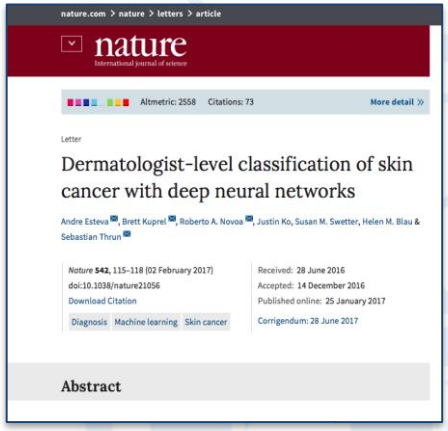
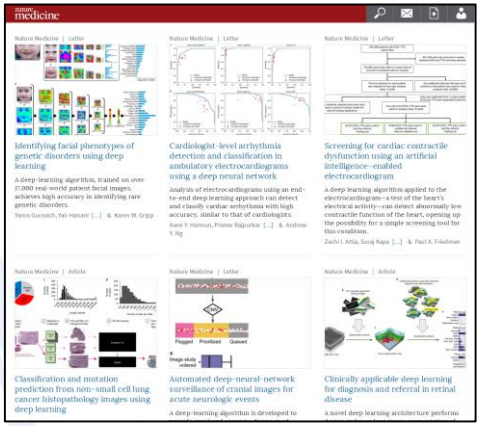
“Internet + AI” Dermatology Care
(A Case of Skin Disease Smart Care in China)

Prof. Weihong Huang
Mobile Health Ministry of Education – China Mobile Lab
Xiangya Hospital Central South University
P. R. China

Background on AI in Healthcare

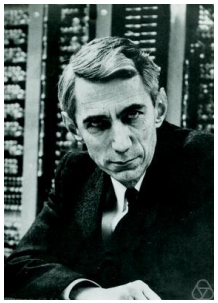




- *Nature* (02/2017) published a paper on **dermatologist-level** skin cancer detection (classification) AI algorithm.
- Nature Medicine (01/2019) published **9 papers** on AI in healthcare.
- Energias Market Research: Global **Artificial Intelligence (AI) in Healthcare market** is expected to grow significantly from USD 1.12 billion in 2017 to **USD 19.9 billion** in 2024, at a **CAGR of 48.7%** from 2018 to 2024.

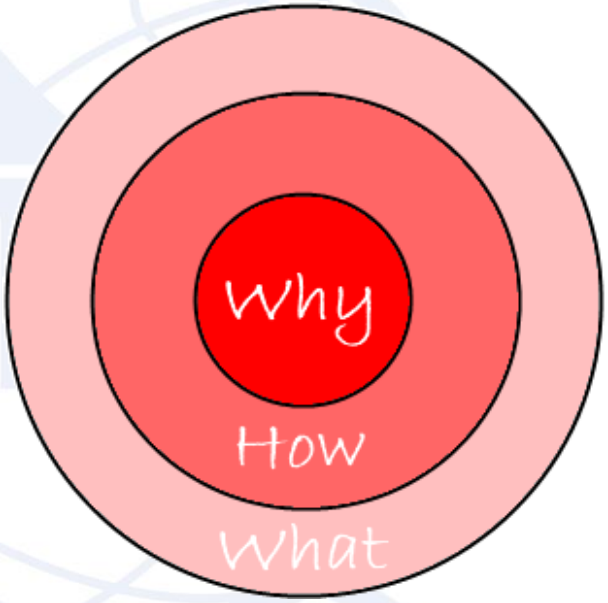
Thinking about AI and Clinical Practice

Asclepius
God of medicine
and physicians



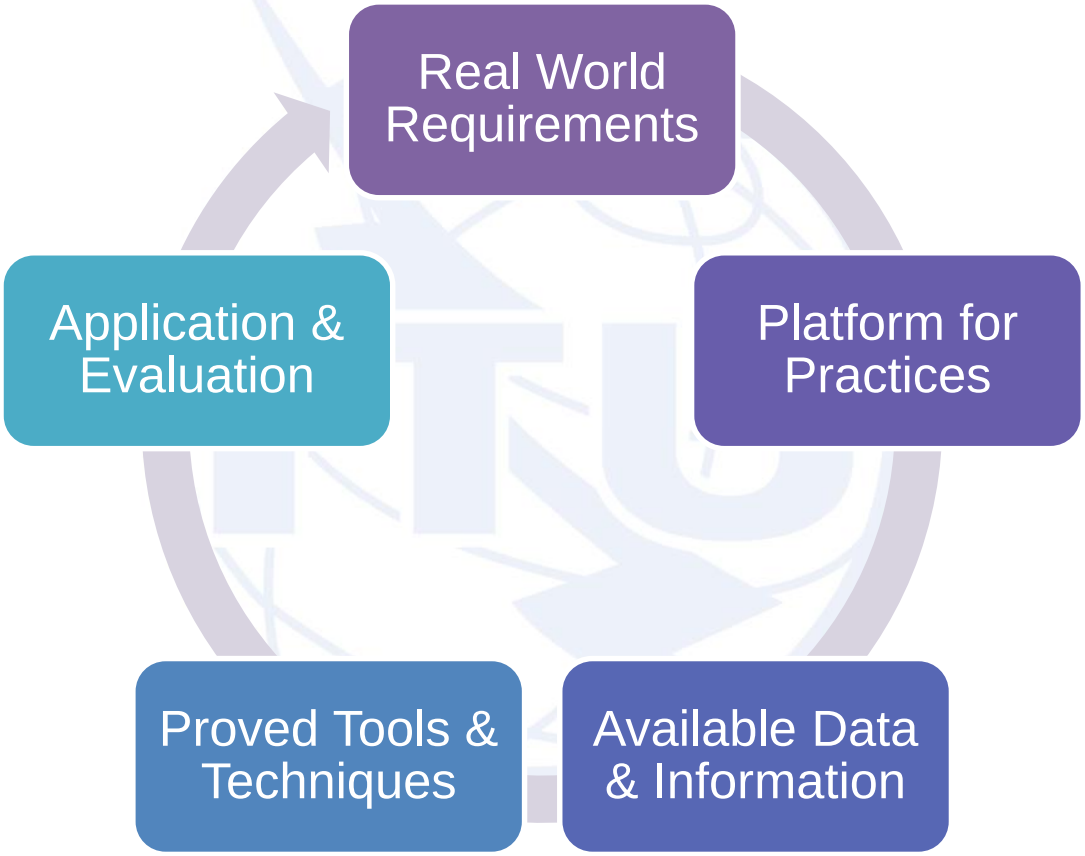
Claude Shannon
Founder of
Information Theory

The best part of Clinical practice is not knowing "what" or "how", but "why".



Clinical practice is the ultimate way of proving the effectiveness of AI-assisted smart care technologies.

The Way New IT Works in Clinical Practice (in China)

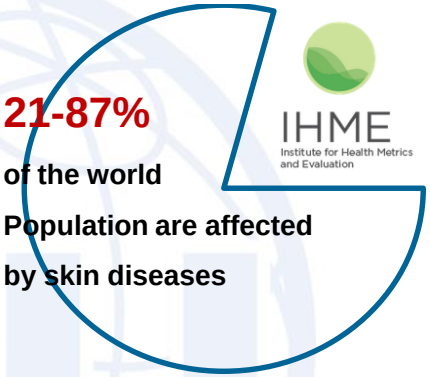


1. Requirements (Skin Diseases)

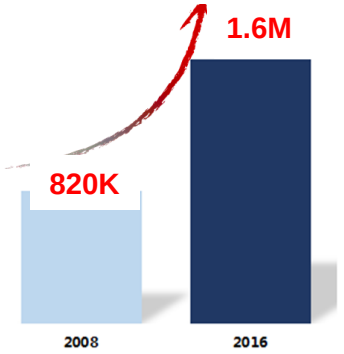
Skin Disease: serious threat to human health

- **Account for 1.79% of global diseases burden**
- **Cutaneous and subcutaneous diseases rank 3rd in disability causes in China**

---Globalburden.org



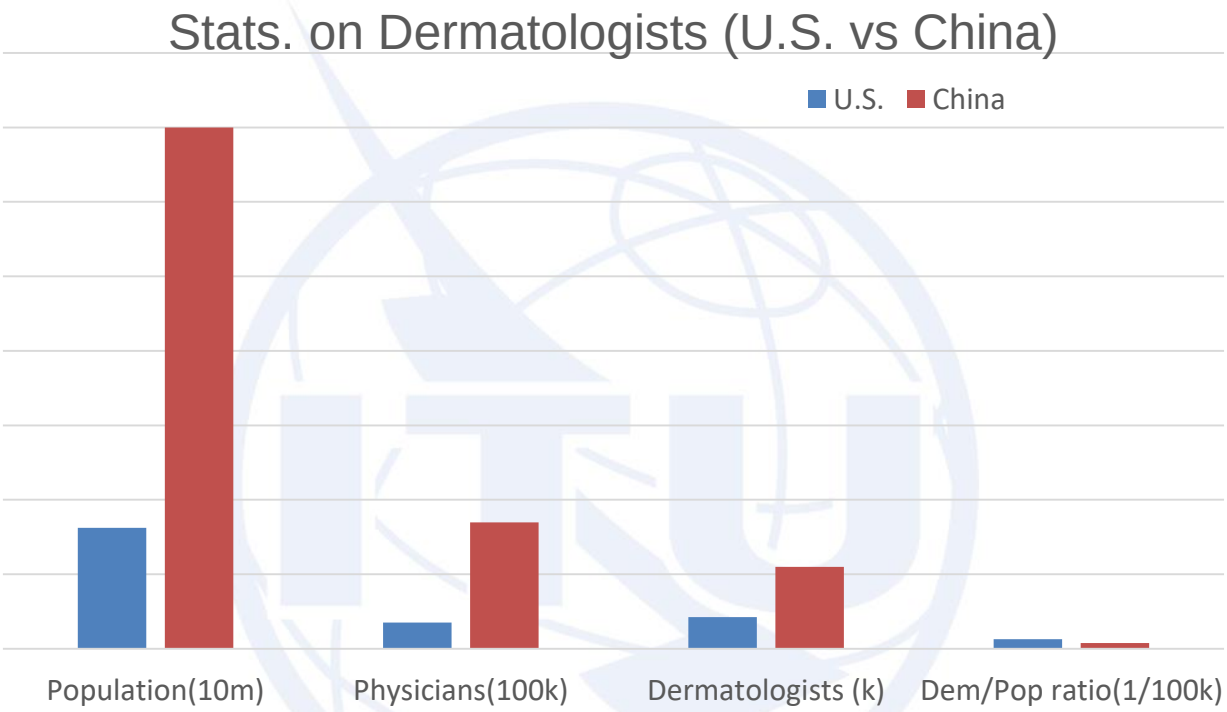
Derm. Dept. of Huashan Hospital, China
(The biggest clinical department in the world)



Priority: complicated chronic disease

High mortality	**Skin cancer**（eg. Melanoma）
High incidence	**Allergic skin diseases**（eg. Urticaria）
Very stubborn	**Chronic recurrent diseases**（eg. Psoriasis）

1. Requirements (Dermatologists)



	U.S.	China
Population(10m)	32.5	140
Physicians(100k)	7	33.9
Dermatologists (k)	8.5	22
Dem/Population ratio(1/100k)	2.6	1.57

2. Platform (Licensed Service Platform)

中华人民共和国中央人民政府
www.gov.cn

国务院 | 总理 | 新闻 | 政策 | 互动 | 服务

首页 > 信息公开 > 国务院文件 > 卫生、体育 > 卫生

索 引 号：000014349/2018-00061　　主题分类：卫生、体育\卫生
发文机关：国务院办公厅　　成文日期：2018年04月25日
标　　题：国务院办公厅关于促进“互联网+医疗健康”发展的意见
发文字号：国办发〔2018〕26号　　发布日期：2018年04月28日
主 题 词：

国务院办公厅关于
促进“互联网+医疗健康”发展的意见
国办发〔2018〕26号

各省、自治区、直辖市人民政府，国务院各部委、各直属机构：

为深入贯彻落实习近平新时代中国特色社会主义思想和党的十九大精神，推进实施健康中国战略，提升医疗卫生现代化管理水平，优化资源配置，创新服务模式，提高服务效率，降低服务成本，满足人民群众日益增长的医疗卫生健康需求，根据《“健康中国2030”规划纲要》和《国务院关于积极推进“互联网+”行动的指导意见》（国发〔2015〕40号），经国务院同意，现就促进“互联网+医疗健康”发展提出以下意见。

The “Internet + Medicine” (Health & Care) National Strategy, 25 April 2018

The Xiangya Dermatology Internet Hospital established, 4 Nov. 2018

The First Dermatology Internet Hospital licensed to operate over the Internet in China.

2. Platform (Xiangya Medical Big Data Platform)

2013

Initiation of Xiangya Medical Big Data Project

2014

Vice-Premier Yandong Liu inspected this platform in 2014

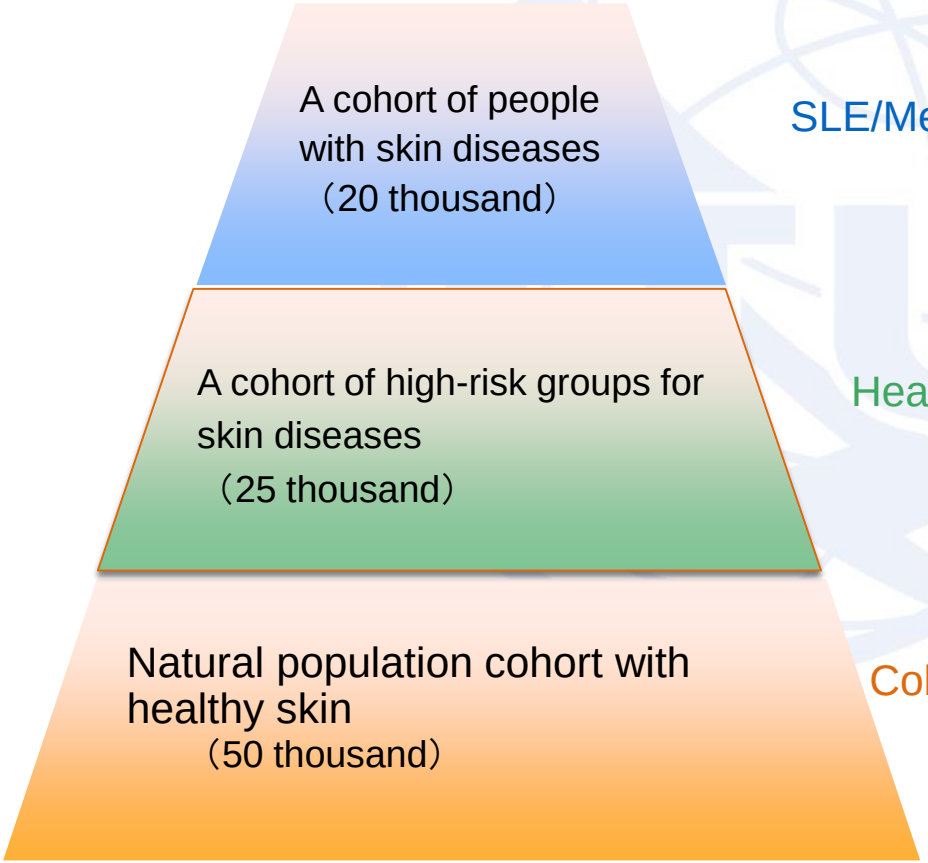
2017

National Engineering Laboratory of Medical Big Data Technology was approved in 2017

- RMB 310 million of investment from CSU and China Mobile
- Big data institute and medical data center established
- “Xiangya Medical Big Data Dataset Standards”（covering 700+ diseases）
- Collected 57 million patient data from Xiangya and collaborating hospitals

Supported by Various Key Research Projects/Funds

- National Key Project Support
- The Largest Skin Health/Disease Queue in China



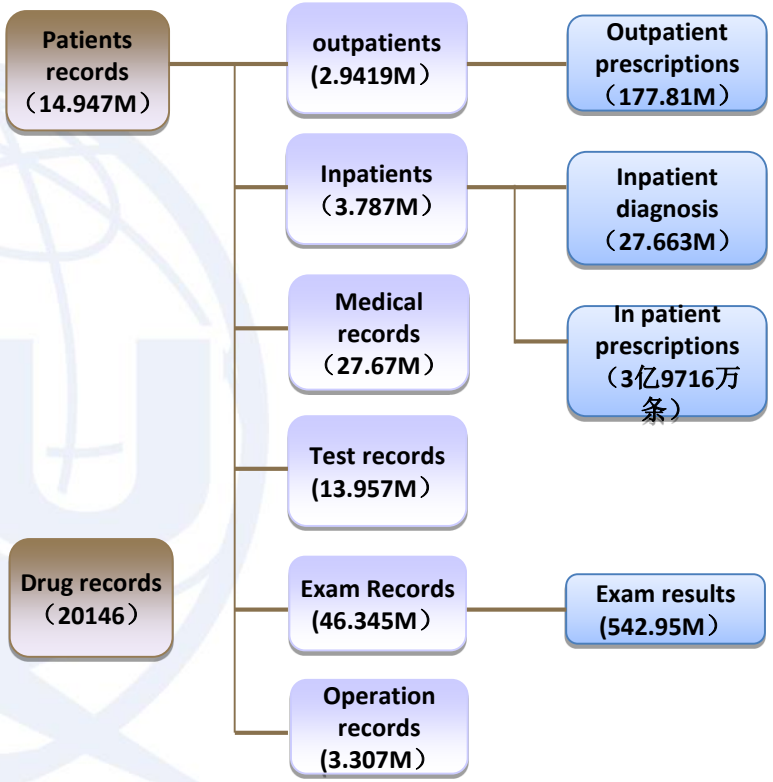
SLE/Melanoma/Rosacea/Psoriasis /Urticaria

Heavy metal contaminated areas Non-occupational Exposure Population

College Students/National Public Officials/Elderly People

3. Datasets (from Xiangya Medical Big Data Platform)

Hospital	CIS system	Data from	Data to
Xiangya Hospital	HIS	2011-01-01	Present
	EMR	2008-12-01	Present
	PACS	2009-01-01	Present
	LIS	2006-01-27	Present
Xiangya 2nd Hospital	HIS	2009-09-01	Present
	EMR	2009-09-25	Present
	EMR textfiles	2011	Present
	LIS	2002-01-01	Present
	RIS	2013-02-01	Present
	PACS	2012-01-31	Present
Xiangya 3rd Hospital	HIS	2002-04-08	Present
	EMR	2002-04-08	Present
	EMR text files	2014-05-16	Present



Data accumulation of Xiangya Hospitals (10,000+ beds in total) in the past 20 years

3. Datasets (from Xiangya Medical Big Data Platform)

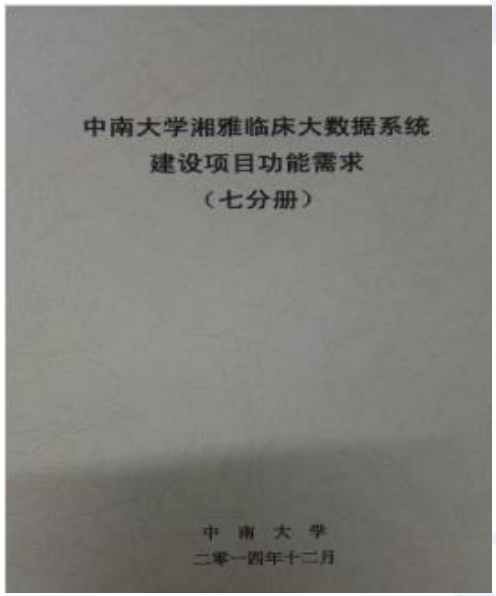
	Time span	Quantities	storage
Data size	>15 years	40 billion	
Medical records	>7 years	1.8 million	
Examinations	>10 years	>250 million	
Imaging reports	>6 years		180T
Lab results	>10 years	>400 million	
Medical orders	>15 years	20 billion	
Drug information	>15 years	30 billion	
……			

Medical data of all diseases including skin diseases

3. Datasets (Skin Diseases)

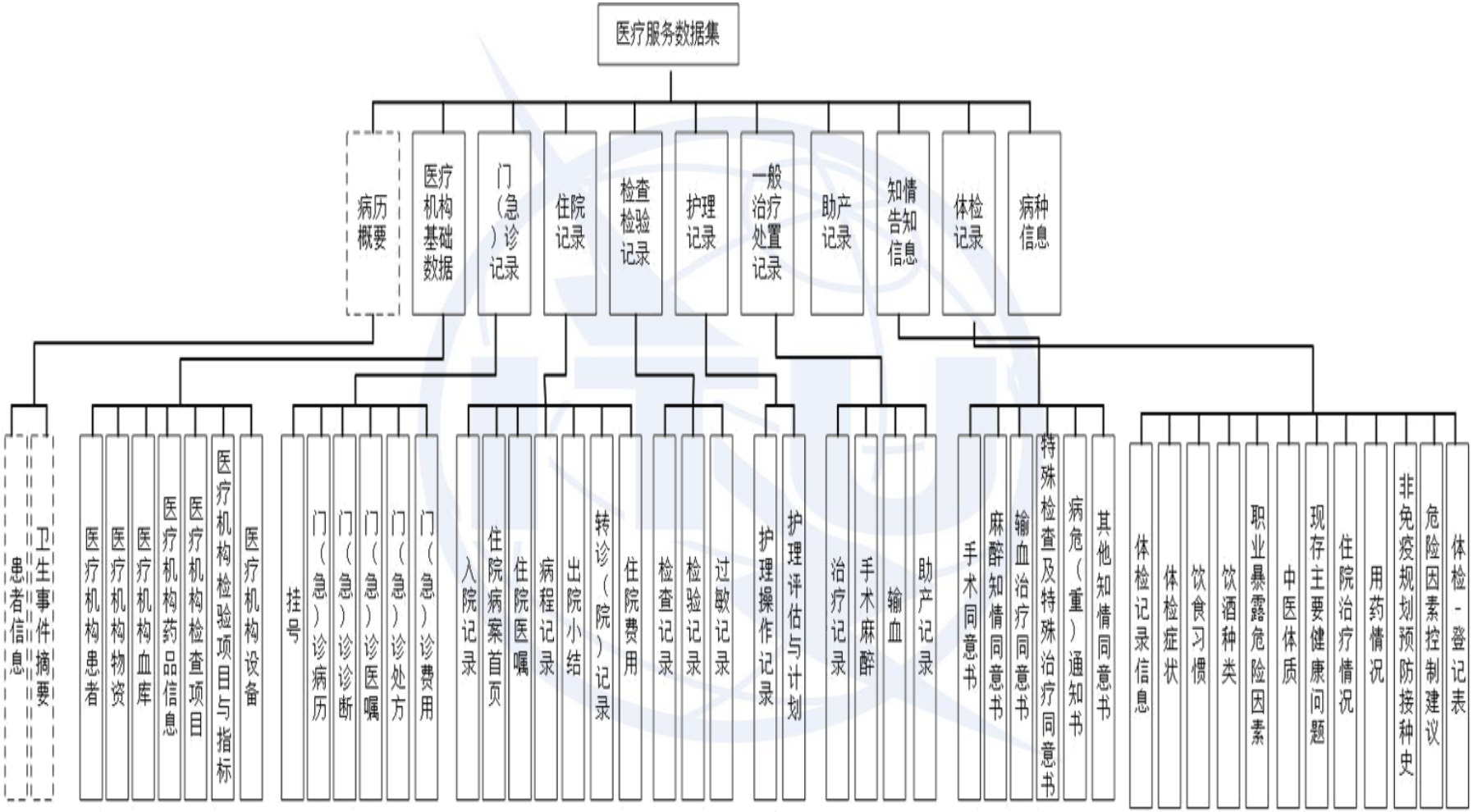
Keys	Description
Data Sources	From over 200 hospital across 30 provinces in China
Data Volume	Over 50,000 patients, over 200,000 clinical images, skin cancer database with over 5000 cases
Purpose of Datasets	For AI assisted decision support, full structured EMR for clinical research
Application Scope	Skin disease image identification, decision support, pathology diagnosis, support for Internet + medical network
Classification of Database	Clinical images, dermatoscope images, skin pathology images, skin cancer full dataset

4. Tool & Techniques (Xiangya Medical Big Data Standards)



Standard Basic Information & Clinical Service Dataset of Xiangya Medical Big Data Project

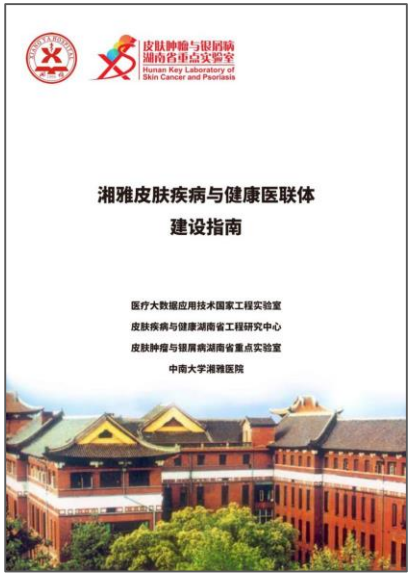
4. Tool & Techniques (Xiangya Medical Big Data Standards)



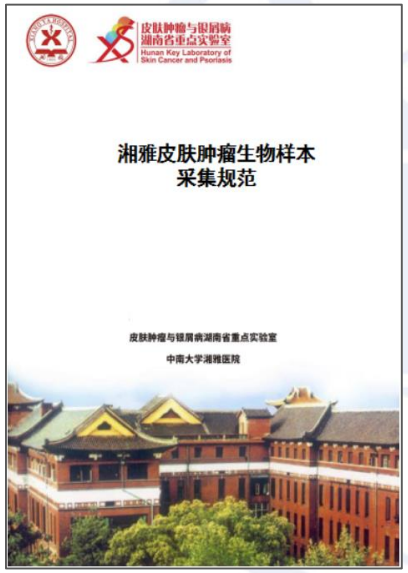
10 standard datasets，92 sub-datasets (including skin diseases);

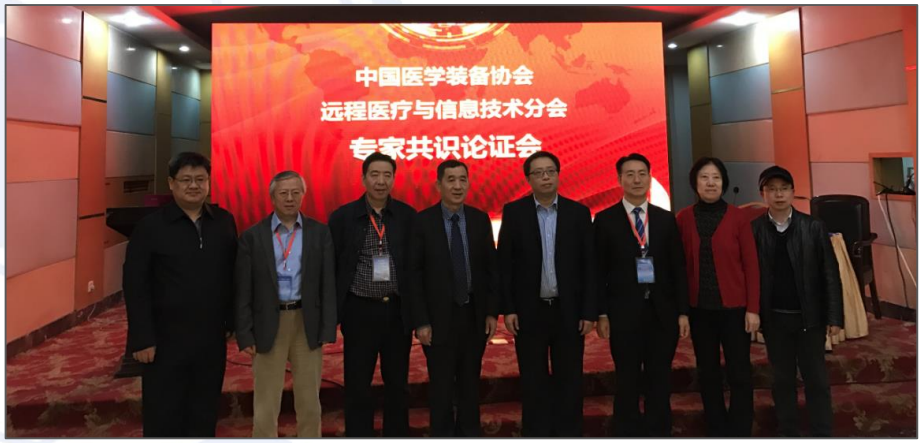
4. Tool & Techniques (Xiangya Skin Disease Big Data Standards)

Xiangya Skin Disease and Medical Network : Development Guidelines



Xiangya Skin Cancer Biological Sample: Collection Standard



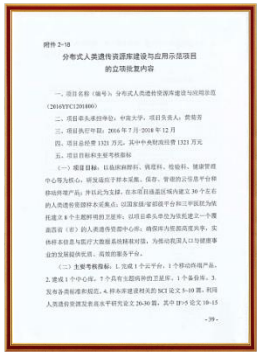


4. Tool & Techniques (Xiangya Skin Disease Big Data Standards)

Skin Disease Biological Sample Bank

Key R & D programs of the Ministry of science and technology

"Distributed Human Genetic Resource Bank Construction and Application"

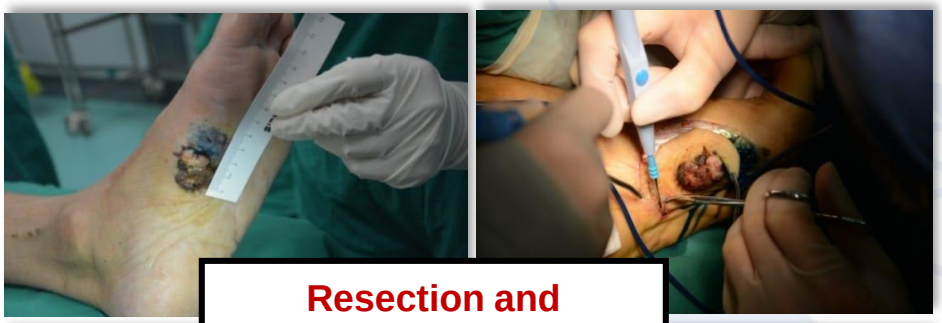


The largest national rosacea, lupus and skin cancer biological sample bank

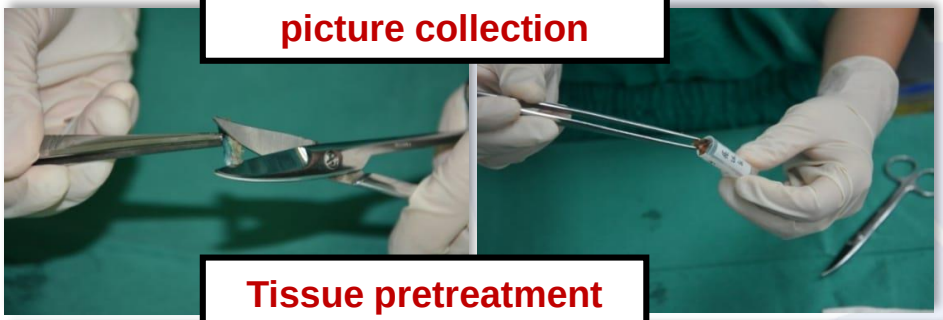
- 100 Ultra low temperature freezers
- Over 500m^2
- Over 60,000 skin health and diseases-related biological sample

4. Tool & Techniques (Xiangya Skin Disease Big Data Standards)

Melanoma Biological Sample Collection Standard

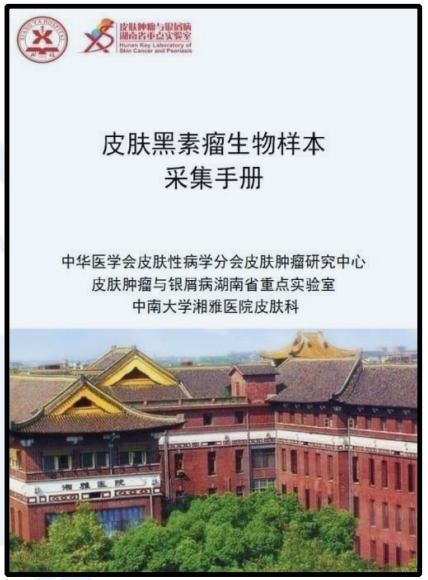


Resection and picture collection



Tissue pretreatment and packing

Blood pretreatment and packing

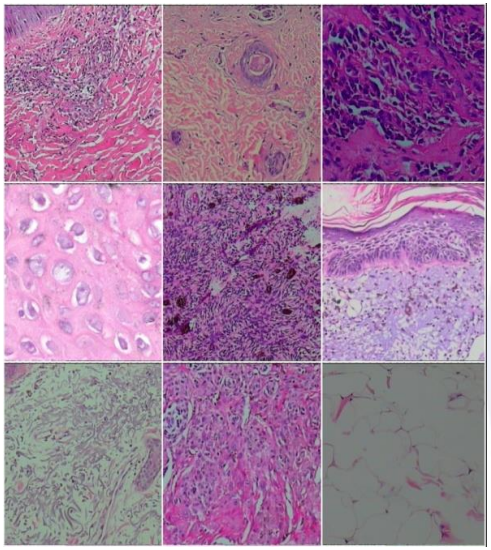


Sample quality control and storage

Reference: IARC and TCGA

4. Tool & Techniques (Xiangya Skin Disease Image Libarary)

Skin Disease Image/picture Library



Dermatopathology picture library
（1 million pics）

Standardized skin disease picture library
（0.4 million pics）

Tagged picture library
（20,000 pics）

4. Tool & Techniques (Xiangya Skin Disease Data Collection)

Xiangya Skin Disease Data Collection Platform using cloud/mobile smart apps

- **Skin disease big data acquisition platform**
- **Collected data of over 50,000 dermatology patients from 200 different hospitals**
- **Expanded to over 100 hospitals**
- **Acquired 5 software copyrights**

4. Tool & Techniques (Xiangya Skin Disease Data Collection)

Skin Cancer Data Work

Platform

The first big data acquisition platform of skin cancer in China

http://122.207.81.240:8084/FormParser

Standard

Lead to develop the Melanoma Biological Sample Collection Standard

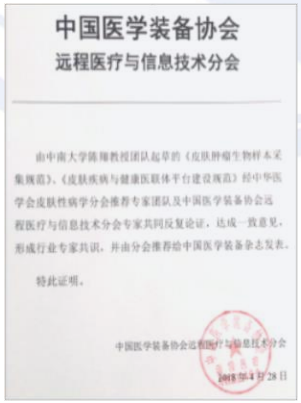
Sample database

Established the biggest biological sample bank of skin cancer in China

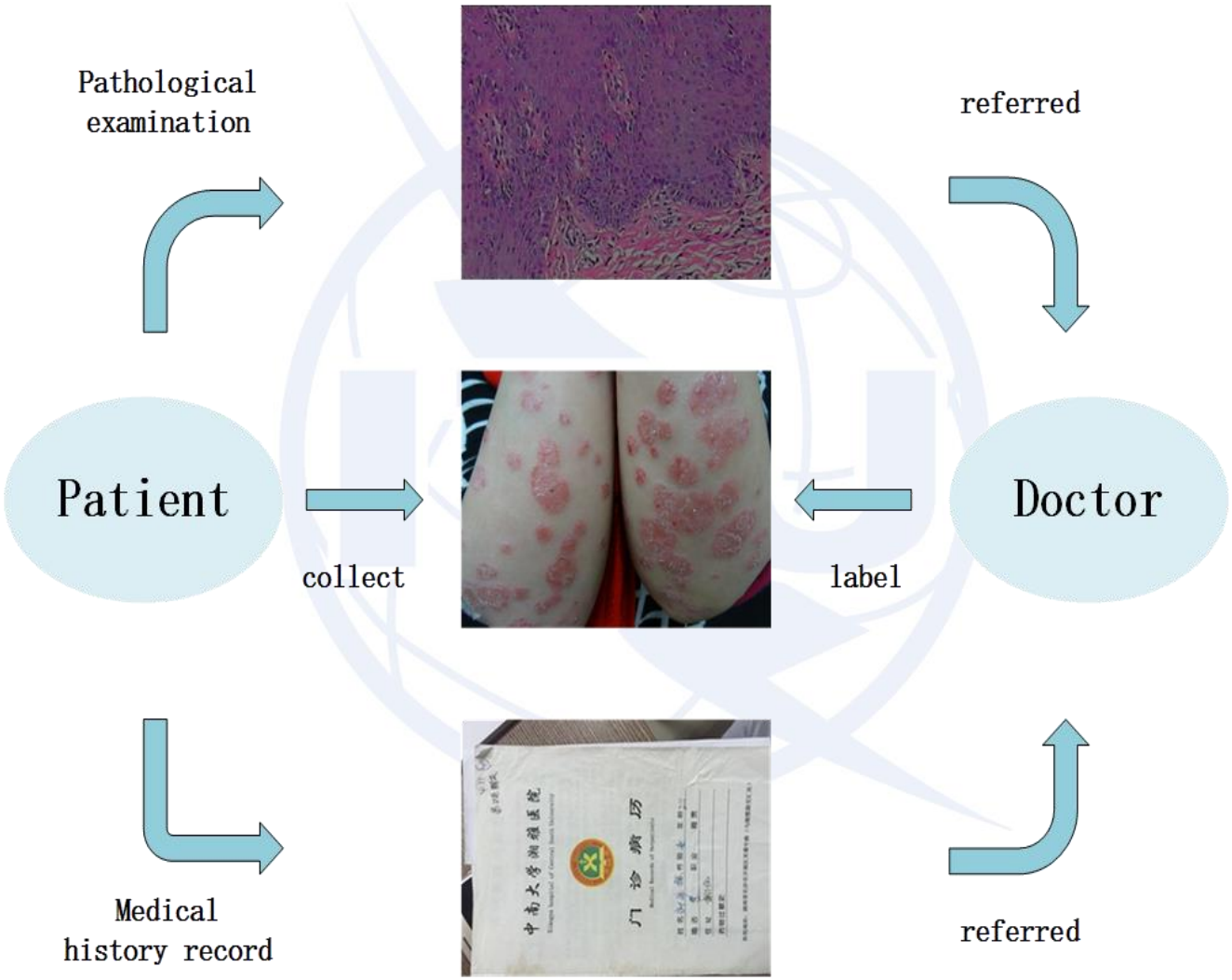
Collaboration network

Constructed the first national skin cancer collaborative network

（covering over 100 hospitals in 30 provinces）



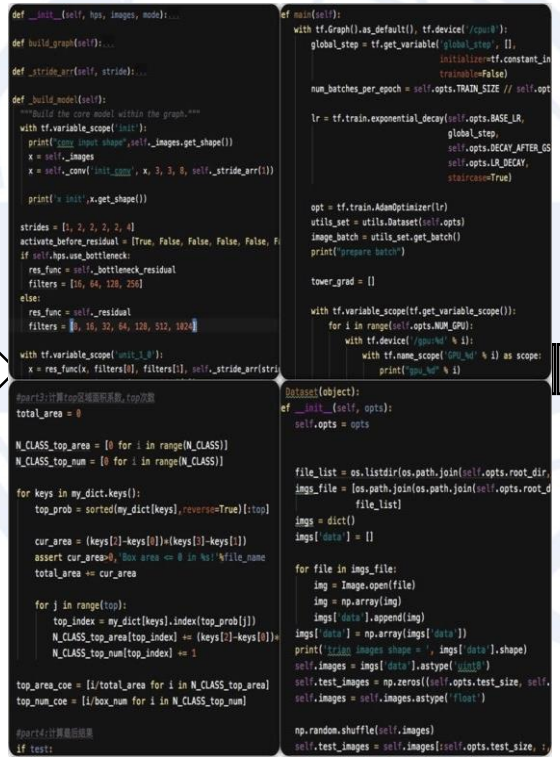
4. Tool & Techniques (Xiangya Skin Disease Data Collection)



4. Tool & Techniques (Xiangya Skin Disease Smart Diagnosis)

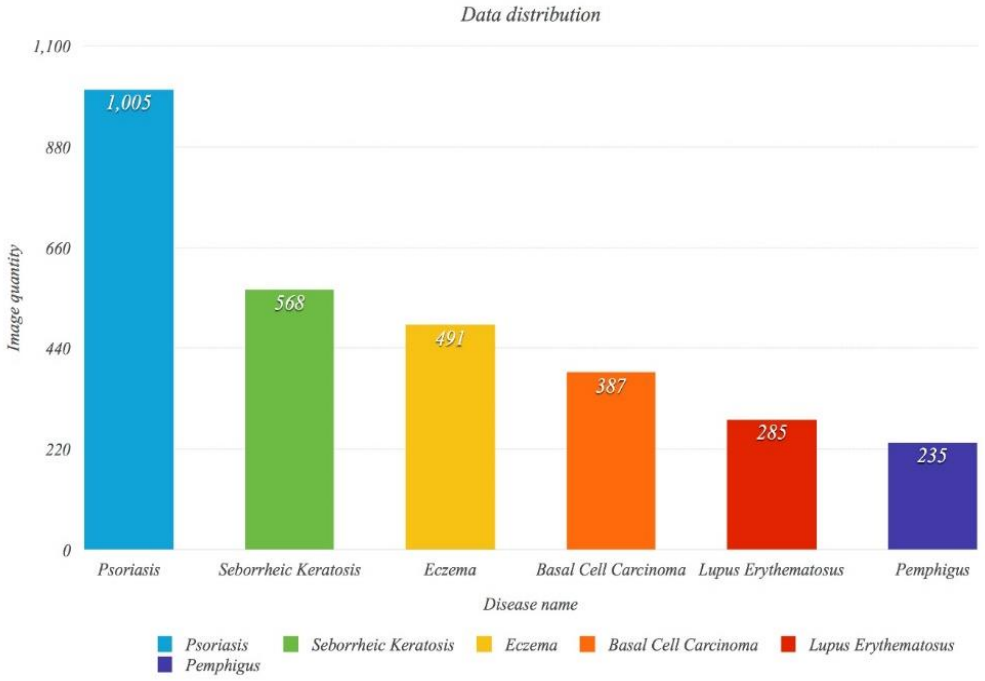
Skin-Net System

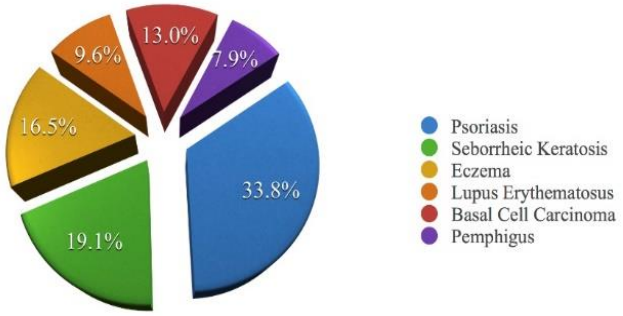
The raw dataset



4. Tool & Techniques (Xiangya Skin Disease Smart Diagnosis)

A practical skin disease classification tool covering 6 common skin diseases: psoriasis, seborrheic keratosis, eczema, basal cell carcinoma, lupus erythematosus, pemphigus





5. Application: Skin Care Network and Academic Influences

2013

National Skin Cancer Research Center

National Rosacea Research Center

2014

3 sub-centers and 12 members

2015

124 members

2016

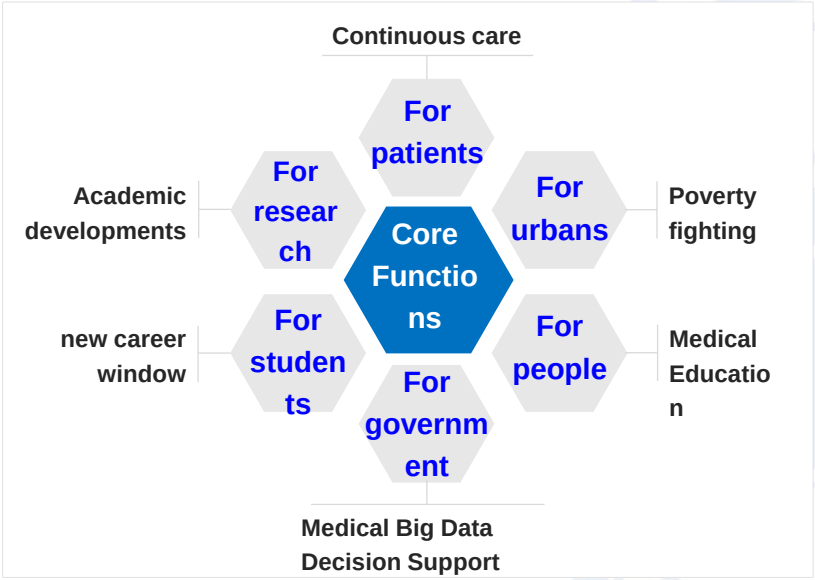
225 members

5. Application: Skin Care Network and Academic Influences

643 Network Hospitals
from 30 provinces across China

5. Application: Medical Network Platform of Skin Diseases

Supported by the National Engineering Laboratory for Medical Big Data Technology , Central South University



- Test run for 8 months
- 53 collatoration hospitals, 225 registered account
- 106 teleconsulation and 2-way referal cases
- **33 Online revisits, online drug purchase and delivery (in the last month)**
- 120480 website visitors, 1269 downloads of our app

Patient version

Doctor version

Multifunctional platform

Consultation, patient referral, patient education, epidemiological investigation, online inquiry, distance learning etc.

http://xypf.csu.edu.cn:8089/

5. Application: Medical Network Platform of Skin Diseases

- Skin Disease Network Press Conference
- Mobile learning using social network apps

- Clinical networking activities in unban counties of China

- Clinical Networking activities in difference places across China


Work of “AI for Healthcare” is always on the way.
Thanks for Listening!