recently raised $500 million and was valued at $5.5 billion before their 2018 IPO on the Stock Exchange of Hong Kong. However, Tencent has also backed various other health startups, making its largest investments in online-to-offline (O2O) services, health monitoring, and genomics (see Figure 6). O2O services, where customers are driven from online platforms to physical locations, have accumulated 39% of Tencent's investments in particular, demonstrating how many Chinese companies believe that that a product should also have a physical linkage component to ensure its success amongst the competitive and oversaturated digital market (Technode, 2018).

Many other prominent Chinese companies are also increasing their involvement in the health technology market. Alibaba Group has focused increased their investments in Artificial Intelligence healthcare companies, both domestic and international, which aim to use big data to impact medical decisions, services, and management. Alibaba Health Information Technology, the healthcare flagship of Alibaba Group Holding had $376.5 million (2.4 billion RMB) worth of revenue in the last year (Soo & Deng, 2018). Additionally, in 2017, China's largest insurance company Ping An created a $1 billion overseas fund to invest in digital health companies overseas for abroad investments and to bring innovative ideas to the Chinese market (CNBC, 2017).

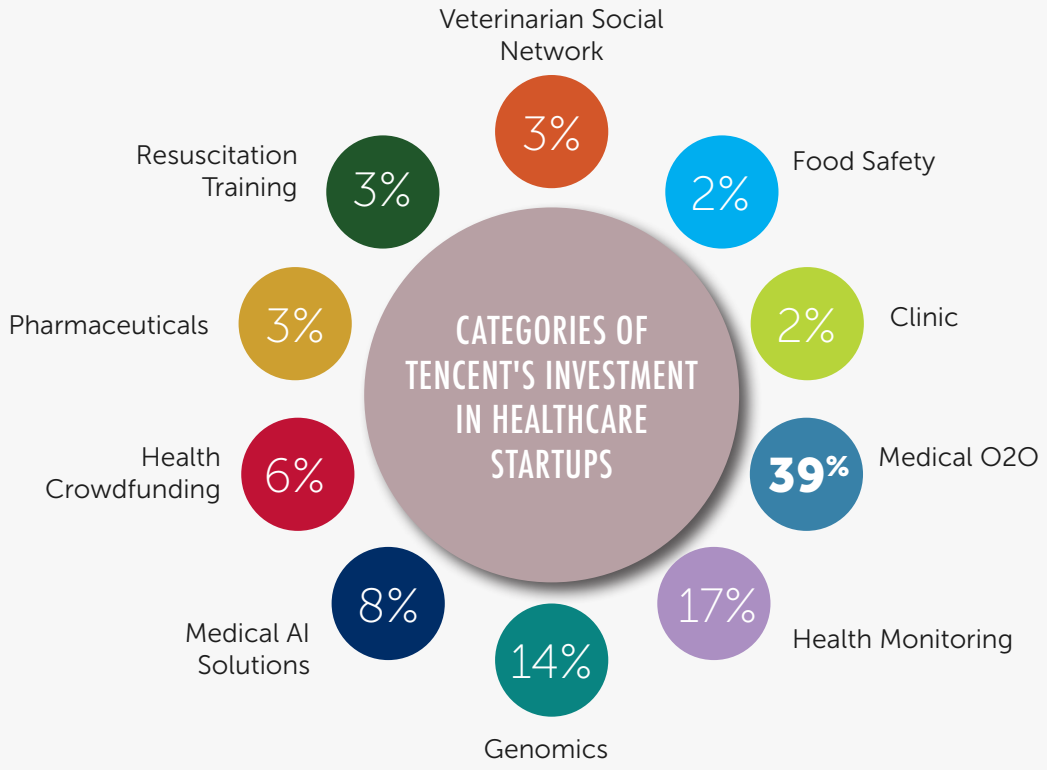

Figure 6: Categories of Tencent's Investment in Healthcare Startups. Source: Technode, 2018

CONCLUSION

With China's shifting demographics and increasing urbanization, the demand for affordable and adequate healthcare will only continue to grow. These are promising prospects for the future of healthcare in China, although execution of these policies will take time.

The major obstacles that all hospital types face are insufficient resources, uneven patient distribution, public distrust, and strains from migration. These issues impact the quality of patient-physician relationships and create both health and financial repercussions for all patients in every localities. These four major challenges we identified are the issues that are making the biggest impact on patients and physicians.

Patients seeking medical care vary in their socioeconomic status and age and thus experience healthcare in different ways. In recognizing their diverse perceptions and challenges, we can better understand and tailor healthcare to fit their needs. Additionally, each patient type will incorporate health technologies in unique ways into their lives.

Health technology offers unique solutions to formidable issues. For companies to ensure their success in health technology, they must prioritize the following: 1. Focus on identifying the biggest needs of their target population, 2. Ensure the sustainability of both the product and team, and 3. Actively build relationships with government organizations, hospitals, and other companies.

From a regulatory standpoint, Chinese healthcare is undergoing major changes and development. We expect the privatization of both healthcare facilities and insurance plans to continually expand to target the middle class, beyond just serving uber-wealthy citizens. For health technology, the national government is supportively funding modern health technologies initiatives, especially telemedicine and AI technology, to address the system's burdens. Finally, attempts to restructure patient flow will increase the role of the general practitioner and clinics to relieve the overcrowding of tertiary hospitals.

REFERENCES

Ainger, N. (2017, May 5). China's Ping An launches $1 billion fintech and health care fund. CNBC. Retrieved from https://www.cnbc.com/2017/05/05/chinas-ping-an-launches-1-billion-fintech-and-health-care-fund.html

Chen, Y., Yin, Z., & Xie, Q. (2014). Suggestions to ameliorate the inequity in urban/rural allocation of healthcare resources in China. International journal for equity in health, 13(1), 34.

China Internet Network Information Center. Retrieved from https://cnnic.com.cn/#

Chok, L. (2017, July 17). These Chinese Companies Are Quietly Revolutionizing The VR Industry. Forbes. Retrieved from https://www.forbes.com/sites/lionelchok/2017/07/17/these-chinese-companies-are-quietly-revolutionizing-the-vr-industry/#456e96ce768b

Crunchbase. Retrieved from https://www.crunchbase.com/

Dai, S. (2018, April 20). How technology is helping to improve health care in rural China. South China Morning Post. Retrieved from https://www.scmp.com/tech/article/2135880/look-how-china-using-technology-improve-rural-access-quality-health-care

Digital Health Investment In China Tops $1.1B In First Half Of 2016 (2016, August 23). CB Insights. Retrieved from https://www.cbinsights.com/research/china-digital-health-funding-boom/

EHealth, China (2018). Statista. Retrieved from https://www.statista.com/outlook/312/117/ehealth/china

Fang, H. (n.d.). International Health Care System Profiles. The Commonwealth Fund. Retrieved from https://international.commonwealthfund.org/countries/china/

Feeding the fires of innovation by mentoring young startups (2017, September 7). Shanghai Daily. Retrieved from https://www.shine.cn/archive/supplement/Feeding-the-fires-of-innovation-by-mentoring-young-startups/shdaily.shtml

Ferris Jr., R., Lacktman, N. (2014, September 16). China Issues New Telemedicine Opinions for China and Foreign-Based Providers. Foley & Lardner LLP. Retrieved from https://www.healthcarelawtoday.com/2014/09/16/china-issues-new-telemedicine-opinions-for-china-and-foreign-based-providers/

Jain, R., Zweig, M. (2017). 2017 Year End Funding Report: The end of the beginning of digital health. Rock Health. Retrieved from https://rockhealth.com/reports/2017-year-end-funding-report-the-end-of-the-beginning-of-digital-health/

Lew, L. (2018, February 11). How Tencent's medical ecosystem is shaping the future of China's healthcare. TechNode. Retrieved from https://technode.com/2018/02/11/tencent-medical-ecosystem/

Li, H., Wang, Z., Jiang, N., Liu, Y., & Wen, D. (2015). Lifelong learning of Chinese rural physicians: preliminary psychometrics and influencing factors. BMC medical education, 15(1), 192.

Li, J., Bateman, H., & Liu, K. (2015, August). Regional Differences in Life Expectancy in Mainland, China. In Actuaries Institute. Astin, AFIR/ERM and IACA Colloquia (pp. 23-27).

Liu, Q., Wang, B., Kong, Y., & Cheng, K. K. (2011). China's primary health-care reform. The Lancet, 377(9783), 2064-2066.

Shira, D. (2018, February 20). China's Healthcare Reforms Underscore Market Growth. China Briefing. Retrieved from http://www.china-briefing.com/news/2018/02/19/healthcare-reforms-underscore-market-growth-china.html

Si, Y., Zhou, Z., Su, M., Ma, M., Xu, Y., & Heitner, J. (2017). Catastrophic healthcare expenditure and its inequality for households with hypertension: evidence from the rural areas of Shaanxi Province in China. International journal for equity in health, 16(1), 27.

Woetzel, J., Seong, J., & Wang, K. (2017, December 6). How China became a digital leader. McKinsey. Retrieved from https://www.mckinsey.com/mgi/overview/in-the-news/how-china-became-a-digital-leader

Xia, M., Poon, L., Choy, M., & Wong, J. (2015, September 16). China's Digital Health-Care Revolution. Boston Consulting Group. Retrieved from https://www.bcg.com/publications/2015/biopharmaceuticals-medical-devices-technology-chinas-digital-health-care-revolution.aspx

Zhang, M. (2018, April 18). Digital platform to link Chinese hospitals, enable remote diagnosis and reform health care services. South China Morning Post. Retrieved from https://www.scmp.com/business/companies/article/2142314/digital-platform-link-chinese-hospitals-enable-remote-diagnosis

Zhu, L. (2013). A Review of Rural Healthcare System Weaknesses in China. Oslo and Akershus University College of Applied Sciences, Faculty of Social Sciences, 1-60.

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