



仁济医院智慧医疗  
Renji Smart Hospital

# Using the smart hospital platform of internet hospital to address the challenges of aging population

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# Background of The Elderly-oriented Services of Internet Hospital

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RENJI INTERNET HOSPITAL  
SHANGHAI JIAOTONG UNIVERSITY  
SCHOOL OF MEDICINE

# Rapidly increasing demand for medical services among the elderly



## China's Increasing Aging

- China's population aged 60 and over is **297 million**, accounting for **21.1 %** of the total population, while the population aged 65 and over is **217 million**, accounting for **15.4 %** of the total population. <sup>[1]</sup>
- Shanghai**, one of the earliest and most aging cities in China, has **5,536,600** elderly registered members aged 60 and over, accounting for **36.8%** of the total registered population. <sup>[2]</sup>

## Changing disease spectrum / High incidence of chronic diseases

- High incidence of chronic diseases among the elderly (>190 million), with about **40 million disabled and partially disabled**. <sup>[3]</sup>
- 75%** of the elderly having at least one chronic disease and **43%** having multiple co-morbidities. Co-morbidity of chronic diseases is common among the elderly. <sup>[3]</sup>



## Increasing medical visits because of transformed health concepts

- Changes in health concepts and increased demand for medical services for the elderly.
- The elderly in urban and rural areas are significantly more motivated to seek medical visit compared to the beginning of the century.

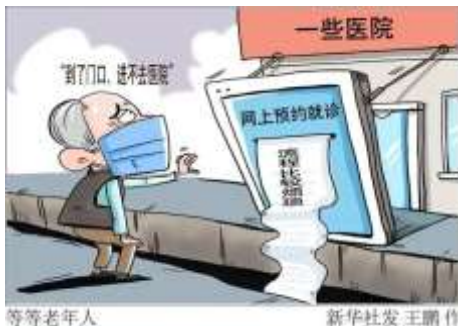


[1]国家统计局. «中华人民共和国2023年国民经济和社会发展统计公报» [EB/OL].2024.

[2]上海市老龄工作委员会办公室. «2022年上海市老年人口和老龄事业监测统计信息» [EB/OL]. 2023.

[3]健康中国行动推进委员会. 健康中国行动 (2019—2030年) [R/OL].2019.

# Elderly face digital divide in access to medical



## ❑ Insufficient understanding and low popularity of the Internet

- China has 170 million Internet users aged 60 or older, with an Internet penetration rate of 57.2% (by the end of 2023).<sup>[1]</sup>
- Low Internet penetration limits the promotion of smart medical services among the elderly.

## ❑ Low utilization rate of intelligent medical services for the elderly

- Research shows that the higher the age of the patient, the worse the utilisation of intelligent medical services.
- The elderly have weak e-health literacy, unable to use or afraid to use smart healthcare services.

## ❑ Elderly-oriented Internet medical services need to be improved

- Fewer Internet hospitals or platforms for diagnostic and treatment have set up special areas for the elderly.
- The Internet consultation system is complex, and less than 5% of elderly in outpatient clinics use Internet medical services.

[2]

[1]中国互联网络信息中心.第53次《中国互联网络发展状况统计报告》[EB/OL].2024.

[2]秦涵书,肖明朝,胡磊.互联网医疗服务适老化研究[J].中国医院,2022,26(8):47-49.



# To improve the elderly-oriented intelligent medical services of great significance



## The individual need...

- ❑ Streamlining offline medical care through virtual cloud-based diagnosis and treatment
- ❑ Strengthening health management and providing personalised medical services

## The institutional need...

- ❑ Optimising service processes to improve service quality and efficiency
- ❑ Enhancing the precision and effectiveness of medical services through elderly-oriented construction

## The social need...

- ❑ Promoting collaborative and hierarchical diagnosis and treatment to enhance the efficiency of resource allocation
- ❑ Optimising “health care combined” model, helping precision medicine and serving the Healthy China



Helping the Elderly Bridge the Gap to Improve Access to Healthcare



- ❑ Elderly-oriented medical services adaption for the elderly population
- ❑ Innovative medical services models to deal with aging population



# Exploration of The Elderly-oriented Services of Renji Internet Hospital

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RENJI INTERNET HOSPITAL  
SHANGHAI JIAOTONG UNIVERSITY  
SCHOOL OF MEDICINE

# Background of Renji Hospital



## The first hospital practicing western medicine in Shanghai

- Founded in 1844, by Dr. William Lockhart, from London  
Missionary Society
- In 1952, became a teaching hospital affiliated to  
Shanghai Second Medical University
- At present, affiliated to Shanghai Jiao Tong University  
School of Medicine





# Background of Renji Hospital

The hospital is the cradle of Western medical education in China



William Lockhart & Huang Chunfu

- ▣ Training for local doctors
- ▣ Promoting vaccination of cowpox
- ▣ Pioneer of Western medical education and public health



## The Firsts in Chinese medical history

- ▣ The first cardiac surgery--closed mitral commissurotomy
- ▣ The first ECMO made in China
- ▣ The first open heart surgery with acupuncture anesthesia



1972年4月19日，王一山首次在针麻下施行  
心内直视手术获得成功

- ▣ Many 'Firsts' in Chinese medical history exposed Renji hospital as one of origins of Western medicine in China

# Background of Renji Hospital



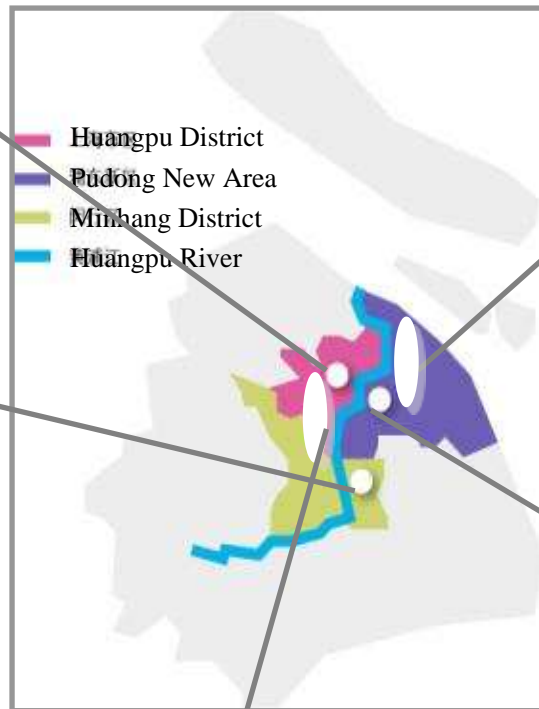
**West Campus**



**South Campus  
Tertiary hospital in suburb area**



**Shanghai Cancer Institute**



**North Campus  
Reproductive Center**



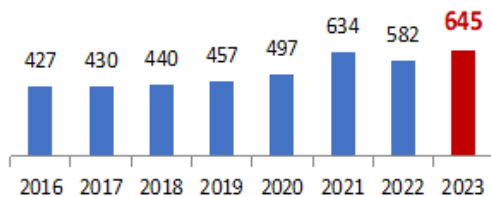
**East Campus Headquarter**

**Total 13 Campus  
in China**

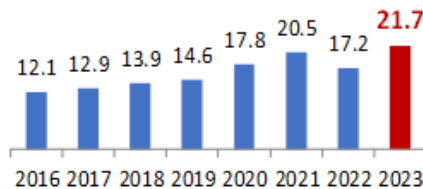
# Performance of Renji Hospital



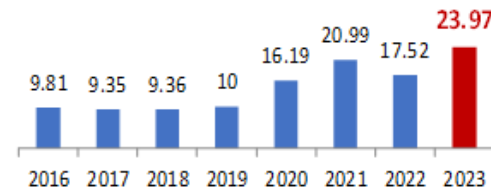
Outpatients and ER visits (10<sup>4</sup>)



Inpatients (10<sup>4</sup>)



Surgeries(10<sup>4</sup>)



Outpatients, discharged patients, surgeries

Ranked No.1 Shanghai

Day surgeries 40%

China's leading level



# International Medical Service



Launched in 2016

Direct-billing with 32 international and domestic insurance companies

54 Dicipines Billingual Service

/ First international medical platform in China passed **DNV DIAS-OSC**

international accreditation with zero rectification for three consecutive years

Providing medical services to the Consulates General of 25 countries in

## CERTIFICATE OF ACCREDITATION

Issued to: Renji International Medical Service  
 Issued date: 22 January 2018  
 Valid until: 22 January 2021

This is to certify that

**Renji International Medical Service**  
 No. 160 Fujian Road, Shanghai, China, 200127

complies with the requirements of  
**DNV GL'S INTERNATIONAL ACCREDITATION PROGRAM  
 FOR OUTPATIENT SPECIALIST CENTRES**

This certificate is valid for the following scope:  
**The Delivery of Outpatient Assessment, Diagnostic and Therapeutic Care.**

File ID: 16161  
 Issued on: 27 February 2018



DNV GL Group (inc.)  
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**Timothy Michel FODGIN**  
 全科家庭医生/Family  
 Medicine  
 加拿大/Canada



**Wai Kwan LA**  
 内科/Internal  
 Medicine  
 马来西亚/Malaysia



**Eszterina Maria BISKUP**  
 内科/Internal  
 Medicine  
 德国/Germany

### Direct Billing Services



# Medical Education

- ✔ **Five-year undergraduate English class**
- ✔ **Full time Master or PhD**
- ✔ **Eight year consistent program, 4+4 education program**
- ✔ **Resident, Specialist training**



## **Simulation Center**

- ✔ officially launched in August 2017, with a total area of 2300 square meters
- ✔ Animal surgery training, comprehensive skills training, and nursing skills training (minimally invasive skill training)



## **Ottawa-Shanghai Joint School of Medicine**

- ✔ Established at October 2014
- ✔ The first 46 students graduated smoothly in July 2020

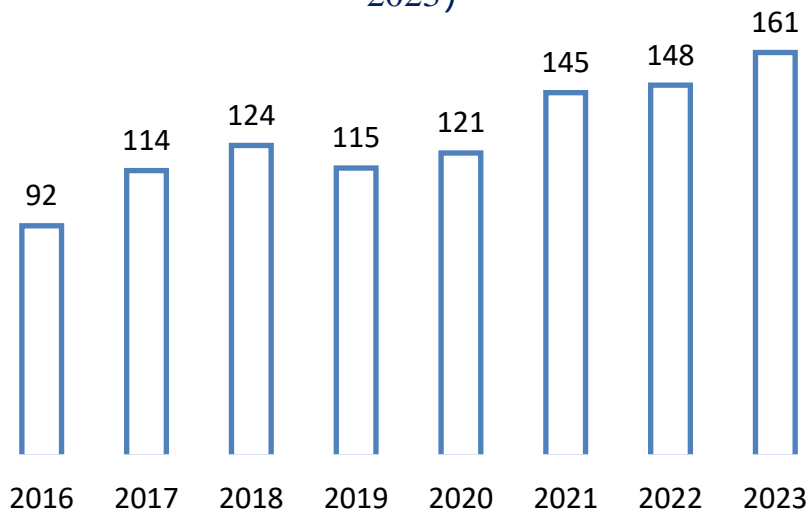


## **Ecole Sino-française de Chirurgie**

- ✔ was jointly established in 2019 with the University of Strasbourg in France to build an international training base for surgical specialists
- ✔ Cultivate a team of surgical teachers with international perspectives who understand teaching and research

# Research

Chinese National Natural Science Foundation (2016-2023)



- **Chinese National Natural Science Foundation:**
  - ➔ More than 100 items for 7 consecutive years
  - ➔ 566 items during the “13th Five-Year Plan” period, the most in Shanghai hospitals
- **Scientific research funding:** exceeded 100 million yuan for 10 consecutive years
- **Natural Index:** Ranked the top 3 medical institutions in the country for 5 consecutive years

# Overall Orientation



Shanghai  
leading  
medical  
center of  
Asia



**Shanghai Jiao Tong  
University**

**ranks among the world's first-class  
(TOP 50) universities**

Innovative  
research-based intelligent  
internationalization



**Renji Hospital**

**National medical  
center**

- To make great achievements in the development of modern medical service in Shanghai

Comprehensive



Distinctive



Reputation



Classic



# Smart Elderly-oriented Services of Renji Internet Hospital



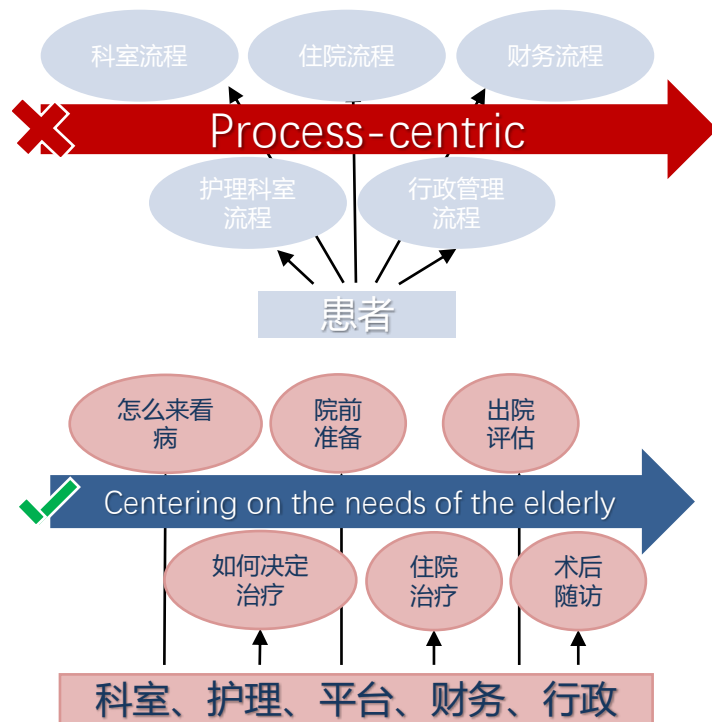
- Strengthen the top-level design, and promote digital transformation of hospitals
- Build a smart medical platform to improve elderly-oriented medical services and supporting services

**Convenience of medical services:** improve whole process of medical treatment for elderly groups around patient experience

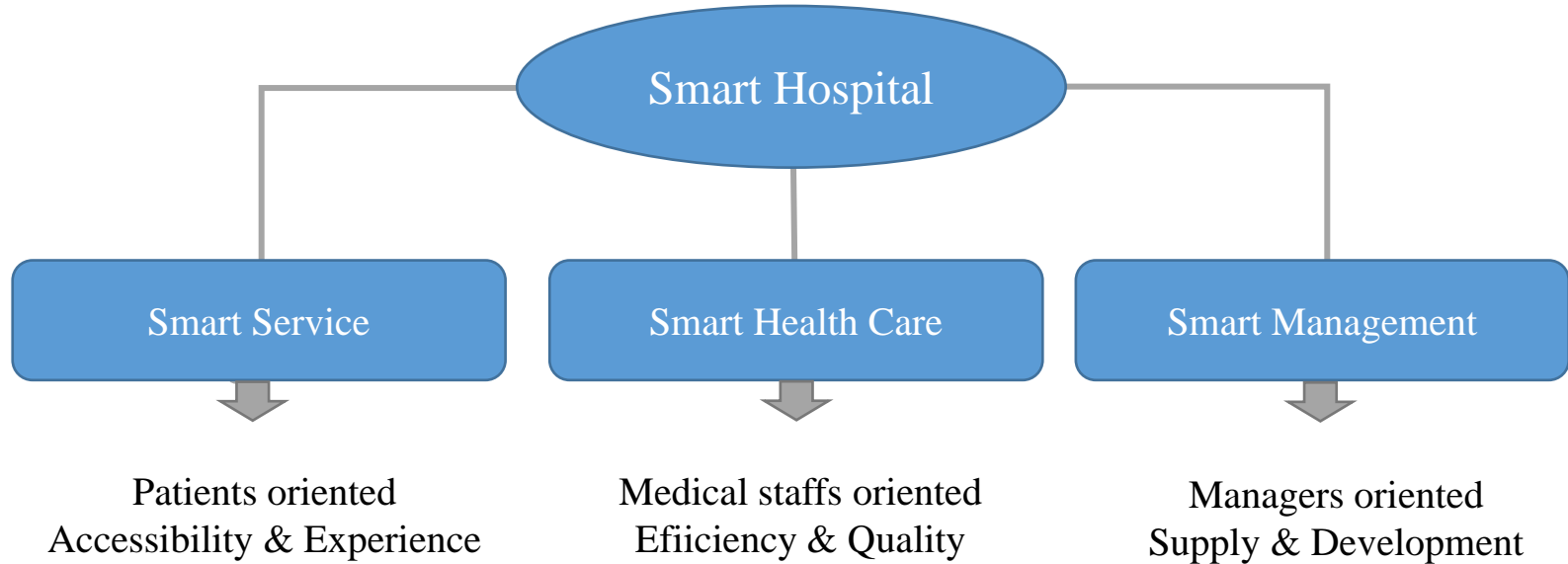
**Service continuity:** shorten the time and space distance of medical supply, and improve service continuity in multiple ways

**Comprehensive service:** break the interinstitutional barriers and enhance the synergy of medical service providers

**Medical ecological integration:** improve the ecological integration of medical and nursing services



# Smart Hospital Framework



Higher quality

Higher efficiency

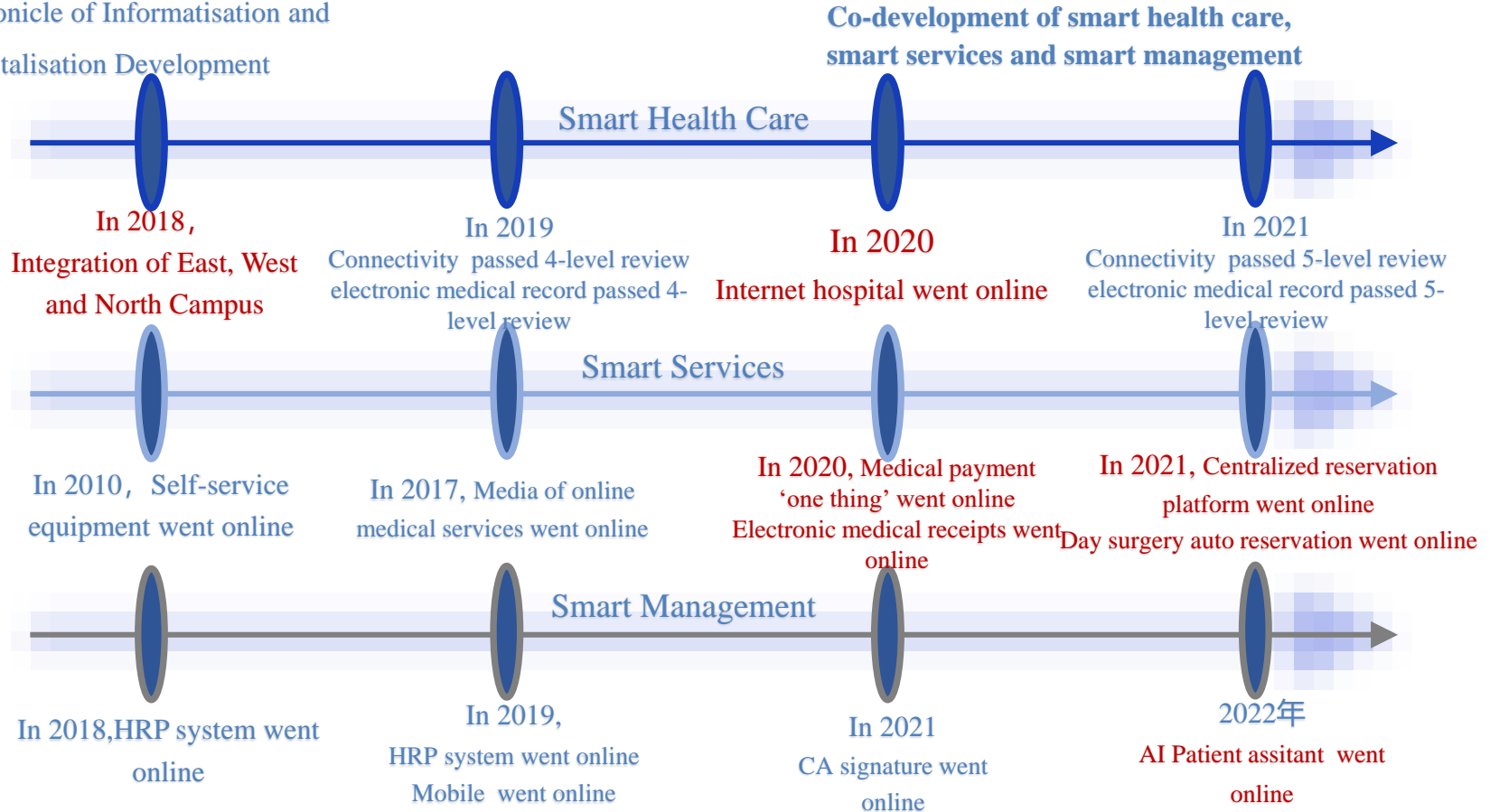
Higher safety

Higher satisfaction

# Structure of Renji Smart Hospital



## Chronicle of Informatisation and Digitalisation Development



# Milestone of Renji Internet Hospital Platform



2020-3  
officially launched

The first batch of internet hospitals with licenses in Shanghai



2021-8

promoting the construction of Internet hospital **version 2.0**

led by Smart Hospital development department

推进仁济互联网  
医院2.0版建设



2022-3

The number of online monthly follow-up visits **exceeded 15,000** for the first time

2024-1

promoting the construction of Internet hospital **version 3.0**

led by Smart Hospital development department

2021-3

The number of online monthly follow-up visits **exceeded 1,000** for the first time

2021-7

Tests such as laboratory test, ultrasound, bone mineral density examination, breath test, Dr, CT and ECG items can be issued online

2021-12

Renji Internet Hospital Experience Center



2023-1

The number of online monthly follow-up visits **exceeded 30,000** for the first time



# Online Smart Core Platform



53

disciplines

>1100

medical staffs

>6 million

registered patients

>11 million

cumulative number of  
people served

>1.2 million

cumulative number of  
seeing doctors online

Annual volume of Internet medical services and online  
prescriptions

Ranking the first place in Shanghai



# Online Smart Core Platform

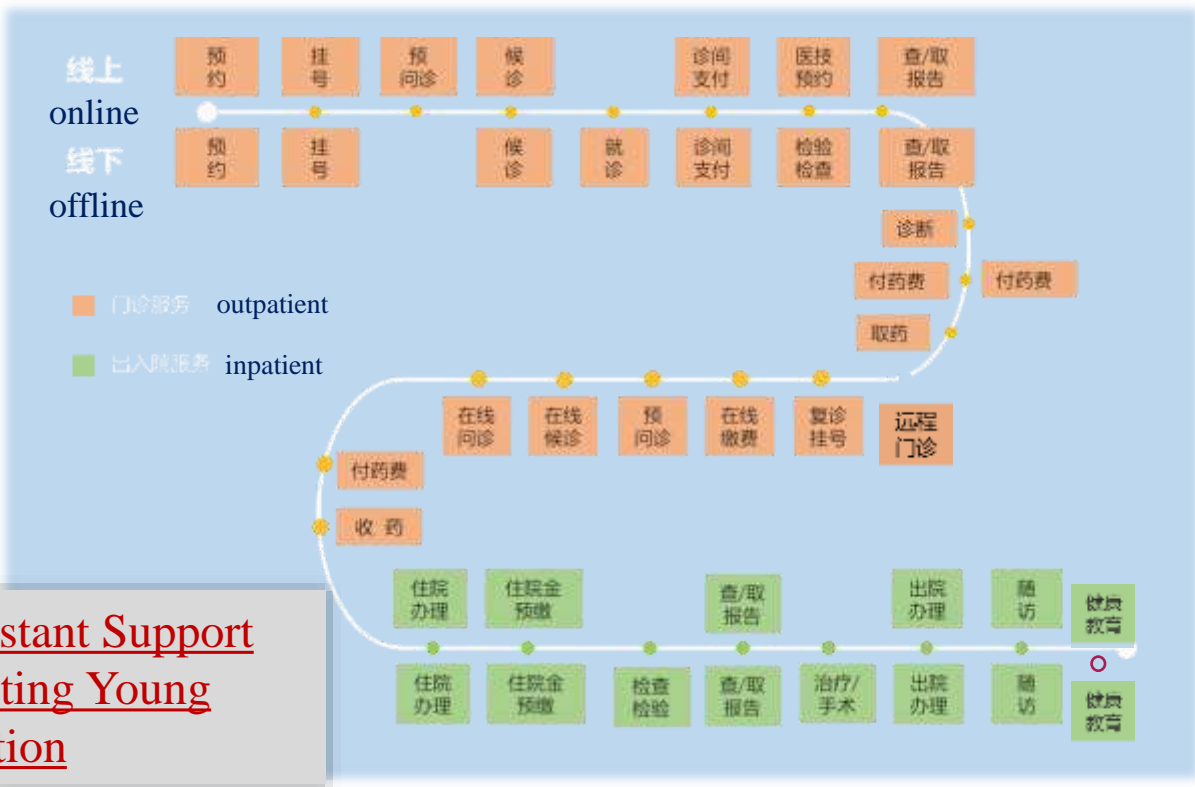


Online and offline

Services throughout whole process

- reservation
- registration
- consultation
- laboratory test
- examination
- hospitalization
- treatment / operation
- follow-up
- education

**AI Assistant Support**  
**Connecting Young**  
**Generation**



# Integration of online and offline resources



- Support to gain health data to achieve cross-campus follow-up
- Increase the number of offline services such as tests and examinations on the Internet hospital
- The inspection can be completed in multiple campuses
- One less queueing visit per treatment
- Examinations are prescribed and reserved online  
(bone mineral density, breath test, PETCT/MR, DR, CT, MRI, ECG, etc.)

AI Centralized  
Reservation Platform

Improve access to experts

Experts above the associate professor level  
accounted for over 50%

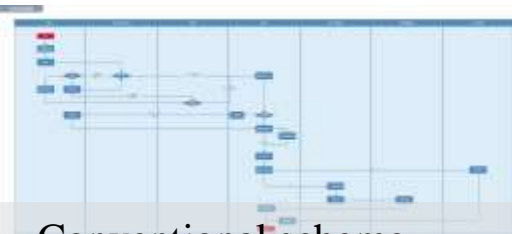


# Multiple ways to improve payment and medicine delivery



- Dynamic adjustment of drug distribution mode
- multi-channel to improve the efficiency of distribution, shorten the delivery time

- Online hospital 'cloud pharmacy' to improve the efficiency of resource allocation
- Open drug pick-up Windows in different campuses for patients and volunteers to take drugs
- Clinical pharmacists guide drug use online to ensure drug safety



Conventional scheme



- Establish a central warehouse for drug sorting in Pudong New Area to accelerate distribution
- 3-5 days delivery to Pudong New Area
- Emergency delivery for patients who are off medication



浦东新区药品分拣中央仓  
覆盖浦东新区36个街镇

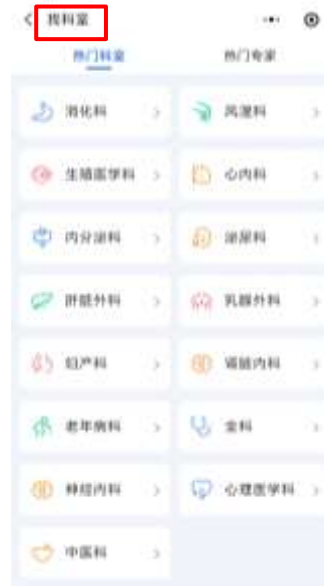


emergency scheme

# Commercial medical insurance cooperation



- Build PICC-Renji 'Cloud Clinic'
- Build a comprehensive platform integrating medical services, health management and insurance services
- Promote the deep integration of high-quality medical services and commercial insurance



Provide convenient medical treatment and direct compensation services for patients in different channels

# Set up specialized outpatient services



- Set up Internet hospital nursing outpatient services
- Expand the scope and level of services of specialist nurses

46 specialist nurses

22 nursing outpatient services



[Home / Personal QR code](#)

## [Access to professional care without leaving home](#)





# Renji Internet Hospital Experience Center



## First Internet hospital exploration zone in Shanghai

Establish 1 service team (Providing services to doctors & patients)

Form 2 exploration systems (Offline: iPad, Screen, business card ;Online: Customer Service)

Develop 3 service procedures (reception of patients & complaints & offline refund)

Create 4 thematic sections (medical experience & customer service  
doctor introduction & achievement display)

More than 150,000 patients received exploration, consultation and assistance services

49 exploration zones have been established



# Intelligent Custom Service of Renji Internet Hospital



Partnership with Tecent, launched the first AI custom service of internet hospital in Shanghai

The application scenario of ‘**artificial intelligence + medical services**’ improves the medical experiences

Awarded at 2022 World Artificial Intelligence Conference





Analysis of patients' medical intention

## Knowledge graph

一级意图	二级意图	意图描述
普通单据	取打印	化验单, 保险单, 检查报告打印相关问题
	查询	查询历史做过的各种检查单据
	补办	补办历史单据
	其他	其他非医院支持的单据类型
医保指南	医保卡	医保卡的使用人、使用范围
	电子医保卡	
	异地医保 新农合医保	
办卡办证	其他	医保相关问题且不包含在上面三种意图范畴内的, 如兵团社保卡报销问题、社保卡相关问题
	办卡办证	办卡, 如就诊卡办理, 新生儿办卡, 如办健康证, XXX证明, 需包含如何办、办理时间、办理地点
门诊时间	建档	产科建档等
	统一上班时间	相关门诊时间兜底意图, 如提到门诊时间但细节不明确则选择该意图
	分院上班时间	问相关分院的上班时间
	放号时间	问医院放号时间
	科室上班时间	问科室上班时间
就诊经费	医生上班时间	问医生线下排班时间
	地点信息	问检查等就诊项目所需费用
电话信息	科室	院内问路, 科室, 检查项等位置
	医生	问科室电话
	医院	问医生电话
住院部	住院部	电话相关兜底意图, 不明确则归到该意图中
	其他	住院部电话
	其他	其他类型的电话, 如住院结算中心电话, 保安处电话
	住院手续	比如住院需要带哪些材料, 如何办理

Digital customer service version 1.0 went online  
More than 730,000 interviews and 260,000 questions answered



# Intelligent Customer Service of Renji Internet Hospital

- Create a virtual medical character to close the relationship between doctors and patients



高度拟人化虚拟数字客服  
“小威”

Image of a real doctor (3D)

- Dynamic Interactive
- Virtual Nurse Images

Elderly-friendly

- Reduced text input

Real time captioning

- Voice interaction
- real-time captioning

Report scanning

- Automatically scan
- Organize according to timeline

[Internet Hospital Digital Customer Service to Improve Efficiency](#)

[Won the excellent case of China Hospital Development Research](#)

[Institute](#)



人民网 上海频道

AI赋能, 医疗数智人帮老年人像打电话一样使用互联网医院

2022年07月19日 09:48



# Social accountability for the elderly



Over **100** thematic free clinics

Over **4,000** doctors and nurses participated

Serving over **50,000** patients







# Innovative Model of "Renji Internet Hospital + Nursing Home"

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RENJI INTERNET HOSPITAL  
SHANGHAI JIAOTONG UNIVERSITY  
SCHOOL OF MEDICINE



# '9073' Elderly Caring Mode in Shanghai

[1]

By the end of 2022, the elderly population with registered residence aged 60 and above in Shanghai reached **5.54 million**, accounting for **36.8%** of total registered residence

Internet hospitals: to promote high-quality medical resources to communities



90% at home

90



7% In the community

7



3% in institutions

3

# Renji Internet Hospital + Nursing Home



**Service object:** elderly people in nursing homes are able to access tertiary care directly

**Service mode:**

- Online diagnosis and treatment for the elderly
- Family members accompany the progress of diagnosis and treatment
- Convenient referral

## Renji Internet Hospital + Nursing Home

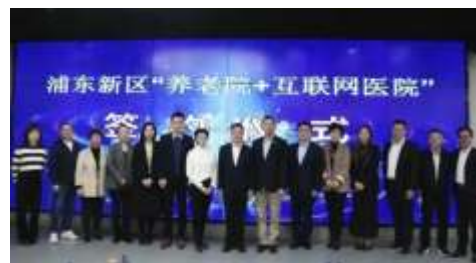
- Application guide
- Cloud Consulting Room
- Rapid medical referral
- Innovate cooperation model

# Renji Internet Hospital + Nursing Home



**8** districts **45** nursing homes

cover more than **16,000** nursing home beds



# Renji Internet Hospital + Nursing Home



## Establish mobile experience centers among nursing homes

To guide the service content and use process of Internet hospital for elderly care institutions

- Intensive training + on-site experience
- Use guidance in nursing facilities



# Cloud Consulting Room of Nursing Home



- To provide convenient, standardized, and continuous medical services for elderly people

Monday to Sunday 7×24h online

Convenient for the elderly



Nursing home workers or volunteers as "health managers" participate in the whole process of diagnosis and treatment of elderly patients



# Renji Internet Hospital + Nursing Home



- Combined with features of nursing homes, explore personalized solutions

## 10 featured disciplines

Geriatric synthesis	Kidney function
Heart health	Urinary system
Cognitive function	Senile nutrition
Digestive function	Traditional Chinese
autoimmunity	Medicine conditioning
	Test

## 7 featured projects

- Brain health
- Heart health
- Internet hospital + remote ward round
- Internet hospital + nursing home integration test
- training program for doctors of medical institutions
- training program for nursing staff of medical institutions
- Internet hospital + non-emergency transport project



# Smart Medical Tests



## Advantages



The elderly are not necessary to come to the hospital, samples can be collected inside nursing homes supported by the smart system linking with Renji Hospital



# Smart Electrocardiogram



- 5G medical application scenarios
- Release medical supplies and provide convenient medical services



前期设备准备



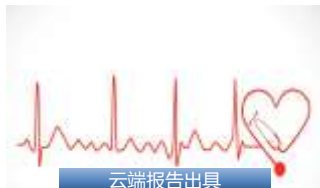
互联网医院开单缴费



院内动态心电监测



数据上传终端

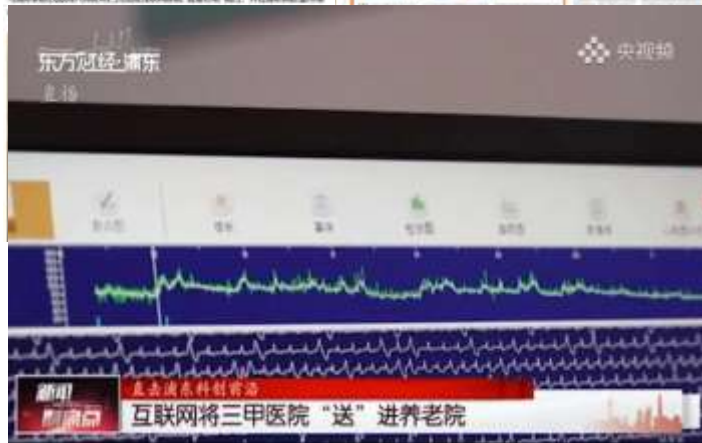


云端报告出具

国产制造助力，浦东首张“养老院生成态心电图”诞生

在养老院内得到24小时动态心电图检查，出具报告！互联网医院“智慧心电”创新医养结合新模式

浦东首张“养老院生成态心电图”诞生



# Smart Check-In Connection and follow up



# Renji Internet Hospital + Nursing Home



- In March 2024, White book of “Renji Internet Hospital + Nursing Home collaboration” has been released

- ✓ Enhance data security
- ✓ Strengthen the construction of application scenarios
- ✓ Strengthen the connection of 5G wearable devices
- ✓ Empower institutional and community elderly care



White book of Renji Internet Hospital + Nursing Home collaboration

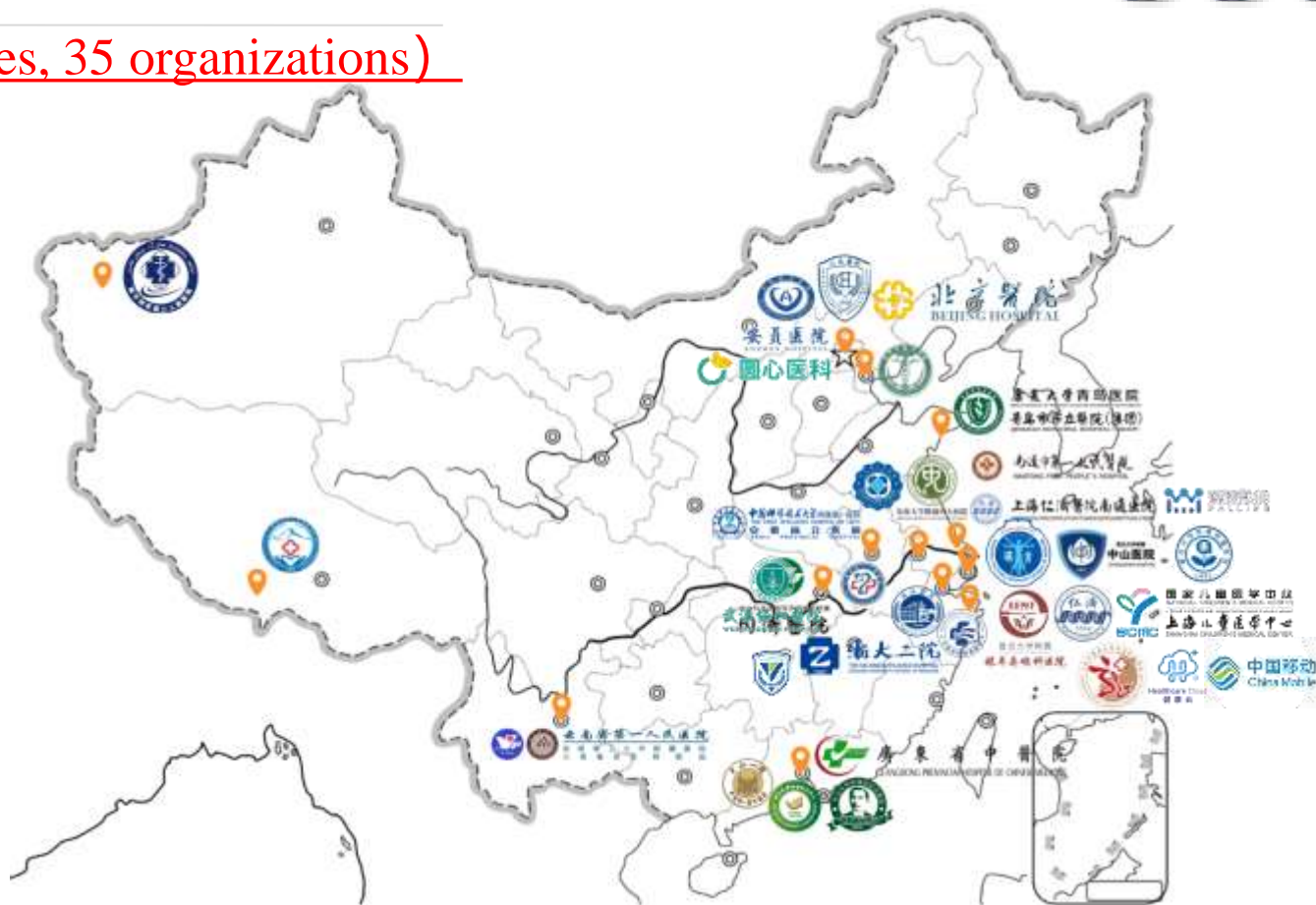
To form reproducible and propagable experiences of integrated medical and elderly caring services



# Future : Multilevel Cooperation



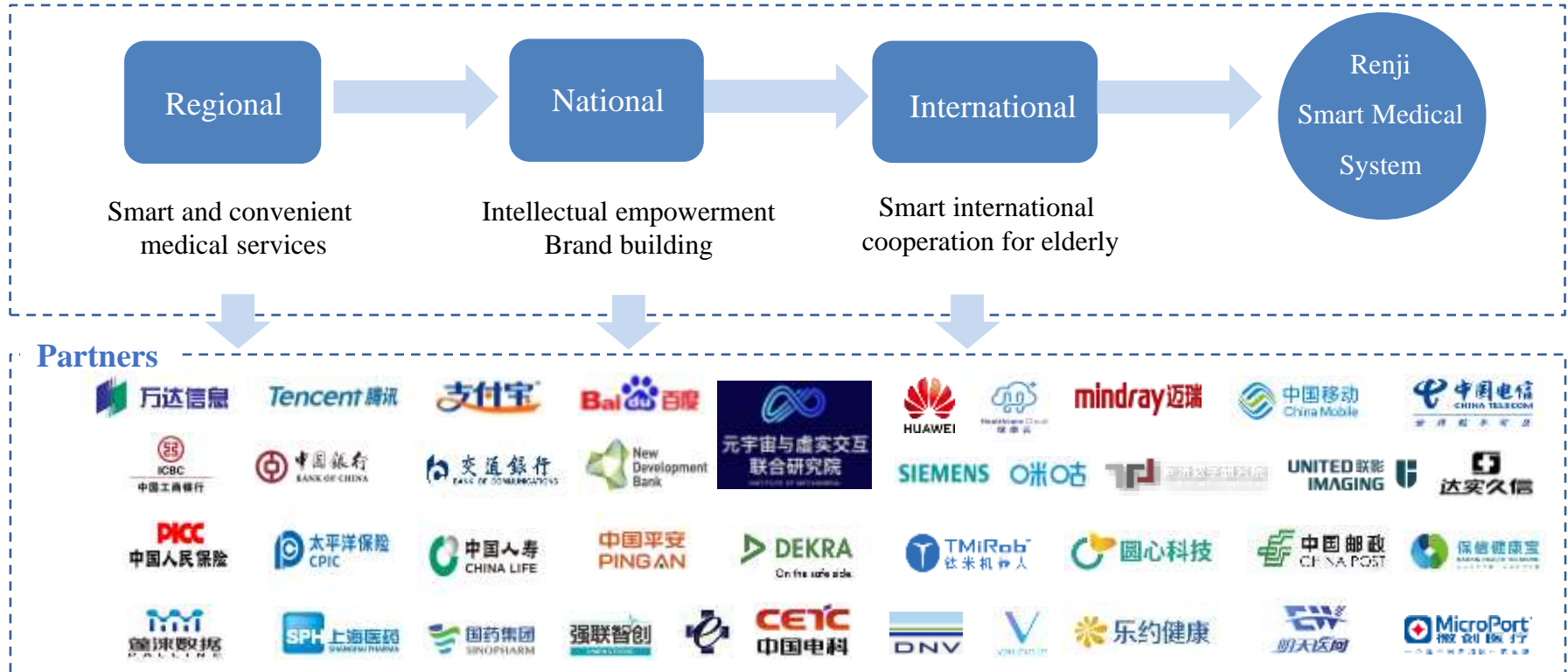
(12 provinces, 35 organizations)



# Future : Multilevel Cooperation



- gradually form a smart medical system of Renji Hospital **through three steps**





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THANK YOU

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Prof.Dr. WANG Chunming (Michael)

Professor, PHD

- Director of Smart Hospital Development Department, Renji Hospital, Jiaotong University School of Medicine, Shanghai
- Guest professor, School of Medicine, University of Ottawa

## academic post

- Member of the Medical Course Management Committee & Director of the Integrated Medical Humanities Curriculum, Ottawa-Shanghai Joint School of Medicine
- Director of Medical Management Branch of China Operations Research Society
- Leader of the Scientific Research Group of the Internet Hospital Branch of the First China Research Hospital Association
- Member of the Medical Artificial Intelligence Management Professional Committee & Outpatient Management Professional Committee of Shanghai Hospital Association
- Advisor of Medical Service Professional Committee & Big Data Center of Shanghai Modern Service Industry Federation
- Young Editor of BMJ Quality & Safety Chinese Edition