



Research on Respiratory Medical IoT(MIoT)



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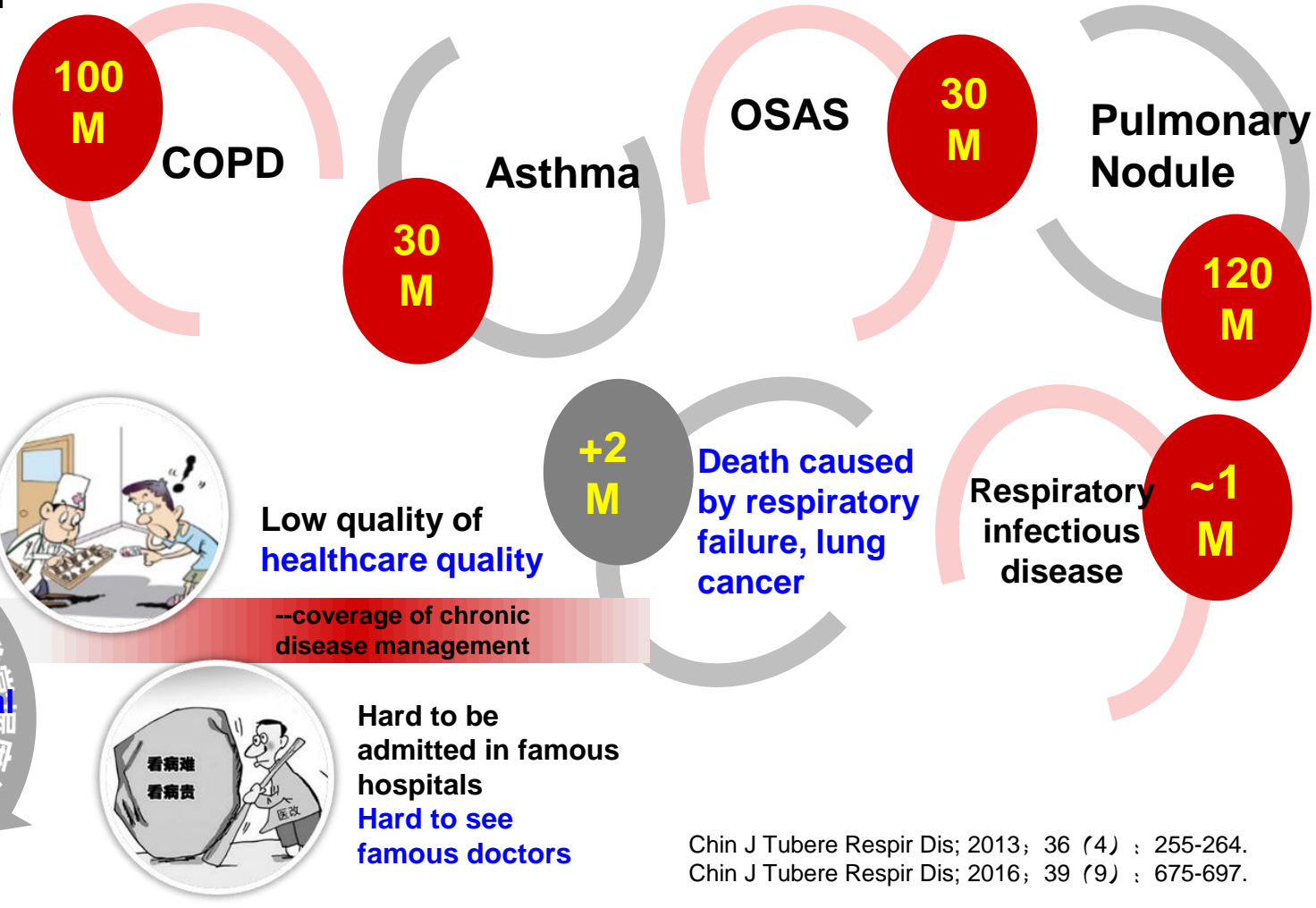
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Medical Care Needs MIoT

- Uneven distribution of medical recourse, need for tiered diagnosis and treatment
- Homestay community require management of chronic disease
- Need 4P medicine and intelligent medicine
- Local medical device request for the international market



Inefficiency on **medical resource application**

++ require management of chronic disease



Low efficiency medical system



Low quality of healthcare quality

--coverage of chronic disease management



**Hard to be admitted in famous hospitals
Hard to see famous doctors**



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IoT Medical Theory Research



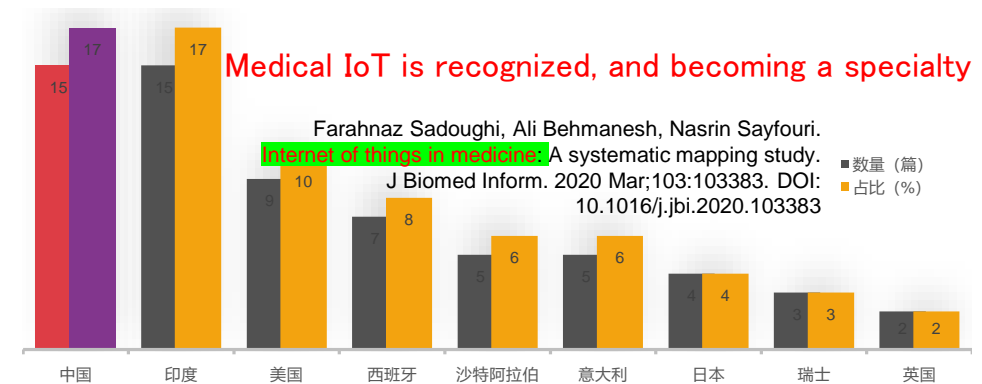
The Concept of MioT

- In 2008, Prof. Chunxue Bai invented cellphone based wireless spirometry, which was reported by 'Who's who' column in 2009 ATS NEWS | VOL.35 NO.7/8
- Then, he proposed 'Medical Internet of Things(MioT)' and edited the books of *Practical Medicine with of IoT*, *Hierarchical Diagnosis and Treatment by Medical IoT*, *Medical Internet of Things*, and co-edited *e-Health 4.0:How Virtualization and Big Data are Revolutionizing Healthcare* with Prof. Thuemmler



Modern Concept of MioT

- By the internet connection of physical things network, including hardware and software technique of sensing, transferring and intelligent processing, it could combined virtual reality (information) and real world (object) to service the huge market of healthcare
- Sadoughi et al. recently published a medical IoT related research, they searched out scientific database from 2000 to 2018 (including IEEE Xplore, Web of Science, Scopus and PubMed) to find 89 papers fitting the concept of medical IoT. Among them, **the highest published countries were China, India and US**
- **Meantime, they also find it is urgent to define the word of 'IoT in Medicine'**
- **This suggests Medical IoT is becoming a specialty**



Biomed Inform, 2020, 103:103383



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Advance in Clinical Application of MIoT





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Clinical Research and Application in China

- **AI assist early detection of lung cancer:** The system was used in 900+ pulmonary nodule centers
- **AI assist management COPD and asthma :** Developing the early detection and management systems by using clinical informatics, including CT and lung function testing
- **nCapp fighting against COVID-19:** Recommended by ATS to detect virus pneumonia and other infectious disease. It could also evaluate the progression and staging of the pneumonia

Int J Respir, 2017, 37(8):561-568; Int J Respir, 2021,41:321-323.

I J COPD 2014:9 381–395; *AJRCCM* 2020, 201:1019–1022; *Eur Res Rev* 0287-2020.

900 Application Sub-Centers Have Been Launched Nationwide

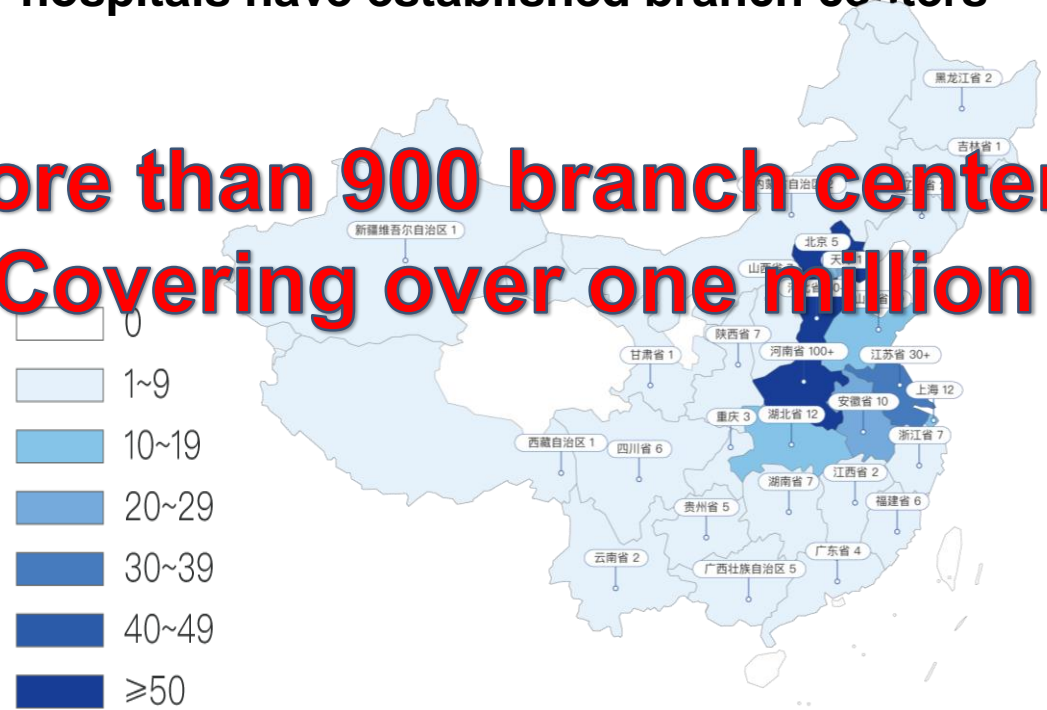
Establish more than **20** medical IoT sub-centers to carry out IoT medical care



Academician Zhong Nanshan highly affirmed the Medical IoT work of Professor Bai Chunxue's team at the 2019 National Respiratory Medicine Annual Conference

More than **120** university hospitals, including Zhongshan, West China, First Hospital of Guangzhou Medical University, Peking Union Medical University, Wuhan Tongji, etc., and more than **780** prefectural and county-level hospitals have established branch centers

More than 900 branch centers covering over one million



AI Assisted Early Detection of Lung Cancer



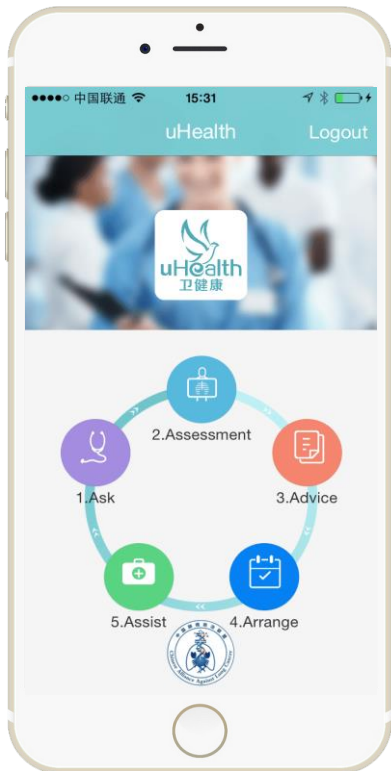
- Developed the new concept of IoT in medicine
- **Launching the "Expert-Machine MDT" for outpatient clinic in Jan 2019**, combining AI to offer patients comprehensive evaluation and management with the sensitivity of 99%, and the specificity 98% for early stage of lung cancer

Chin J Tuberc Respir Dis, 2018,41(10):763-771

Int J Respir, 2017, 37(8):561-568; Int J Respir, 2021, 41 : 321-323

Integrate Consensus Guidelines into PNapp 5A

Easily upgrade the handicraft workshop mode to the homogeneous level



1A

- ASK: history of exposure to risk factors, medical history and family history of tumors, COPD, pulmonary nodules, etc.

2A

- Assessment: chest CT, LCBP and AI, and differential diagnosis of tuberculosis and fungus

3A

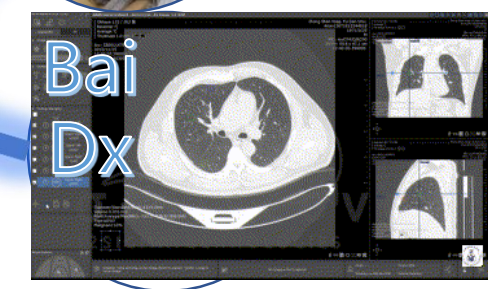
- Advice: Individualized liquid biopsy, ask Grade A, B or C-level experts to judge those who are difficult to diagnose

4A

- Arrangement: those with a clear diagnosis will be given corresponding treatment, and those with high malignancy will be evaluated by Grade A&B experts and a diagnosis and treatment plan will be provided.

5A

- Assistance: IoT-assisted quality control, consultation, and post-operative management



simplification of complex problems, **digitization** of simple problems, **proceduralization** of digital problems, and **systemization** of procedural problems

Integrate PNapp5A into Two Step Process

1. Scan the code; 2. Connect with IAIH cloud; 3. Generate LCBP and analyze with AI; 4. Junior experts make primary evaluation; 5. If lung nodules $\geq 10\text{mm}$ are indeterminate, invite experienced experts to reevaluate

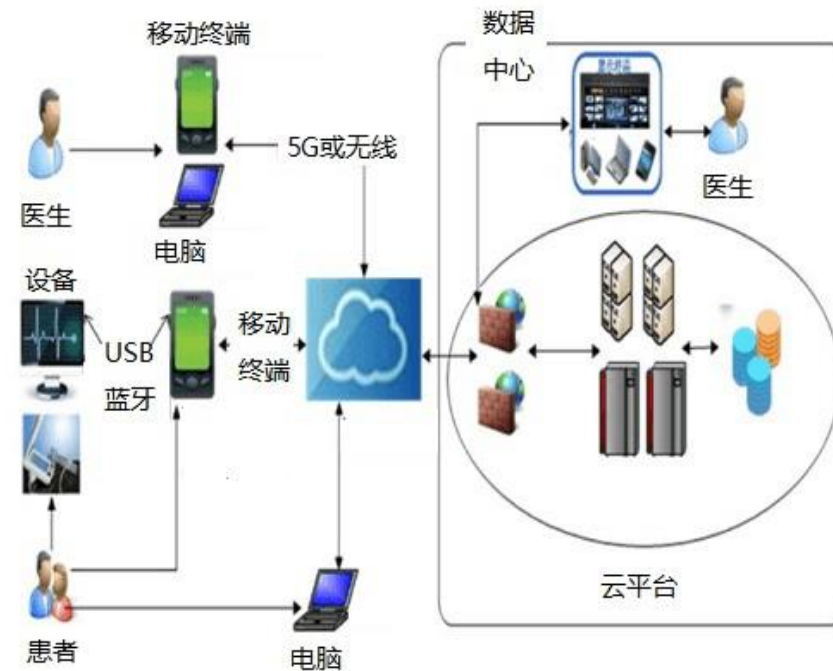
Patent: mobile phone cloud plus terminal MIoT system



PNapp 5A

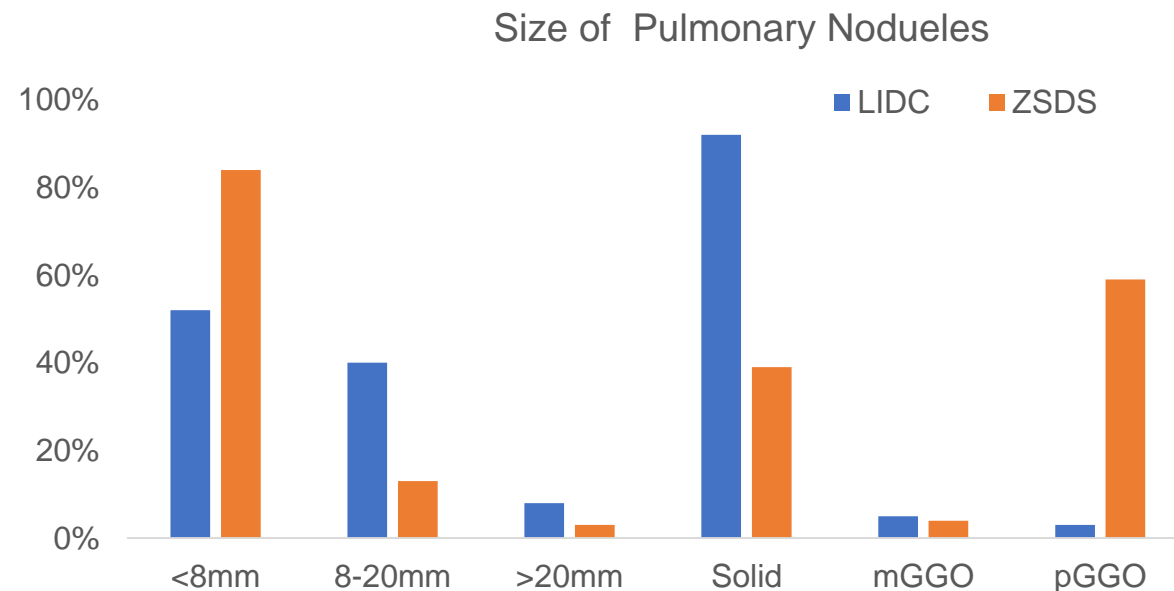


cloud plus terminal implements homogeneous diagnosis and treatment



The Difference of Early Detection of Lung Cancer with and without MioT

- From 2014 to 2019, 16,417 cases of pulmonary nodules were operated at Zhongshan and 9,980 cases with early stage of lung cancer (60.8%) were rescued
- The average age dropped from 63 in 2014 to 50 in 2019
- **Reasons for the success of the case:**
 - Screening the people with risk factors \geq 40 years old
 - Serve the Patients with PNapp5 A
 - Junior experts make primary evaluation
 - If pulmonary nodules \geq 10mm were indeterminate, I will be invited for reevaluation



Compared with the data from the Lung Nodule Clinical Imaging Database (LIDC) in the NLST study in the United States, the proportion of patients with malignant pulmonary nodules that were surgically removed in Zhongshan Hospital was significantly higher than that of patients with lung nodules in the pre-infiltration stage

Note: The above data sets of the United States and China are based on the case data analysis of the LIDC database and the Zhongshan Hospital database respectively

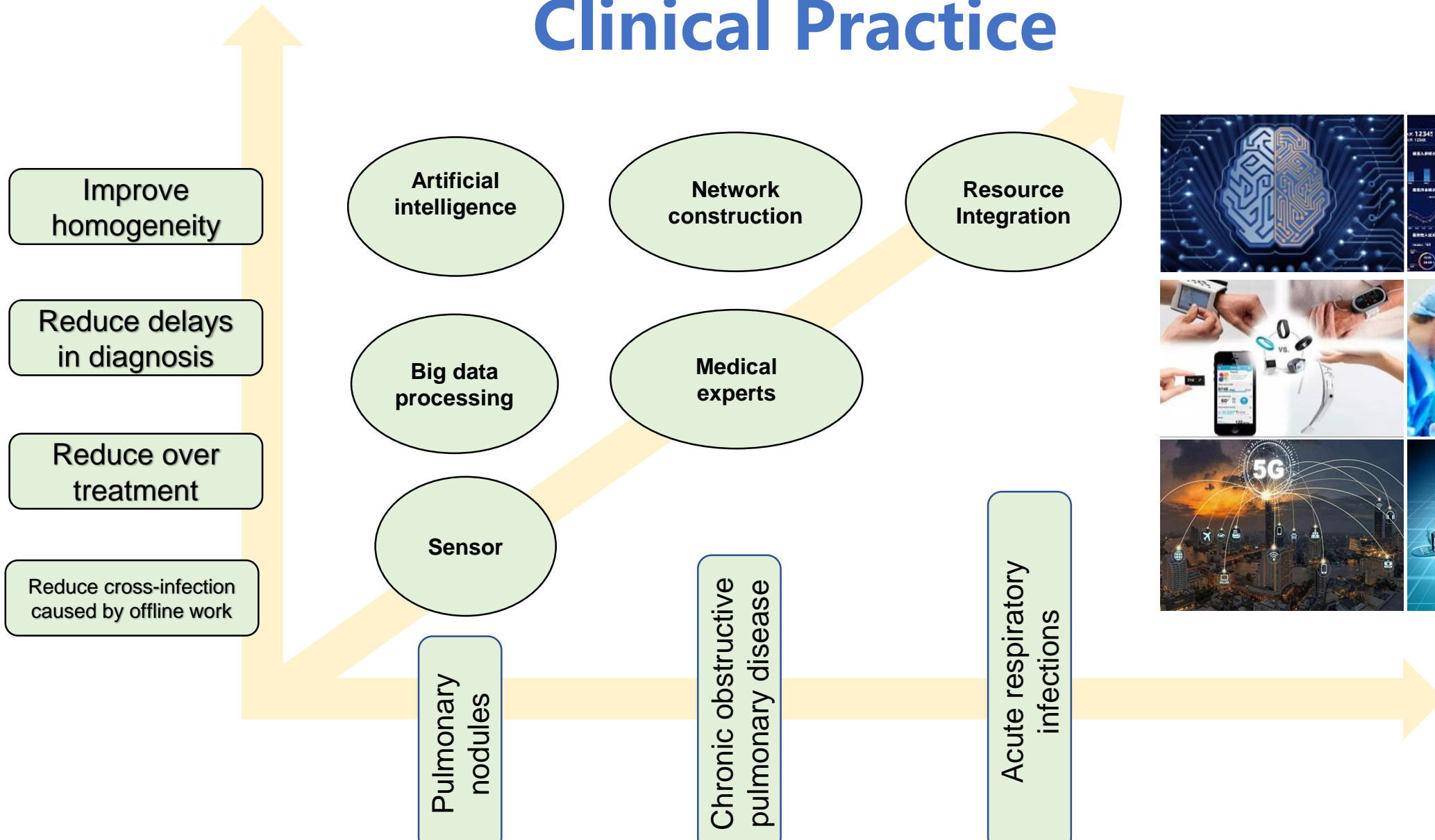


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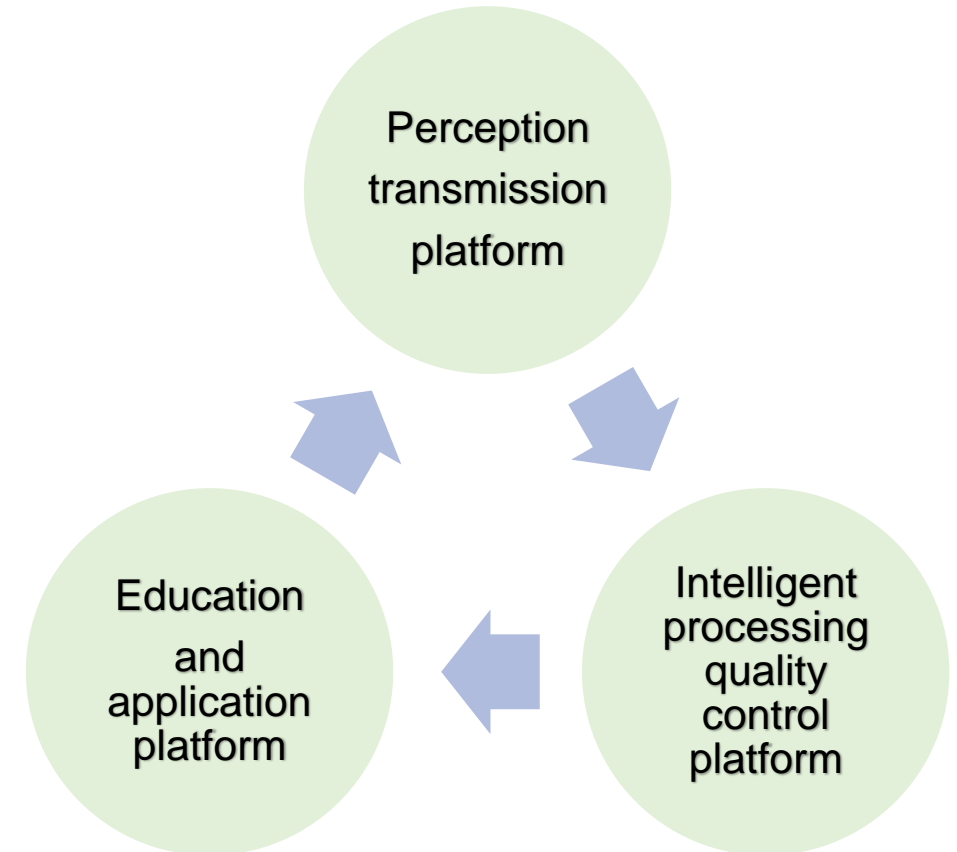
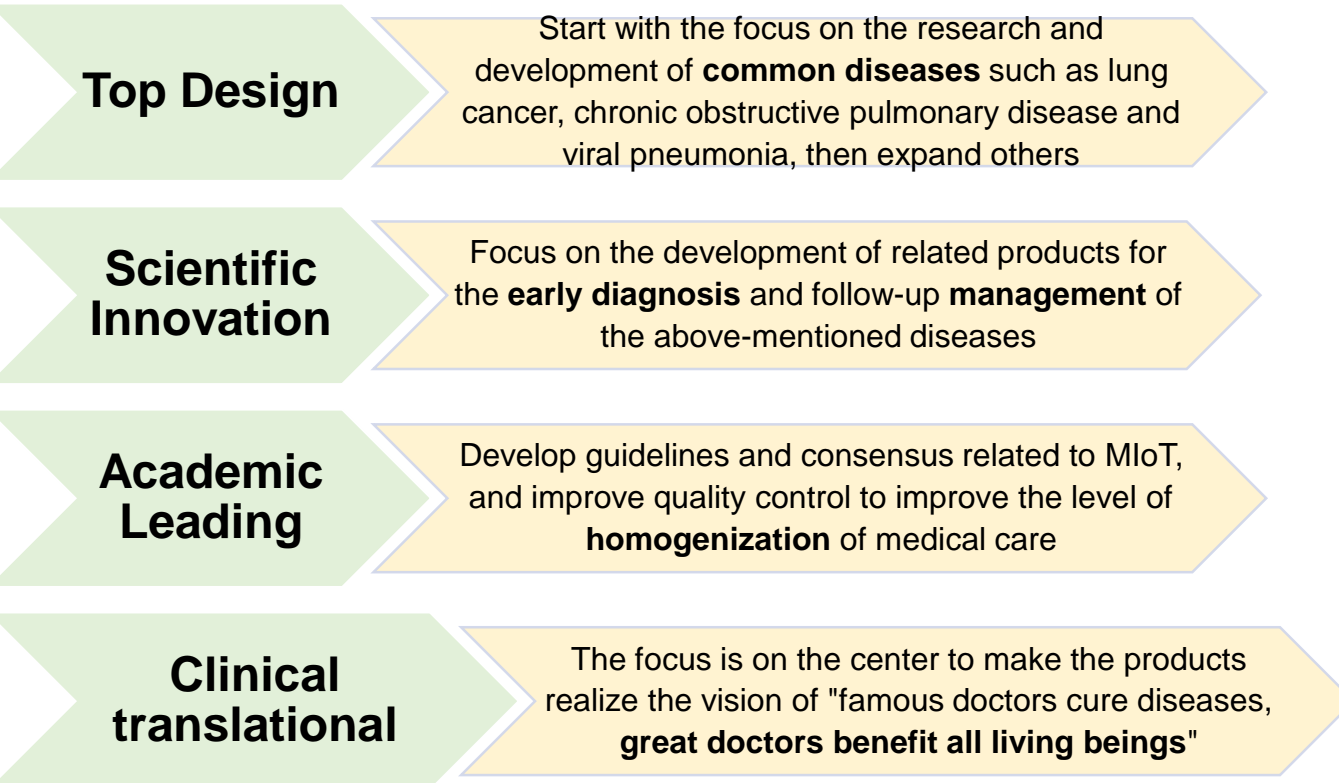
Incorporate new concept of MioT into Clinical Practice



The Goals and Tasks of the Center

Establish a four-features engineering center with "culture, talents, technology, and social benefits"

Create three IoT medical platforms

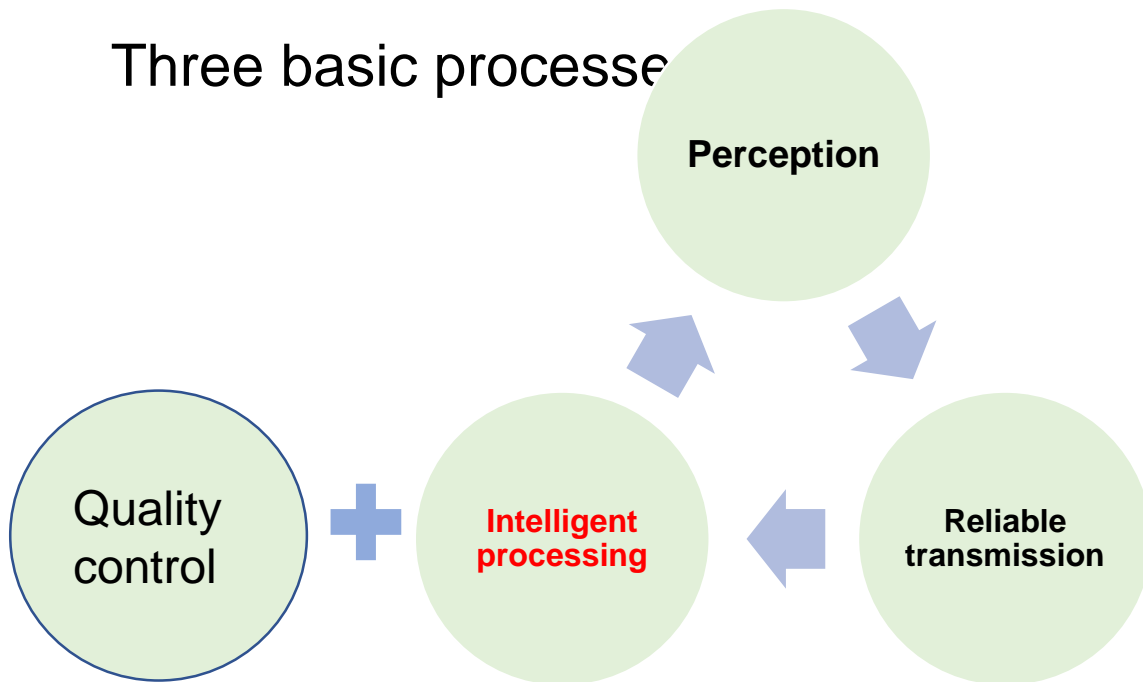


Simplification of complex problems, **digitization** of simple problems, **proceduralization** of digital problems, and **systemization** of procedural problems

The goal of building

Build an internationally advanced Platform for MioT

Three basic processes



Main mission

Perception

- Take the IoT pulmonary function instruments as breakthrough points to build an internationally advanced level of **respiratory function sensing** equipment

Perception

- Developed a wearable **cardiopulmonary coupling monitoring system** to monitoring chest breathing, abdominal breathing, breath sounds and diaphragm movements, with a battery life of no less than 48 hours

Perception

- Develop a wearable **exercise lung function** monitoring system to reliable monitoring of nasal airflow and composition, vital capacity, tidal volume, carbon dioxide concentration and oxygen concentration

Transmission

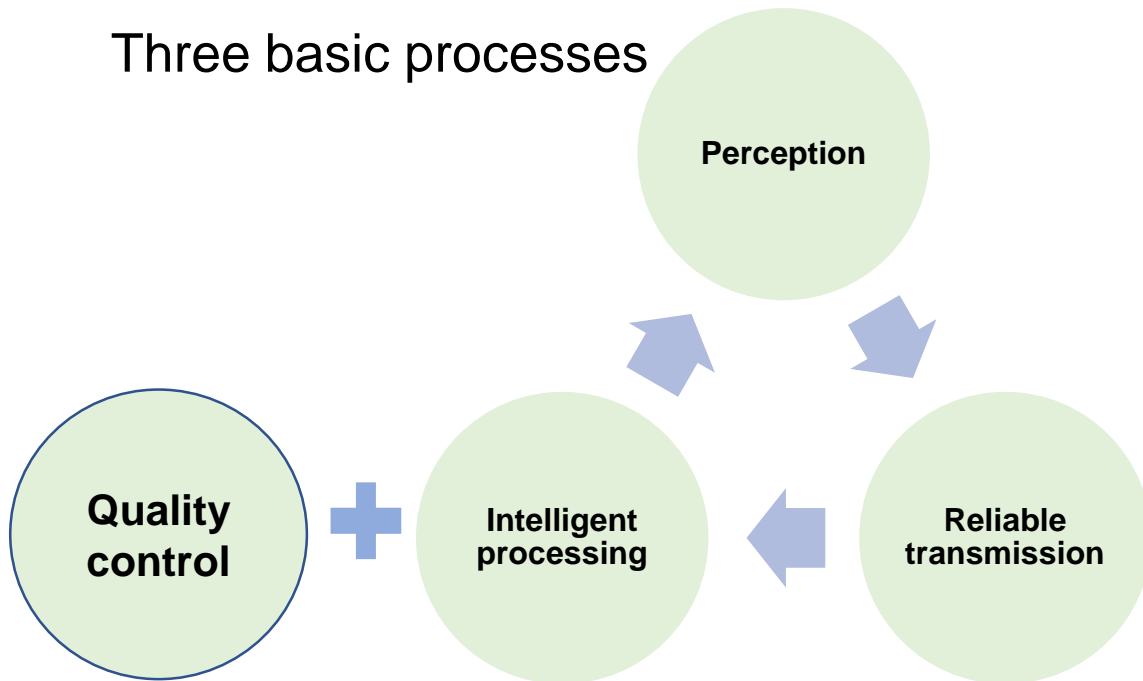
- Using the chip as the starting point, build an internationally advanced **transmission software and hardware equipment** that can break the current information island effect

Intelligent Processing and Quality Control

The goal of building

Build an internationally advanced Platform for
MioT

Three basic processes



Main mission

**Chronic respiratory disease and
health management system**

**Early detection and risk prediction
model based on multi-modality**

**Viral pneumonia and lung nodules
"Intelligent Processing"**

Reach the international leading level

The goal of building

- Serving 120 million users for Healthy China “2030” plan through platforms “Healthy China Internet TV”



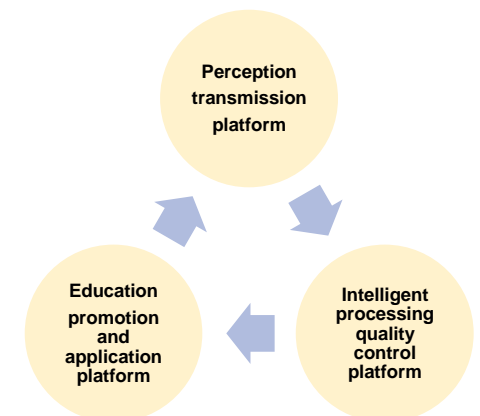
Main mission

• "Healthy China Internet TV" channel

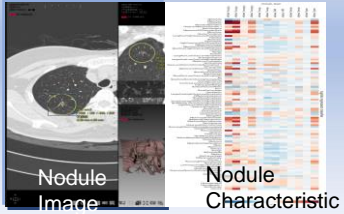
- Smart health and medical work
- Lung nodule diagnosis and treatment and big health IoT experience center
- **IHC** online version and mobile version
- Integration and command of IoT management functions
- Serve **120 million** users and radiate grassroots physicians

Upgraded OTT all-in-one machine

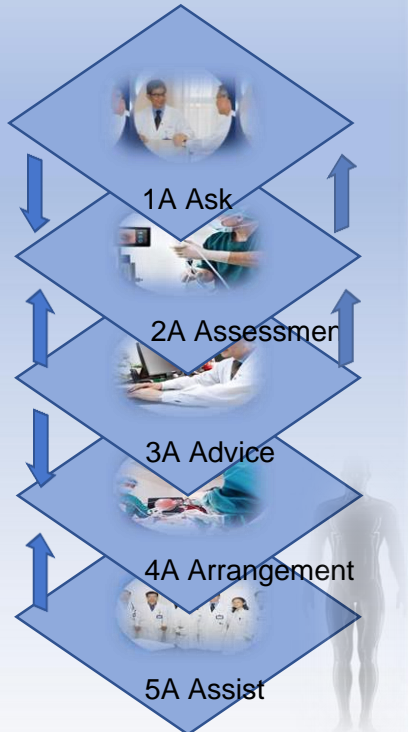
- Improve promotion effect



Application Area 1: Early Detection of Lung Cancer Reducing Lung Cancer Mortality and Increase 10-year Survival Rate



Radiological reductionism



Integrate consensus guidelines and technology into the 5A process, and use AR to assist in promotion

To innovate and develop software and hardware for early detection of lung cancer

- To innovate and develop a new system for pulmonary nodules "intelligent evaluation and management" cloud plus end software to improve the quality for front-line doctors and experts
- Cooperate with CIBN Health Tech to develop an upgraded version of OTT all-in-one machine
- Cooperate with SANMED, East China University of Science and Technology, Shanghai Jiaotong University, etc.,



Application Area 2: nCapp Intelligently Assists in Detection of Viral Pneumonia to Reduce Mortality Rate of It, such as COVID-19



患者登记

开始接诊

智辅诊断

智导治疗

智慧专家

地图定位

自我防控

相关资料

新型冠状病毒肺炎全国疫情数据报告

截止2020-09-24 09:04:36数据统计

确诊	疑似	死亡	治愈
90918	2765	4745	85788

- To establish a Cube for the diagnosis of viral pneumonia
 - ✓ Single cylindrical independent single room
 - ✓ ID card/medical insurance card + face recognition
 - ✓ Automatic temperature measurement and flow adjustment
 - ✓ Automated portable X-ray scanner (patent applied)
 - ✓ Cough and other voice recognition
 - ✓ Automated disinfection
- Cooperate in the research and development of the "intelligent assessment and management" cloud-added software for monitoring the recurrence of infectious diseases



Application Area 3: Precise Management of COPD to Reduce Acute Exacerbation and Mortality

- Cooperated with HUIzhong Health in MioT
- Cooperated with Huawei for MioT in Transmission and artificial intelligence
- Cooperated with XEEK (Xiamen) Medical Equipment Co., Ltd. to transform our transferred patent "an IoT PM2.5 pressure based lung function detection system" into a product
- Cooperating with United Crest Telemedicine Health Service (China) Co., Ltd. to develop a chip that can transmit the signals detected by physiological and pathological sensors to cloud computing, breaking the current information island effect
- Cooperated with Zhejiang Yiliankang to develop wearable exercise lung function monitoring equipment



Platform Expansion and Large-scale Cooperation

Simplification of complex problems, digitization of simple problems, proceduralization of digital problems, and systemization of procedural problems

Cell phone app

- PNapp5A
- SCapp5A
- nCapp5A
- COapp5A
- ASapp5A
- OSapp5A
- ARapp5A

IAIH cloud

- Lifetime storage
- Cloud interconnection
- Close monitoring
- Interact
- Full perception
- Reliable transmission
- Intelligent processing
- Benefit all beings

Function and service

- Online medical
- Offline medical
- Graded diagnosis and treatment
- Health management
- QC
- Popular Science and Professional Education
- Prescription over-the-counter drugs
- Insurance

Research and cooperation

- Develop 5Aapp according to PNaap5A template
- Mobile platform cooperation
- Online and offline services
- Health management cooperation
- Internet medical platform
- Online drug cooperation
- Medical device cooperation

Three links, full time and space, integrating the four population in them, quality control, prevention, diagnosis and treatment, a brand-new model that benefits all living beings



Platform was selected as National 5G+ Project, Launched Innovation Center of AI for Respiratory Health, China

Platform of AI management for Pulmonary nodules was selected as National 5G+ application project

Chunxue Bai was appointed as Chief of the Center Pro. Zhong was congratulating the Center launching



序号	项目名称	牵头单位
94	基于5G+的呼吸健康智能管理应用试点项目	南京医科大学江苏省肿瘤医院
95	基于5G+的人工智能辅助呼吸内镜检查与诊断系统	高邮市人民医院
96	"AI+AI"在高血压和糖尿病等慢性病管理中的应用	南京医科大学第二附属医院
97	5G+肺结节中心远程介入介入治疗管理	南京医科大学附属上海人民医院
98	5G+智慧呼吸科建设与应用	南京市鼓楼医院
99	5G+人工智能呼吸管理云平台	烟台莱阳人民医院
100	5G+远程呼吸健康智能管理平台	上海交通大学医学院
101	基于5G+的呼吸健康智能管理平台	江苏省疾病预防控制中心
102	基于5G+的呼吸健康智能管理平台	江苏省疾病预防控制中心
103	5G+智慧呼吸科建设与应用	江苏省疾病预防控制中心
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124	5G+智慧呼吸科建设与应用	江苏省疾病预防控制中心

发布时间: 2021-08-17 16:52 来源: 信息通信发展司

各有关单位:

根据《工业和信息化部办公厅 国家卫生健康委员会办公厅关于组织开展5G+医疗健康应用试点项目申报工作的通知》(工信厅联通信函〔2020〕270号)有关要求,按照“宽进严出,优中选优”的整体工作思路,经项目申报、专家初审、复审等程序,现将5G+医疗健康应用试点项目名单予以公示。如有异议,请以书面形式反馈。





Thanks for Your Attention!

Welcome to the 17th ISRD and the 2nd IAIH Conference
Conference theme: IoT Health, Smart Benefits for All Living Beings
Organizers: International Society of Respiratory Diseases, People's
Government of Nanhu District, Jiaxing International Smart Health Alliance
Meeting time: November 26-28, 2021
Venue: Nanhu Hotel, Jiaxing City



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Welcome to scan the QR code in the middle and apply to become a member of the Double League, realizing the vision of "famous doctors cure diseases, great doctors benefit all living beings"!

