



Innovate UK
Global Expert Mission

Healthy Ageing in China 2019

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Welcome

Innovate UK global missions programme is one of its most important tools to support the UK's Industrial Strategy's ambition for the UK to be the international partner of choice for science and innovation. Global collaborations are crucial in meeting the Industrial Strategy's Grand Challenges and will be further supported by the launch of a new International Research and Innovation Strategy.

Innovate UK's Global Expert Missions, led by Innovate UK's Knowledge Transfer Network, play an important role in building strategic partnerships, providing deep insight into the opportunities for UK innovation and shaping future programmes.

Each Global Expert Mission has selected representation from the UK's business, policy and research community, and has the following objectives:

1. Gather market insights and build expert foresight on new and emerging innovation sectors.
2. Identify opportunities for international collaboration.
3. Build a portfolio of technology and business priorities that will elevate the UK as the "Partner of Choice" in future innovation partnerships with global partners.
4. Facilitate international dialogues for the UK business community.
5. Align innovation policy and unlock regulatory barriers for future partnerships.

In March 2019, the Healthy Ageing Expert Mission travelled to Beijing and Shanghai in order to:

1. Gather market insights and build expert foresight on new and emerging innovation sectors, ascertain quantifiable benefits and synergies between the UK and partner countries in accessing/creating commercial opportunities.
2. Build a portfolio of technology and business priorities as the foundation to elevate the UK as the "Partner of Choice" in resilient and successful bilateral/multilateral partnerships with strategic global economies.
3. Explore and identify effective and sustainable international collaboration model(s).

4. Set groundwork for early dialogues between key stakeholders and the business community to catalyse future internationalisation opportunities.
5. Align innovation policy direction and unlock regulatory barriers for future international partnerships.

It is worth mentioning that on 28 November 2018, the ninth biennial UK-China Joint Commission on Cooperation in Science, Technology and Innovation brought a delegation of senior Chinese officials to London led by the Vice-Minister of Science and Technology, Zhang Jianguo. The delegation met with Sam Gyimah, the Minister of State for Universities, Science, Research and Innovation, UK government and academic leaders; and jointly celebrated successes to date, and mapped out future collaboration. Healthy ageing was agreed as the Flagship Challenge for 2019¹ given its importance to both countries.

This report summarises the information and insights gathered during the Healthy Ageing Expert Mission to China.



Chinese Vice Minister for Science and Technology, Zhang Jianguo with UK Science Minister, Sam Gyimah

¹ <https://www.gov.uk/government/news/uk-and-chinese-ministers-celebrate-40th-anniversary-of-scientific-relations>

Executive Summary

The UK and China healthy ageing markets share key similarities as both countries have a growing population of senior citizens with increasingly complex needs, decreasing human resources to provide support, an increasing need to upskill the existing workforce, and increasing demand for better dementia care.

In China, where the rate of growth is more rapid, there is a more pressing and greater need to act fast and with greater efficiency. In 2017, there were 158 million people over the age of 65; this is expected to double by 2050. The Chinese government has identified healthy ageing as a national priority, and it is implementing and piloting several policies to ease the pressure of an ageing population.

The innovation opportunities in the healthy ageing market in China considered by the mission delegates are those around standards, training, regulation and policy development; new business model development; technology and service innovation; extensive scale product testing and cross-cutting impact research. The key market challenges include underdeveloped elderly care infrastructure; workforce issues of resources, training and skills; business culture; and business models. The Chinese government is the most dominant player in the healthy ageing market as it is largely responsible for financing elderly care. Other key market players include service providers, SMEs, insurance providers, universities, IT companies, and investment firms.

There is a keen interest from different Chinese stakeholders in the healthy ageing market to collaborate with UK partners. A joint agreement between the UK and the Chinese government has set healthy ageing as the priority area for the 2019 Flagship Challenge². China's principal collaborator in healthy ageing is Japan with other notable nations such as India, Australia, the Netherlands, USA and Germany.

The benefit of a joint UK-China collaboration to China will be most significant in the design and development of standards, training, regulation, policy development and technology development. The UK also provides added value by successfully translating our domestic research on implementation of technology to support and enable care to effective practice.

The advantages to the UK are access to a large market, a broad product and service testbed, a large dataset for AI and machine learning development and analysis of population-level data for predictive modelling and prevention. However, this requires appropriate infrastructure and permissions. It is worth mentioning that technology development in the healthy ageing market in China needs better infrastructure, business models and policies as it currently does not provide a cohesive service. This is also true for the UK where there is no formal method of innovation assessment or innovation implementation into the UK healthy ageing market. There is also a lack of cohesion between the funding models for health and social care in the UK, which is a barrier to cross-department programmes.

In summary, the delegation was very optimistic about the healthy ageing market in China and felt that collaboration between the UK and China would be significant to both countries. There is much to be learnt from a UK-China healthy ageing collaboration.

² <https://www.gov.uk/government/news/uk-and-chinese-ministers-celebrate-40th-anniversary-of-scientific-relations>

1. Healthy Ageing Overview in China

The demand for an elderly care service in China is on the rise. China is facing an ageing population crisis³. Data from the China National Statistics Bureau shows that in 2018, 17.9% of its population, translating to about 250 million people, are over the age of 60 (an age it uses to classify a person as being elderly). Family planning policy, low and declining birth rates, an average increase in life expectancy and gender imbalance have led to an ageing population that is on the rise. With the elderly population projected to grow at an average rate of 3% annually, by 2030, the elderly Chinese population will surpass those under the age of 14. Furthermore, by 2050, it is anticipated that one-in-three Chinese citizens will be over the age of 65.

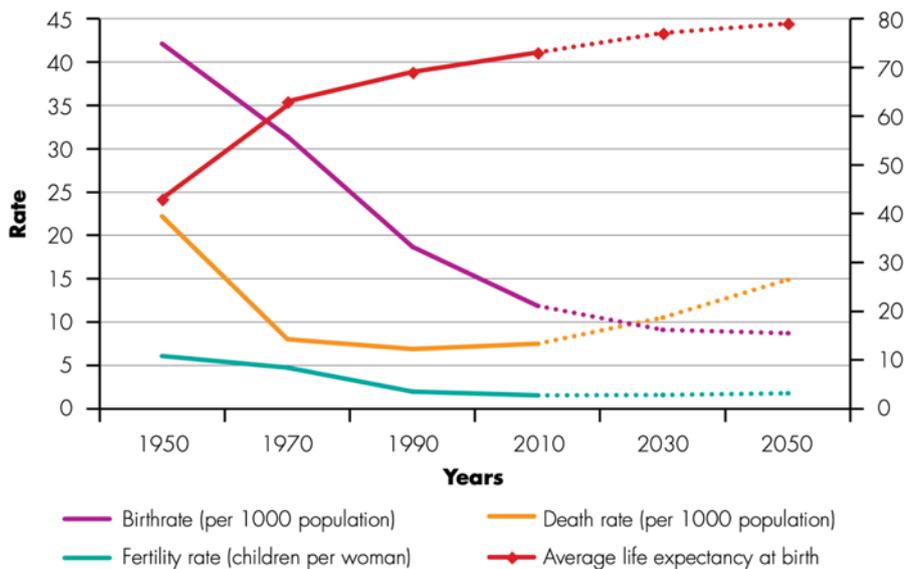
Although China abolished its one-child policy for a two-child policy in 2016, decades of the policy has led to what is being referred to as a “4-2-1” problem. The 4-2-1 problem relates to a situation where a child is being tasked with providing care for two parents and four grandparents (based on the traditional family-centric model of elderly care). The case is compounded for married couples where a couple takes care of one or two children, four parents and eight grandparents. The 4-2-1 problem is fast evolving to a 4-2-0 problem as urbanisation results in about half of a typical family being left behind in the rural areas. Increasingly, the traditional family-centric model of elderly care is becoming untenable. It is worth noting that the Chinese government has made it clear



The 4-2-1 family structure⁴

in law that children have a caring responsibility for their elderly parents.

In response to the decline of the traditional family-centric model of elderly care, Chinese citizens are warming towards the idea of living in elderly care centres. The conventional attitude towards elderly care has been negative in China. The case for growth in the elderly care market has been made stronger by increasing per capita disposable income levels (on average from RMB 10,493 in 2005 to RMB 31,195 in 2015) which has made traditionally expensive elderly care more affordable. It is projected that by 2050, the market for elderly care will surpass that of real estate and be worth as much as RMB 7.6 trillion.



Demographic transition in China, 1950-2050³

³ World Health Organization. “China country assessment report on ageing and health.” (2015).

⁴ Adapted from Ageing in China: Changes and Challenges <https://www.bbc.co.uk/news/world-asia-19630110>

The Chinese elderly care industry is still at its infancy when compared to the UK. It is characterised by a lack of critical organisational business infrastructure – business modelling, infrastructure and human resources. As it stands, Chinese government-funded elderly care services are insufficient, while private sector elderly care is dominated by premium facilities that are situated in urban areas. In any case, private sector elderly care is minimal, providing about 42,000 elderly care facilities⁵. It is projected that about 3.4 million nursing homes will be required to cope with the rising ageing population in China. Also, there is a need for a change in attitude towards paid care workers as this profession is not well paid, not well trained and lacks social recognition.

Home care services are at the heart of healthy ageing care management in China. A study on the need for home care services in urban China⁶ showed that 49% of older people have certain daily needs that require formal assistance. Some 25% need help with domestic chores, 18% with personal care, and 14% with social conversation. It estimated that urban home care services can only satisfy 16% of expressed need, and there is no specific government target for future expansion of services⁷. It is important to note that the financing of home care is the primary responsibility of local government and varies geographically across China with a better-resourced government providing more services.

Statistics from China's Ministry of Civil Affairs reveal that, as of 2017, the number of nursing homes has more than tripled since 2012, going from about 43,000 to just under 145,000⁸. However, this is still insufficient as 3.4 million nursing home beds are required to meet the growing healthy ageing needs. The decline of the traditional family support system for the

elderly coupled with government intervention in promoting private sector participation within the healthy ageing space is frequently cited as the main driver behind the increase in nursing homes in the last couple of years⁹. In comparison to continuing care retirement communities and supportive housing programmes, nursing homes are regarded as providing the highest level of healthy ageing care. Statistics from the Chinese government indicate that as of 2017, close to 80% of nursing homes offer medical services.

Continuing care retirement communities (also referred to as dedicated living apartments) are on the rise in China and show significant scope for growth, fuelled by the opportunity to generate substantial income¹⁰ from such developments. In China, care retirement communities are built around the provision of additional senior care services, as required, with the emphasis on independent living¹¹. This model differs from that widely practised in the UK and the USA, where care is provided in one of three main stages: independent living, assisted living, and skilled nursing¹². The large scale of these care retirement communities in China implies that their model of operation would differ. A delegate noted that in the UK a very large retirement community would comprise of 150 residential units. Whilst in China, these communities can hold up to 2,000 residential units.

Dementia care management is a growing aspect of healthy ageing in China. Globally, the number of people living with dementia will increase from 50 million in 2018 to 152 million in 2050, a 204% increase¹³. China has the largest population of people with dementia and the prevalence of dementia appears to have steadily increased between 1990 and 2010¹⁴. Given the rapid growth of the elderly population,

⁵ An Overview of China's Elderly Care Industry - <https://www.china-briefing.com/news/overview-chinas-elderly-care-industry/>

⁶ Yen, Q. (2008). Report on the study of urban home care services. Retrieved from: <http://www.cncaprc.gov.cn/info/156.html>

⁷ Wong YC, Leung J. (2012). Long-term care in China: issues and prospects. *J Gerontol Soc Work*. 55(7):570–86.

⁸ http://www.xinhuanet.com/english/2018-02/22/c_136991456.htm

⁹ https://www.researchgate.net/publication/23253946_Institutional_Care_for_Elders_in_Rural_China

¹⁰ <https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/life-sciences-health-care/deloitte-cn-lshc-the-last-mile-of-senior-care-en-181024.pdf>

¹¹ <https://daxueconsulting.com/nursing-home-in-china/>

¹² <https://www.webmd.com/healthy-aging/guide/choosing-long-term-care#1>

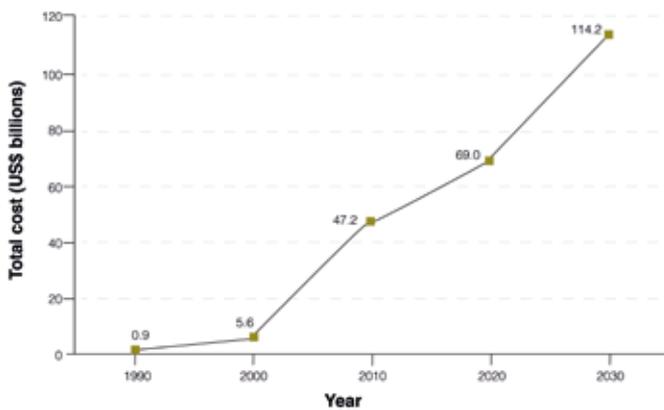
¹³ Dementia fact sheet December 2017; World Health Organization

¹⁴ Zhang Y, Xu Y, Nie H, Lei T, Wu Y, Zhang L, et al. Prevalence of dementia and major dementia subtypes in the Chinese populations: a meta-analysis of dementia prevalence surveys, 1980–2010. *J Clin Neurosci*. 2012 Oct;19(10):1333–7. <http://dx.doi.org/10.1016/j.jocn.2012.01.029> pmid: 22682650

¹⁵ Chan KY, Wang W, Wu JJ, Liu L, Theodoratou E, Car J, et al.; Global Health Epidemiology Reference Group (GHERG). Epidemiology of Alzheimer's disease and other forms of dementia in China, 1990–2010: a systematic review and analysis. *Lancet*. 2013 Jun 8;381(9882):2016–23. [http://dx.doi.org/10.1016/S0140-6736\(13\)60221-4](http://dx.doi.org/10.1016/S0140-6736(13)60221-4) pmid: 23746902

dementia is expected to pose tremendous challenges to the national healthcare system and to the sustainable development of the Chinese economy. According to a bulletin of the World Health Organisation¹⁶, the number of people with dementia in China was estimated to be about 3.5 million in 1990, 5.1 million in 2000 and 9.6 million in 2010. The total costs of dementia were projected to reach US\$ 69.0 billion in 2020 and US\$ 114.2 billion in 2030.

Notable key challenges and issues in dementia care in China are poor public awareness of dementia, lack of dementia training and education of medical professionals and caregivers, an undeveloped service system and a high cost of dementia care¹⁷. Furthermore, dementia care in rural China is a growing concern¹⁸. Providing care to nearly 10 million people with dementia is a monumental challenge for China.



Estimated total annual costs of dementia, China, 1990–2030¹⁷.

¹⁶ <https://www.who.int/bulletin/volumes/95/1/15-167726/en/>

¹⁷ Chen, Zheng, et al. Challenges of dementia care in China. *Geriatrics* 2.1 (2017): 7.

¹⁸ Chen, Shulin, et al. Dementia care in rural China. *Mental health in family medicine* 10.3 (2013): 133.

2. Government, State and Industry Priorities

2.1 Policy Landscape

China's government has highlighted healthy ageing as one of its critical national priorities and is actively introducing and piloting new policies to manage its rapidly ageing population. Notable policies are:

1. Elderly Rights Law. The Chinese government has a national level of legislation to protect the rights of senior citizens and their interests. Broadly speaking, the law aims to tackle the challenge of providing affordable social insurance for seniors, enhance social security for disabled or sick seniors, develop affordable housing and an elderly-friendly environment for seniors, protect seniors' rights, care for the mental wellness of seniors, and develop professional services, including skilled nursing care facilities and home care, among others. One aspect of the law that has gained significant media coverage is that children are required to visit their parents¹⁹.
2. The 13th Five-Year Plan for Economic and Social Development (2016-2020). This policy aims to set home-based care as the bedrock, supported by community-based care, supplemented by institutional care²⁰. In addition, the policy seeks to integrate and coordinate aged care and health care. It is worth noting that five-year plans and policy statements are issued at different government levels – provincial level, city level, and ministerial level.
3. Action Plan on the Development of Smart Health and Elderly Care Industry 2017 – 2020 (Feb 2017). Jointly made by the Ministry of Industry and Information Technology, Ministry of Civil Affairs and the National Health and Family Planning Commission. The policy aims to build a smart health and elderly care industry with more than 100 industrial leading enterprises and several brands by 2020. It aims to have more than 100 model bases for the industry in the next four years. Three critical areas in the policy are real-time health status analysis, health trend analysis, and big data.
4. Notice on Accelerating the Reform on the Entry, Supervision and Service Level of the Senior Service Industry (Feb 2017). This policy aims to mobilise resources to develop the elderly care industry, lower the cost of elderly care, create an appropriate development environment for elderly care and mobilise private capital to build healthcare enterprises.
5. The 13th Five Year Plan for Developing Undertakings for the Elderly and Establishing the Elderly Care System (March 2017). This policy aims to establish a sound basic healthcare system and insurance schemes for long-term care, strengthen community-level medical and healthcare institutions, step up efforts to develop the workforce of rural doctors, support at-home elderly care, and promote family-based elderly care.
6. Two Sessions Government Report – Elderly Care (Feb 2019). This policy aims to promote the construction of a multi-level elderly care security system, continue to increase the basic pension for retirees, improve the level of disability prevention and rehabilitation services, develop elderly care with a critical focus on elderly care services in communities, provide critical support to institutional-offered services in communities, and advance newly built residential blocks which should be equipped with community elderly care services and facilities. A key focus of this policy is to improve integration between healthcare and social care.

¹⁹ <https://www.bbc.co.uk/news/world-asia-china-23124345>

²⁰ <http://en.ndrc.gov.cn/newsrelease/201612/P020161207645765233498.pdf>

2.2 Ministerial Landscape

It became clear that different Chinese government bodies are responsible for different policy areas in the healthy ageing area (see table below). There was, however, a lack of clarity as to how the different government bodies work together to implement changes.

Government body	Policy areas of interest
Ministry of Science and Technology (MOST)	Central government ministry which coordinates science and technology activities.
Ministry of Civil Affairs (MCA)	Oversight and administration for elderly and welfare affairs.
National Health Commission (NHC)	Administration of medical and health-related issues.
Ministry of Commerce (MOFCOM)	Approval and oversight for foreign investment where necessary.
Administration for Industry and Commerce (AIC)	Administration of the for-profit business.
China Food and Drug Administration (CFDA)	Administration of food, drug, medical equipment and cosmetics.
Ministry of Finance (MOF)	Policies for tax preference and subsidies.
Ministry of Housing and Urban-Rural Development (MOHURD)	Construction standards and requirements.
Ministry of Natural Resource (MNR)	Land use rights policies.
State Administration of Foreign Exchange (SAFE)	Foreign exchange controls.
National Development and Reform Commission (NDRC)	Approval of project construction.
Ministry of Human Resources and Social Security (MOHRSS)	Caregiver qualification, long-term care insurance policy.
China Insurance Regulatory Commission	Insurance policies, and a pilot for "Reverse Mortgage."
Ministry of Industry and Information Technology (MIIT)	Responsible for regulation and development of the postal service, Internet, wireless, broadcasting, communications, production of electronic and information goods, software industry and the promotion of the national knowledge economy.

Government bodies and policy areas of interests

2.3 Regulators and Formalities

There is a shortage of regulators of elderly care, and communication between the ones that exist is highly bureaucratic. The complex nature of regulation makes it difficult for foreign direct investment in the Chinese elderly care market. Just as an example, foreign businesses require business approval from MOFCOM, licensing by MCA and registration with the State Administration of Industry and Commerce (SAIC) before they can commence operations. In practice, the sequence for obtaining the relevant approvals is not straightforward as it is influenced by local practices; there may be differences within the same administrative region.

2.4 Restrictions

The healthy ageing business environment in China is significantly influenced by the institutional environment, as foreign companies must abide by strict rules and regulations. It is mandatory that business activities are well-documented and approved before operations commence. This restricts the dynamism of foreign companies and limits their competitive prowess. Similarly, foreign-owned businesses are prohibited from undertaking numerous business activities. For example, there is a limit to the amount of corporate debt that foreign companies can take on in the healthy ageing market. In recent years, there have been positive changes and a relaxation of legal restrictions, according to the managing partner at Law View Partner.

2.5 Investment Strategy

As part of the medical care reform, foreign investors are encouraged to scale-up senior care investments, develop franchises and cultivate quality senior care brands. There is no restriction as to what market entry method a foreign entity adopts in penetrating the Chinese market. There are instances of foreign firms taking Greenfield and collaborative measures such as joint operation, shared participation, lease and public-private-partnership (PPP) when penetrating the market. The ideal investment strategy involves collaboration with a Chinese company to gain market know-how and critical resources. It should be noted that in the joint venture the Chinese counterpart by law is afforded more rights. Notably, adopting a Greenfield strategy or undertaking strategic alliances such as mergers and acquisitions would provide a foreign entity greater control of its business. However, the foreign partner is then left to deal with numerous stakeholders directly, which may not be preferable.

2.6 Administrative Charges, Tax Benefits and Price Control

Whilst the elderly care market is theoretically market controlled, there is still significant influence by the government. Regulations and incentives (such as a reduction in administrative fees) are geared to provide an equal footing for both local and foreign companies. However, a key incentive in tax reduction and rebates is usually extremely difficult for foreign companies to obtain. This is especially the case as local governments can issue tax rebates that are not approved by the Chinese government. Thus, one can benefit from such tax rebates and be acting illegally for doing so. It is anticipated that tax benefits made available to foreign-invested senior care facilities will have either expressed this on a legal basis or have a written endorsement from the State Council.

Notably, the government expects to play a significant role in adopting pricing control²¹. This is because the Chinese government sees the provision of elderly services as a priority. Such pricing control is anticipated to be geared at controlling the activities of foreign companies operating in the Chinese elderly care market. Critically, there is a risk that incentives afforded to attract foreign participation can be removed without prior notice. However, there is likely to be a boom in foreign investment in China's senior care sector from international companies and private equity funds, and the introduction of more international healthy ageing brands in the market as available opportunities outweigh potential risks.

2.7 Insurance

Long-term care insurance (LTCI) is considered an important strategy to tackle the mammoth expenses associated with providing care for the ageing population²². Typically, LTCIs are provided by private and public bodies. The Chinese government plays a huge role in the provision of LTCI²³. The private sector has been slow to get into the provision of LTCI due to the increasing cost associated with providing care, especially in the face of increasing life expectancy²⁴. Since 2010, when the Chinese government decided on the development of an LTCI system, they have undertaken a series of pilot programmes in 15 cities²⁵.

The LTCI provided by the Chinese government takes the form of stand-alone long-term care insurance policies which adopt the traditional policy premium format and is based on a means-tested benefits system that is funded partially by the government and the recipient. In some cases, the government bears as much as 90% of the cost²⁶. The Chinese government

²¹ <https://www.forbes.com/sites/gordonchang/2011/05/08/china-imposes-price-controls-informally/#229af5737958>

²² <https://www.ncbi.nlm.nih.gov/pubmed/25133301>

²³ <http://www.chinadaily.com.cn/a/201810/08/WS55bba9ce1a310eff303280ec8.html>

²⁴ <https://www.ncbi.nlm.nih.gov/pubmed/25133301>

²⁵ https://www.unescap.org/sites/default/files/Session4_Ms.ZhangWenjuan_China.pdf

²⁶ <http://www.chinadaily.com.cn/a/201902/11/WS5c613a5ea3106c65c34e8bb3.html>

has also piloted versions of LTCI that is funded by the government, the individual, employees and employers. The private sector format of LTCI also adopts the same traditional premium format.

China has three public sector health insurance schemes that cover up to 97% of its population²⁷. These health insurance schemes are Urban Employee Basic Medical Insurance (UEBMI), Urban Resident Basic Medical Insurance (URBMI) and New Rural Cooperative Medical Scheme (NCMS)²⁸. The UEBMI is regarded as the most generous of all public health insurance schemes and is available to employed individuals. It is funded by the government, employees and employers. URBMI is provided to unemployed adults, children, students and seniors. This is primarily funded by the government. Both the UEBMI and URBMI are governed by the Chinese Ministry of Human Resources and Social Security²⁹. NCMS is administered by the National Health and Family Planning commission and is made available to the rural area populace (based on the Hukou classification³⁰); the NCMS has over 97% subscription in the rural area.

The private sector health insurance schemes are akin to traditional health insurance plans that operate on a premium basis. Typically, private health insurance is more expensive as it allows access to a network of private hospitals in comparison with the government healthcare schemes that are limited to public hospitals. Notably, both the public and private health insurance schemes are based on the reimbursement model. The general perception is that both public and private health insurance schemes are not geared to providing the required level of care needed for the ageing population.

2.8 Key Drivers and Players

The healthy ageing market in China is young and in the early stage of its growth phase. The key drivers are:

1. Significant ageing population. The population in China is ageing at a significant rate, leading to an increasing number of customers with diverse needs and financial circumstances. Ageing population growth is significantly driving demand to exceed supply.
2. Government policy and funding. The Chinese government is actively stimulating the market by introducing and implementing favourable policies. For example, continuing to increase the basic pension for retirees³¹.
3. Growing technological innovation. The healthy ageing market in China is being transformed by technology. There is growing demand and use of people-based care coupled with data-driven, robot-based, AI-driven and smart-sensor-driven care.

The key market players in the healthy ageing market in China are:

1. Government - provides policies and allocates public funding to the healthy ageing market.
2. Home care providers - provide primary and nursing care for senior citizens at home.
3. Care home providers - provide social and medical care in a group/community setting for senior citizens.
4. Technology providers - provide technological solutions for care management, care monitoring and operational management.
5. Insurance companies - provide different insurance packages for senior citizens to cater to diverse aspects of their elderly care.
6. Investment firms - Provide capital for high growth companies and create liquidity in the market.
7. Research institutions - provide fundamental knowledge and answer critical questions.

²⁷ <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0111555>

²⁸ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5681283/>

²⁹ <https://www.ncbi.nlm.nih.gov/pubmed/26466052>

³⁰ The Hukou system has two classification, which are non-agricultural Hukou and agricultural HuKou; the rural area populace usually possess agricultural HuKou

³¹ <http://www.chinadaily.com.cn/a/201805/14/WS5af9868ca3103f6866ee848a.html>

3. Opportunities, Collaboration, and Challenges



Cherish Yearn (clockwise from top left) courtyard; sky garden; fitness and recreation area; painting and calligraphy room

3.1 High-End Healthy Ageing Community Care Services

Delegates were given a tour of Cherish Yearn³² and a briefing on healthy ageing at the Affinity Source Yinfeng Senior Apartment, retirement community.

Cherish Yearn is a private senior-citizen membership community-care centre in Shanghai. The average age of a member is 79 years.

Affinity Source Yinfeng Senior Apartment provides one-stop continuous care for high-end elderly citizens through a combination of medical, social and nutritional care. There is a strong family culture of “harmony, respect, nutrition and music”.

There are two categories of service – basic and upgrade. The basic service is primarily a secretarial service that acts as the

link between the members’ pension service resources.

The upgrade service is a personalised care service comprising of a psychological care nurse, rehabilitation caregiver and nutritional care professional. The psychological care nurse acts as an “intimate partner” by patiently listening to the elder, helping to solve problems and providing mental health support. The rehabilitation caregivers create a personalised and professional rehabilitation training programme to improve an elder’s self-care ability and quality of life. The nutritional care professional provides tailored guidance and menus.

The six characteristics of medical care at Affinity Source Yinfeng Senior Apartment are:

1. Family doctor: provides members with health care, medication guidance, health management and emergency assistance.

³² <http://www.qinheyuan.com/index.html>



Cherish Yearn (clockwise from top left) psychological counselling room; rehabilitation sports area; experiential kitchen; hospice care area

2. Chronic disease management: personalised guidance in sports, nutrition, psychology, rehabilitation and other aspects.
3. Medical assistance: provides medical assistance to members, such as accompanying a doctor, assisting with medication, taking inspection reports, etc.
4. Green channel: open exclusive channel service for members in medical appointment registration, daily clinic, expert clinic and appointment surgery.
5. Rehabilitation therapy: provides members with safe and soothing rehabilitation treatment services, improves self-care ability and their quality of life.
6. Self-care: inspires members' potential and improves their self-care ability.

Cherish Yearn has a strong focus on using technology as a driver for elderly care operational management. Examples are:

1. Smart badge for monitoring the movement of elderly people going in and out of the facility.
2. Smart badge for service payment and financial tracking.
3. Smart badge with an emergency button for access to an immediate response by qualified or unqualified staff.

4. Facial recognition technology for analysis of a member's emotional state, disease progression and access permission.
5. Data from smart sensors to optimise elderly care experience.
6. Data from activities to assess the welfare and engagement of its members.
7. Smart mirror for news and weather update.
8. Use of robots to monitor the mobility of an elder during activities.

Cherish Yearn has started a new dementia care project; a separate dementia unit has been set up to receive dementia patients who are unable to live independently. Social care is a key part of dementia care management at Cherish Yearn.

Research and development is a key activity at Cherish Yearn. They are looking into how ageing affects service and digital devices; designing and developing unconscious behaviours to improve elderly activity engagement; the creation of new service models for elderly care and integrating human-robot relationships for better elderly care experiences.



Visit to Cherish Yearn Group (Clockwise from top left) UK delegates and Cherish Yearn Group representatives; presentation by Founder and Chairman of Cherish Yearn Group; group activity board; and swimming pool facilities

Cherish Yearn is very open to collaboration with UK delegates and stakeholders across the healthy ageing supply and value chain. They have collaborated with Richard Rogers on architectural design; attended healthy ageing training at the University of Oxford³³; hosted seminars and academic exchanges with Japanese, German and Singaporean healthy ageing experts; and sent Chinese delegates to Germany for healthy ageing training.

It's worth mentioning that Cherish Yearn also has a charitable foundation which supports elders in financial difficulty.

Key notable challenges faced by Cherish Yearn are:

1. Difficulty with the management of elderly couples and supply of door-to-door services if one has dementia, rather than splitting them up.
2. Low willingness for elderly people to spend on their care.
3. Low willingness for elderly people to sell their properties.
4. Meeting market demand.

³³ <https://www.oxfordmartin.ox.ac.uk/ageing>

3.2 Door-to-Door Community Healthy Ageing Services

The delegates had an insightful discussion with the managing director of Joy Nay Senior, a door-to-door service for older people on low incomes who require living needs and nursing care. Joy Nay Senior Care provides nursing care services in the community and home care services to 1,000 people-per-day in Shanghai. Care can mean anything from assisting with bathing to helping with shopping. Twenty-four-hour full-time nursing services are available for elders with mild disabilities and early-stage dementia.

In addition to nursing services, Joy Nay Senior Care provides remote home care for elders and rehabilitation care services. They have found the internet of things (IoT) technology to be beneficial in setting up a family-friendly environment.

From the discussion, the key barriers to growth in the market appear to be out-dated laws, lack of training of caregivers and a reluctance to pay for healthy ageing care services. Also, it was noted by the managing director of Nursing Care Services that the UK has a technical strength and long history of providing healthy ageing care, reliable professional services due to government support and a greater willingness by seniors to accept the service.

Key challenges faced by Joy Nay Senior Care are:

1. Lack of young people joining the healthy ageing workforce.
2. Limited availability of quality training for the healthy ageing workforce.

3.3 Healthy Ageing Local Government Services – Shanghai Civil Service Bureau

The delegation visited the Shanghai Civil Affairs Bureau and discussed the local policies around healthy ageing and how community care was provided in Shanghai.

The Shanghai Civil Affairs Bureau has three healthy ageing policy development themes – love and care, traditional communities, and giving elderly people a second “respectful” life. Their five healthy ageing themes are: investing in physical functional maintenance of elderly people; investing in information technology for dementia care; investing in big data and telemonitoring for elderly care management; investing in integrated elderly care systems; and investing in service diversity across different elderly care systems.

Shanghai Civil Affairs Bureau has experienced phenomenal development in the healthy ageing Shanghainese market where there has been an increase in the construction of small-

scale elderly care homes in local communities, an increase in large-scale elderly care facilities with 300–500 beds, and an efficient and effective process of building and managing elderly care facilities in Shanghai.

The local government operates four healthy ageing service models: day-to-day elderly care service mode; home care service model; community care service model and institutional care service model. However, they are looking to transform their current model to a more integrated care model.

In the last five years, the Shanghai Civil Affairs Bureau has developed community-based short term residential care facilities. Furthermore, they are developing “community housing” for healthy ageing in rural areas to encourage and facilitate elders living in small support groups. It was unclear if they cooked and socialised in one dwelling as opposed to living together in one dwelling, but in any case, it was a good example of local government tackling loneliness and isolation by building local self-help groups and engaging elders to help each other.

The local government in Shanghai is keen to better understand dementia care at the state level and is focusing on designing and developing dementia care for physically-dependent elderly citizens. Its area of interests in dementia care are care services and infrastructure for different stages of dementia, accurate tools for diagnosis of dementia, prevention of dementia and psychological support for family members supporting a parent with dementia. Currently, there are two models of dementia-care delivery - a special dementia care unit and a dementia support group. A special dementia care unit delivers dementia care through specialist staff, professional nursing staff and dedicated dementia resources. Dementia support groups are non-professional groups that support family and friends who have an elder with dementia. Also, they promote dementia care in their local community.

The Shanghai Civil Affairs Bureau invests in smart innovations in information technology for healthy ageing community care. Technological areas of interests include - telemonitoring platforms for caretakers and care management, smart call centres for elderly care, big data warehousing for insight analysis on health conditions and population health management, smart infrared technologies for emergency care monitoring, and smart technologies for low-income homes. One key technological interest is in developing and implementing a community care data harvesting platform for understanding population needs and to make intelligent care predictions.

Shanghai’s municipal government is an example of an outstanding local government with a strong emphasis on



Meeting with the Shanghai Civil Affairs Bureau - Group discussion (left). UK delegates and key stakeholders at the Shanghai Civil Affairs Bureau (right)

healthy ageing. Shanghai's municipal government provides financial support to 60% of older residents receiving home care, representing 6% of the city's older population³⁴. Shanghai has also pioneered the provision of 44,000 at-home hospital beds for older people which are primarily funded by the Shanghai local government with a small additional user fee. Furthermore, they have over 700 elderly homes with 140,000 beds – large homes have around 500 beds, and small homes have around 100-200 beds. Shanghai has an elderly cultural heritage to provide “happy, love, care and a cosy life” for their elderly citizens. The healthy ageing experience and resources provided is, however, not representative of China as a whole as many parts lack the resources required to develop a range of healthy ageing facilities and services to compare with those on offer in Shanghai³⁴.

The Shanghai Civil Affairs Bureau has established key collaborations with Japanese experts to provide staff and policy training in healthy ageing, healthy ageing workshops, and textbooks on healthy ageing. In addition, they have partnered with experts in the Netherlands to design and build elderly-friendly homes and care homes. Potential areas of collaboration between UK experts and the Shanghai Civil Affairs Bureau are: development of elderly care service standards, development of training programmes and workshops, development of data-driven innovative elderly care monitoring systems and platform, development of incentives for attracting young people to elderly care and the development of early-stage dementia diagnosis tools for the Shanghainese population.

Key healthy ageing challenges faced by the Shanghai Civil Affairs Bureau are:

1. Shortage of caregivers.
2. Low standard of staff training and development.
3. Low salary for caregivers.
4. Relatively low level of healthy ageing expertise.
5. Inability to attract sufficient young people into elderly care.
6. Low level of critical data – China has the population but does not have the data.
7. Underdeveloped care needs assessment tools.
8. Underdeveloped assessment tools for service providers.

³⁴ Wong YC, Leung J. (2012). Long-term care in China: issues and prospects. *J Gerontol Soc Work*. 55(7):570-86.



Visit to Shuangjing Golden Heights – (clockwise from top left) market; open space for social interaction; art produced by senior citizens; and drug dispensary unit

3.4 High-End Healthy Ageing Nursing Home Care Service

The delegation visited Shuangjing Golden Heights, a part of Yuecheng Group, a private high-end assisted living nursing home where high-end senior care facilities are provided to serve wealthy senior citizens across China³⁵.

Shuangjing Golden Heights was opened in 2012 and has grown to 239 rooms and 439 beds in total. Residents are healthy, semi-independent and fully dependent seniors. Also, dementia patients are cared for. Lifestyle and social innovations at Shuangjing Golden Heights include an open space and social cafe area, free recreational areas, plentiful outdoor space, multigenerational activity programmes, parent-children activity programme, and a community market.

Services include personal care, health care, medical services, rehabilitation services, memory care, meal services and respite services. Key highlights of Shuangjing Golden Heights as a healthy ageing nursing home are:

1. Located in Shuangjing district of Beijing which is conveniently located and free from traffic.
2. Collaborates with Memory 360 to provide quality memory care.

3. Combines senior service and medical services by establishing a close relationship with a local hospital and Beijing Emergency Centre.

The fee structure varies depending on the type of care required. Long-term care with meals included costs between RMB 9800 and RMB 15,600 per month, depending on the type of room. Nursing fee expenses are classified as group nursing at RMB 80-220 per day, varying by nursing level and personal nursing for a minimum of RMB 6,000 per month. Residents are also required to pay a deposit of RMB 50,000 as a medical guarantee, but this is refundable.

Elders tend to enter nursing care around the age of sixty, and the average stay is twenty years for assisted living and five years for special care. This is a similar position to the UK twenty years ago. Now in the UK, older adults tend to enter nursing care later in life at around eighty-five years with a high level of need for an average of less than a year at the end of their life. This change in pattern is because of the increase in the number of retirement properties for independent living and the availability of home care over the last twenty years.

³⁵ Glinskaya, Elena, and Zhanliang Feng. Options for Aged Care in China: Building an Efficient and Sustainable Aged Care System. The World Bank, 2018.



Fu Shoukang facilities (clockwise from top left) - Fu Kang; Medical Care Station; day centre; and elderly care home

Assisted living in the Chinese context is really about moving into a high-end nursing home with accessible medical support when necessary. This is quite different from the UK where assisted/independent living is about staying in your own home for as long as possible. Technology usage in the UK in assisted daily living is focused on extending the length of time people can remain in an assisted/independent living setting. However, one UK delegate noted that technology has had limited success in assisted/independent living setting so far.

Digital healthcare in this nursing home environment appears to be more about back-office infrastructure and management systems; customer relationships and service guarantees. It is used in service delivery to yield (management) efficiencies.

One key lesson that was noted by UK delegates from the discussion at Shuangjing Golden Heights was China is getting older before it gets richer.

3.5 Healthy Ageing Community and Home Care Operators

The delegation visited Fu Shoukang³⁶ for a tour and briefing. Fu Shoukang is one of the biggest chains of community and home care operators in Shanghai. The Fu Shoukang service

Key challenges experienced at Shuangjing Golden Heights are:

1. Need better nursing care model for group support of elderly residents as their frailty increases.
2. Need to understand what key technologies will add value to their nursing services.
3. Need to understand better nursing home models and service design.
4. Need to understand how to adapt to the increasing complexity of care needs.
5. Need to improve management of the workforce in terms of recruitment and training.
6. Optimising nutritional plans.
7. Developing new pricing models for different types of nursing services.

³⁶ <http://www.zhaohu365.com/>



Visit to Fu Shoukang - Dementia care room (top left); ultrasound scanner (top right); care robot (bottom)

model is based on the “four-in-one” full-service healthcare service model centred around the elderly, the weak, the sick, and the disabled. Fu Shoukang is the first batch of designated service agencies of the “Shanghai Elderly Medical Care Plan” and “Long-term Care Insurance” to create the “Nursing Station + Day Care” service model and “Nursing Station + Elderly Care Home” service model. At Fu Shoukang, rehabilitation care services are provided for the elderly within its jurisdiction. Three care service packages provided at Fu Shoukang are long-term care, home nurse care and private care for VIP members. Currently, Fu Shoukang has over 30,000 customers, more than 3,000 employees and 90 service outlets across more than 17 cities. Fu Shoukang has four key care facilities – Fu Kang, medical care station, daycare centre and elderly care home.

Fu Kang is a recreational facility that combines daycare, long-term care and community nursing stations to meet the health and spiritual needs of elders aged 60 years. Fu Kang operates from 8.30am until 5.30pm. The medical care station is used to providing life care for elders aged over 60 - home nursing, bed bath and rehabilitation guidance. The medical care station operates from 8.30am to 5.30pm. The daycare centre provides

care for elders over 60 years old who are disabled and/or have mild dementia. Care provided in the daycare centre includes nutrition, entertainment, and social care. The daycare centre operates from 8.30am to 5.30pm. The elderly care home provides temporary housing care, short-term rehabilitation and personalised care. The elderly care home operates 24-hours every day of the year.

Fu Shoukang has a strong focus on implementing technology for delivering efficient healthy ageing care. There was a dedicated rehabilitation unit with ultrasound scanning, and teleconferencing with medical experts in nearby hospitals. The rehabilitation unit was used for physiotherapy and muscle function training. The ultrasound scanning device was used to assess bone health and bone density. The rehabilitation services were available to both residential and daycare patients. There was evidence of data sharing between a care facility and a specialist hospital.

Humanoid-based robots were used at Fu Shoukang to provide entertainment and social companionship for dementia patients. In addition, bedside robots were used for delivering health report data to carers and elders, providing cognitive



Rehabilitation and teleconferencing facilities at Fu Shoukang

gaming applications for memory improvement, and video call facilities with family members. Notable examples include:

1. Intelligent bed sensor which captures data points on micromovement, heart rate and respiratory rate amongst others.
2. Wrist motion sensors to calculate the toilet walk time and to detect issues with night or day-time falls.
3. Use of data from the bed sensor saves labour costs, through allowing less staff per bed - saved two staff per day; and two staff per night.
4. Monitored data is transferred to an elder's medical team for further analysis and design of more personalised care. It serves as a mechanism to integrate different aspects of the health system.

At Fu Shoukang, the cost of daycare services is RMB 1,500 per month, which is significant when compared to a typical pension of around RMB 5,000 – 8,000 per month. It is important to note that the Chinese government provides RMB 1 million per year to cover the facility's operational and staff costs.

Fu Shoukang has experienced rapid growth in the scale of service and facilities, and this has been achieved in only a few years - mostly due to the determination of the regional governments.

3.6 Healthy Ageing Technology-driven Elderly Care

The Expert Mission visited iZhaohu's care home and head office for a tour and healthy ageing technology briefing. iZhaohu is one of the biggest chains of elderly care operators in China, with a focus on the internet of things, artificial intelligence and robotic technology for elderly care. iZhaohu was established in 2007, initially as an IT company designing software for care homes.

In 2010, iZhaohu pivoted from a purely IT-based company

The key challenges faced at Fu Shoukang are:

1. Lack of funding.
2. Lack of workforce.
3. Need for service improvement.

to an IT company with home care services. iZhaohu is the first technology-driven elderly care service company based on K-AID (Knowledge + Artificial Intelligence + Internet of Things + Big Data) integration technology for elderly care management in China.

In 2013, iZhaohu opened its first care home and has expanded to 80 care homes across China with 30 in Shanghai. The total number of elders in their care management portfolio is 10,352 with 934 caregivers. iZhaohu's unique selling points are lower cost, effective care delivery, elderly-friendly environment, family-friendly and intelligent care management. They successfully passed the ISO9001 (2015 version) international quality management system certification.

iZhaohu has won over 15 awards for technological innovation including the prestigious "China's Social Value Creation of Outstanding Enterprise Award" and the outstanding "China Gold Medal Social Enterprise". They operate four service product models – family e-home, postoperative rehabilitation, memory care and rehabilitation daycare.

Their pricing model is based on care needs, technology needs and risk assessment. The government cover 90% of care home cost. In addition, they provide and support dementia care. Dementia care rooms are marked with a large painting of a colourful fruit or vegetable, to act as a memory aid. The maximum stay in the dementia setting is one year - after which they go into nursing or hospital care.

Beacon technology^{37 38 39} was used to track the length and quality of care delivered by a carer to an elderly patient at iZhaohu's care home. The underlying technology was based on a beacon sensor connected to a mobile application and an algorithm was utilised to extract the length of care time and quality of care. It was not very clear how the quality of care metrics were derived.

³⁷ <https://developers.google.com/beacons/>

³⁸ <http://www.ibeacon.com/what-is-ibeacon-a-guide-to-beacons/>

³⁹ https://www.youtube.com/watch?time_continue=97&v=C-9X-j-wDps



Beacon technology at iZhaohu's care home



Gait analysis for fall monitoring at iZhaohu's development office



3D Printing at iZhaohu's care home



Smart handrails for care-need monitoring at one of iZhaohu's care home



Gait analysis technology⁴⁰ in conjunction with computer vision⁴¹ was used to monitor the likelihood of a senior citizen falling. The data captured from the gait analysis system plays a critical part in risk assessment and care management planning. At iZhaohu's care home, it was claimed that their gait analysis algorithm achieved 95% accuracy. Also, they intend to improve accuracy to 99% by incorporating sound technology.

3D printing was another interesting use of technology in iZhaohu's care home. One problem experienced was the short length of time children/grandchildren spent with their elderly relatives.

3D printing was used to keep visiting children and grandchildren motivated to stay longer. Grandchildren can design and print a toy which can take some time to be printed, and therefore incentivises them to stay for longer.

Bluetooth-enabled handrails were used to monitor an older person's use of handrails. The measurement from the Bluetooth handrails served as an indicator of care management. If the person used the Bluetooth handrail more, more care and physiotherapy was made available. Changes in the use of the Bluetooth handrail were used to monitor potential injury and strength. In extreme cases, an alarm notification alerted a physiotherapist to investigate why there was a sharp increase in activity.

Bedside robots were used for elderly care management in both home and home care settings. The bedside robots help elders with tasks like raising the bed, calling family members and providing weather updates. In addition, iZhaohu is actively engaged in robotic research and development for senior citizens.

At iZhaohu's care home, a dedicated rehabilitation unit was

⁴⁰ Xue, David, et al. "Vision-Based Gait Analysis for Senior Care." arXiv preprint arXiv:1812.00169 (2018).

⁴¹ <https://github.com/CMU-Perceptual-Computing-Lab/openpose>



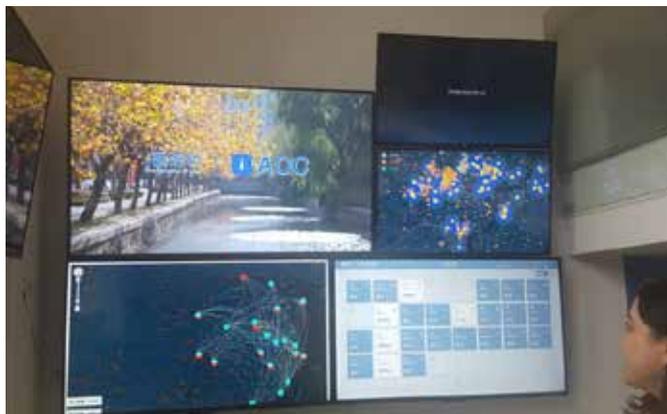
Commercial bedside robot at iZhaohu



Bedside robot R&D lab at iZhaohu



Dedicated rehabilitation unit at iZhaohu's care home



Intelligent smart operational monitoring of home care and care homes at iZhaohu

provided for strength and memory training for older people with reduced muscle functions and to strengthen or maintain their memory and cognitive function. In addition, a small gym unit for one-on-one physiotherapy was provided for direct muscle function training.

Data-driven smart operational monitor trackers are used to measure the operational performance of care delivery at home and in care homes. Tracking algorithms utilise advanced data science models to create a sophisticated approach to ensuring a carer delivers the best form of care. At iZhaohu⁴², the smart operational monitor trackers with big data technology were used to monitor operational performance across 16 provinces and cities in China with a coverage of over 300 communities reaching over 200,000 families.

The key challenges faced at iZhaohu are:

1. Lack of a sufficient number of carers.
2. Poor staff retention.
3. Extracting key insights from a big data set.
4. Underdeveloped service standards and service quality.

⁴² <http://www.izhaohu.com/#/index>

Case study:

Beijing Jieshu Technological Co Ltd

Beijing Jieshu Technological Co Ltd was founded by a number of entrepreneurs who have studied and lived in Europe for many years. Their principal product is an integrated software and intelligent hardware system called “Jieyoubao”.

Jieyoubao consists of a mobile application for customers and service personnel, back-end management system, and a smart speaker. With the help of mobile internet technology, Jieyoubao can harness the unexplored human resources of society to provide comprehensive, responsive and low-cost home-based care service for the elderly. Jieyoubao has been operating as a trial since September 2017, in four communities in Beijing, including the Fenghua Community in Xicheng District and the Xihongmen Community in Daxing District, providing home care services for nearly 80 customers. The National Copyright Administration has issued four sets of software copyright certificates.

The customer acquisition strategy is based around organising local community events to engage elderly people, as the most effective way to build trust while increasing the customer base. They organise free lectures for elderly people and use a mobile app to assist in facilitating activities and event sign-ups. They also run a customer referral programme where they use local community members as service advocates.

The service model is designed to be customer-centric. When a customer needs any type of service, they can send a request through the “one-click call” function on the Beijing Jieshu Technological app on their mobile

phone, or send a request to the smart speaker through voice command. After receiving the request, a customer service centre will contact the user within 5 minutes by phone, to enquire about the type and specific content of the required service. A service ticket is then pushed to the nearest contracted professional. Within 15 minutes, a professional will visit the customer’s house according to the geographical location information stored in the system, and provide the services required (including housekeeping, food delivery, shopping assistance, home appliance maintenance, nursing and caring, medical assistance amongst others). After receiving the service, the customer can give evaluation and feedback on the quality of the service provided by the professional.

Key challenges are:

- Shortage of senior care facilities and amenities as demand significantly outweighs supply as the ageing population is exponentially increasing.
- Shortage and lack of adequate training for a healthy ageing workforce.
- Securing funding.
- Lack of service standards in the healthy ageing Chinese market.

Potential collaboration opportunities with UK companies include:

- Co-technology development.
- Collaborating on service standard development.
- Developing a company-based staff training programme.

Beijing Jieshu Technological Co Ltd won several awards from the Beijing Overseas Scholars Centre.

3.7 Healthy Ageing Research and Development - Tsinghua University – Centre for Gerontology

Established in 1911, Tsinghua University^{43 44} was ranked 1st in Asia University Rankings 2019, 14th in world reputation rankings 2018, and 22nd in world university rankings 2019⁴⁵. It is worth noting that Tsinghua University has experienced a rapid rise in its global ranking from 71st in 2012 to 22nd in 2019, according to the world university rankings league⁴⁶. Tsinghua has educated some of the most prominent Chinese leaders in politics, business, academia and culture, including two Nobel Prize winners.

Tsinghua University – Centre for Gerontology⁴⁷ is committed to multidisciplinary research into the processes of ageing to promote successful ageing and an older population that is healthy and actively involved in the life of the community. The four main research goals of Tsinghua University – Centre for Gerontology are:

1. Provide an academic environment for basic and multidisciplinary research on ageing.
2. Provide education programmes that are demanded by the ageing of the Chinese society.
3. Organise and coordinate research on ageing.
4. Become a think tank for social policies on ageing in China.

Based on discussions at Tsinghua University – Centre for Gerontology, the two main research themes are community settings for elderly care; and financial and economic models for an ageing population. Other areas of interest include:

1. Social services for a healthy ageing population.
2. Game research and development for an elderly population.
3. Practical methods for old age nursing care.
4. Nutrition for an elderly population.
5. Development of health assessment tools for an ageing population.
6. High-tech and low-cost products for elderly people.
7. Human-computer interface research and user acceptance research for older people.
8. Addressing social gaps between older and younger people.

Examples of completed projects in the healthy ageing area include:

1. Living arrangements of the elderly: a new perspective from choice constraints in China⁴⁸.
2. Housing assets for the elderly in urban China: to fund or to hedge?⁴⁹
3. A review of the development of old age security policy in China (funded by the University Research Fund).
4. A study of the development of the institutional long-term care for the elderly and its social implications in China

(funded by the University Foundation from Japan).

5. The organisation and management of community services for the elderly – a case of Tsinghua community (funded by the University Research Fund).
6. Gait assessment of younger and older adults with portable motion-sensing methods: a user study⁵⁰.

Ongoing projects include:

1. Design and evaluation of a mobile phone-based gait assessment application for the elderly: an empirical study among 140 older Chinese adults⁵¹.
2. A prediction of the trend for the development of long-term care facilities in Beijing and suggestions for administrative planning.
3. A study of standardisation for health and social care for the aged population.
4. Dementia-related genes and related metabolic regulation.

We learnt that the Centre for Gerontology received various types of funding, ranging from government, state and industrial financing. The process for obtaining funding wasn't clear.

Long-term insurance was a key point raised during our meeting. Long-term care funding rests on three pillars: state pension (95% of funding), vocation pension (3.4% of funding) and personal pension (1.6% of funding).

Worth noting, personal pension payment is voluntary and is only being piloted. Long-term care insurance is currently funded by the surplus on the medical insurance scheme. This scheme has been identified not to be sustainable as the working population is now experiencing negative population growth and increased longevity. Mentioned in the discussion, there is evidence that long-term care insurance funds in some provinces in China are already in deficit.

The key challenges faced at Centre of Ageing Society Tsinghua University are:

1. Lack of workforce for an ageing population in China.
2. Lack of effective policy and rigorous assessment tools for healthy ageing services in China.
3. Lack of sustainable financial and economic models for a healthy ageing population.

⁴³ <https://www.tsinghua.edu.cn/publish/thu2018en/index.html>

⁴⁴ https://www.youtube.com/watch?time_continue=11&v=KXk3huyXg2Q

⁴⁵ <https://www.timeshighereducation.com/world-university-rankings/tsinghua-university>

⁴⁶ <https://www.timeshighereducation.com/world-university-rankings/tsinghua-university>

⁴⁷ <https://www.tsinghua.edu.cn/publish/Socen/2768/index.html>

⁴⁸ Fan, Ying, Shuai Fang, and Zan Yang. "Living arrangements of the elderly: A new perspective from choice constraints in China." *China Economic Review* 50 (2018): 101-116

⁴⁹ Yang, Zan, Ying Fan, and Cindy Hiu-ying Cheung. "Housing assets to the elderly in urban China: to fund or to hedge?" *Housing studies* 32.5 (2017): 638-658

⁵⁰ Zhong, Runting, Pei-Luen Patrick Rau, and Xinghui Yan. "Gait Assessment of Younger and Older Adults with Portable Motion-Sensing Methods: A User Study." *Mobile Information Systems* 2019 (2019)

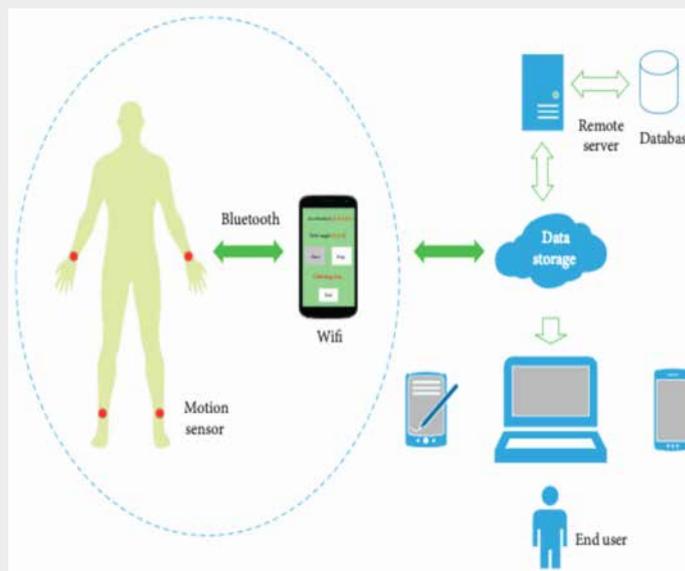
⁵¹ Zhong R, Rau PLP, Design and Evaluation of a Mobile Phone Based Gait Assessment Application for the Elderly: An Empirical Study among 140 Older Chinese Adults, *JMIR Preprints*. 19/04/2019:14453 DOI: 10.2196/preprints.14453

Case study: Gait assessment of younger and older adults with portable motion-sensing methods - A user study

This study aims to explore gait patterns between younger and older adults using a motion-sensing system and sensor technology acceptance among participants.

The motion-sensing system was formed by a smart bracelet, an Android application, and a website based on Microsoft Azure. The study employed quasi-experimental, nonexperimental, and qualitative design.

A total of 28 younger and 28 older adults were recruited. The gait assessment result indicated that the root mean square (RMS) acceleration increased significantly as the walking pace increased based on the right ankle sensor.



User evaluation indicated that the motion-sensing system could be further enhanced by providing feedback on the smart bracelet display, generating an analysis report on the gait visualisation website, and involving family members in data sharing for older adults. Study findings demonstrated that it is feasible to use portable motion-sensing methods to measure gait characteristics among Chinese adults.

Reference: Zhong, Runting, Pei-Luen Patrick Rau, and Xinghui Yan. "Gait Assessment of Younger and Older Adults with Portable Motion-Sensing Methods: A User Study." *Mobile Information Systems* 2019 (2019)

3.8 Healthy Ageing Research and Development – Rehabilitation Research

The delegates visited the National Research Centre for Rehabilitation Technical Aids (NNRA)⁵². NNRA is a national level research centre in the field of rehabilitation technical aids products. It is located in Beijing and is part of the Ministry of Civil Affairs in China.

The NNRA comprises an outstanding research centre, National Quality Supervision and Test Centre for Rehabilitation Technical Aids and the Affiliated National Rehabilitation Hospital, with a total construction area of 15.3 hectares and a total investment of RMB 1.5 billion.

NNRA consists of nine main laboratories - human biomechanics laboratory, biological signal laboratory, intelligent control laboratory, service robotics laboratory, human-machine engineering laboratory, rehabilitation technical aids materials laboratory, environment control and transform laboratory, mechanical design laboratory, and rehabilitation technical aids process laboratory.

The NNRA undertakes two ministry-level key laboratory programmes: the Rehabilitation Technical Aids Technology and System Key Laboratory; and the Rehabilitation Technical Aids Study and Evaluation Key Laboratory. Also, a Beijing key laboratory programme named the Rehabilitation Technical Aids Technology for the Dysfunctions of Old People.

NNRA's business scope includes making policy and regulations in the field of rehabilitation technical aids, study of both advanced key technology and common technology, product quality supervision and test, achievements industrialisation, clinical iatrolgy and engineering combined application, and technological aged care demonstration.

The delegation saw an excellent opportunity to collaborate with the NNRA and foster new partnerships with UK academics and businesses to co-develop new technologies such as smart homes, internet + service application and vital signs home monitoring. There are also opportunities to develop post-discharge monitoring hardware systems and software platforms as patients are required to contact their local hospitals for further care and support. Furthermore, community monitoring and data capture could provide insight/research opportunities currently missing.



The key challenges faced at the National Research Centre for Rehabilitation Technical Aids are:

1. Overuse of medicines and drugs compared to rehabilitation and social care by elderly patients.
2. Lack of information about discharged elderly patients in the community.
3. Lack of new interventions for healthy ageing patients such as rich oxygen therapy.
4. Lack of comparative studies on non-drug solutions for treating elderly patients.

⁵² <http://kffj.mca.gov.cn/article/English/200805/20080500014176.shtml>

3.9 Market Challenges with Healthy Ageing in China

3.9.1 Underdeveloped Elderly Care Infrastructure

One of the challenges facing the provision of healthy ageing care in China is attributed to the lack of elderly care infrastructure. To start with, there is a lack of infrastructure geared towards providing care for healthy ageing. For example, a top government-based nursing home in Beijing receives as many as 10,000 applications for its available 1,100 spaces⁵³. The same issue of limited infrastructure is also noted with regard to private sector provision for elderly care. In the cases where private sector infrastructures are available, they are relatively expensive and out of reach for a majority of the population. In general, China offers approximately half as many beds per 1,000 seniors as other developed countries⁵⁴. In addition to a lack of required capacity, the quality of elderly care infrastructure has been noted to provide significant challenges for the provision of care for healthy ageing.

3.9.2 Workforce

A lack of qualified human resource is noted as the main issue facing the provision of care for healthy ageing in China. Part of this can be attributed to the negative stigma associated with care-related jobs⁵⁵. One effect of the negative connotation is evident in the relatively low pay of social care jobs in China. In addition to the negative stigma, there is a shortage of relevant training for social care workers; to illustrate this, in the past, there were no university-based courses relating to social care in Chinese universities.

3.9.3 Regulations

One of the hallmarks of successful healthy ageing systems, as demonstrated in Japan and America is the integration between the different parties responsible for the provision of care for healthy ageing⁵⁶. In China, there are significant difficulties in integrating medical and elder care services. This is due to the need to interact with multiple regulators that have almost two different sets of regulatory practices. Traditional care institutions are regulated by the civil affairs department, while medical care institutions are governed by the health and family planning departments. There is also a need for standard endorsements to be approved.

3.9.4 Medical Insurance Coverage

Inadequate medical insurance coverage is a significant factor that has a negative effect on the access of healthy ageing care in China. Although 95% of elderly Chinese people have

access to basic medical insurance⁵⁷, most of those are holders of non-agricultural Hukou, which excludes much of the population in rural areas⁵⁸. In addition, the level of coverage is insufficient; this is partly because the government-based medical insurance is linked with public hospitals that are noted to be notoriously underdeveloped in terms of quality of infrastructure and personnel⁵⁹.

3.9.5 Culture

The Chinese government has sought to open up the healthy ageing space to the private sector and in particular to foreign players. Culture is one challenge foreign entities must overcome, and as such it is usually advisable to collaborate with local companies⁶⁰. With collaboration, there comes a considerable risk of intellectual property theft⁶¹. A UK delegate noted that the Chinese employed the same regulations regarding intellectual property as those adopted in the UK. The possibility of intellectual property theft has created operational and market entry challenges for foreign entities, which in turn has limited their participation in the market. In recent years, there have been positive changes in terms of the Chinese business culture and international collaboration as advised by the managing partner at Law View Partner.

3.9.6 Narrow Operating Margins

While the market for healthy ageing in China offers significant opportunities for market players, funding is predominantly provided by the government in the form of public-private partnership projects. Whilst these public-private partnerships have been noted to boost interest in the healthy ageing space, they usually come with a low operating margin. This is a major profitability and financial challenge, especially for the private part of the partnership. For example, iZhaohu stated that they were not yet a profitable company even after benefiting from government funding. UK delegates also noted that private firms were wary of participating in the Chinese private-public collaboration as a route to market entry.

3.9.7 Market Readiness

There are significant challenges as the speed-to-market is substantially different from market readiness⁶². There are challenges around social-desirability due to traditional Chinese culture, family values and the high expectations of the elderly. Also, there are challenges around economy-viability as elderly Chinese people have conservative spending habits towards their healthy ageing needs.

⁵³ <https://www.coresponsibility.com/wp-content/uploads/2016/06/Elderly-in-China.pdf>

⁵⁴ <https://www.coresponsibility.com/wp-content/uploads/2016/06/Elderly-in-China.pdf>

⁵⁵ A part of this lack of skilled human resource can be attributed to the negative stigma previously associated with care-related jobs.

⁵⁶ <https://www2.deloitte.com/cn/en/pages/about-deloitte/articles/pr-exploring-the-last-mile-of-healthy-aging.html>

⁵⁷ <https://international.commonwealthfund.org/countries/china/>

⁵⁸ <https://www.china-briefing.com/news/chinas-hukou-system/>

⁵⁹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3776089/>

⁶⁰ <https://www.b2international.com/publications/china-market-entry/>

⁶¹ <https://www.fdiintelligence.com/Locations/Asia-Pacific/China/China-and-IP-ownership-a-risk-worth-taking>

⁶² <http://businessinnovation.design/blog/2017/2/9/zsyvscym8gjfwm1zbp2k2rcc5ndba>

Glossary

Healthy ageing	A broad definition of healthy ageing has been adopted in this report to encompass the notion of ageing healthy and caring for elderly people. Both aspects of elderly care are considered to be healthy ageing in China.
Health ageing market	Broad overall healthy ageing market in China as a whole.
Service providers	Provides care and support for senior citizens in China. Services include medical care, home care, nursing care, house cleaning and food shopping.
Public/government provided healthy ageing insurance	A tax system that financially supports healthy ageing services provided by the Chinese government.
Infrastructure	Systems used by facilities and establishments to provide healthy ageing care.

Annex 1

List of UK Participants

Appello

Cera Care

Docobo

Howz

Innovate UK

Knowledge Transfer Network (KTN)

Social Care Institute for Excellence

TEC Services Association

University of Reading

WCS Care Ltd

List of China Participants

Beijing Jieshu Technological Co Ltd

British Embassy China

Cherish Yearn

Fushoukang

iZhaohu

Law View Partners

Lujiazui Conference Delegates

National Research Centre for Rehabilitation Technical Aids, part of Ministry of Civil Affairs

Shanghai Civil Affairs Bureau

Spright Industrial Capital Group

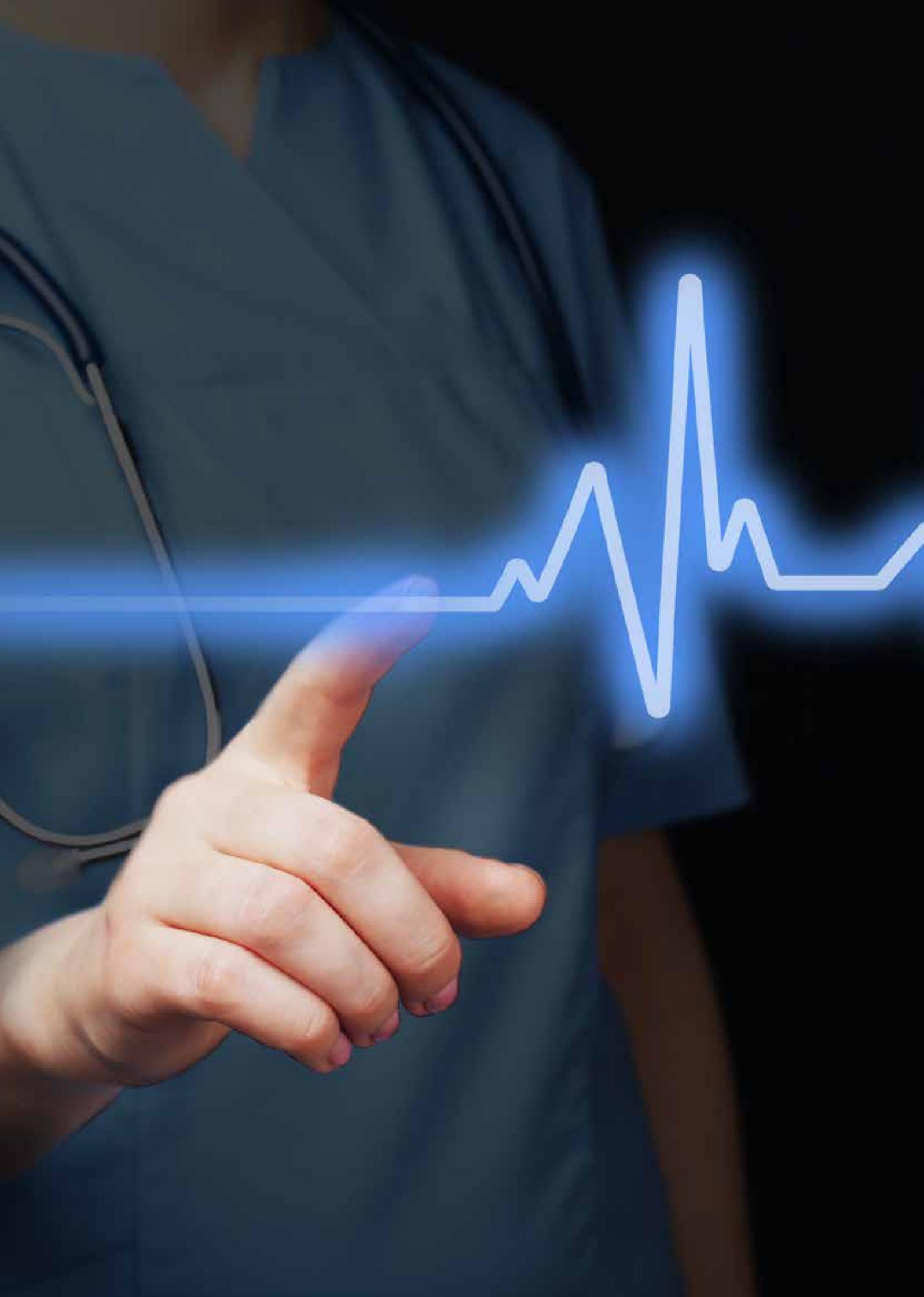
Taikang Healthcare Investment Holdings Ltd

Taikang Pension Insurance Co Ltd

Tsinghua University – Centre for Gerontology

UKRI China

YueCheng Group



Innovate UK
Knowledge Transfer Network

