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In January 2009 China announced a RMB 850 billion ($124 billion) stimulus package over three years to fundamentally reshape the nation's healthcare sector. A key element of the plan is to modernize healthcare services with digital hospitalization, electronic medical records, and next-generation information networks. The goal is to dramatically improve healthcare service quality and, importantly, to enable virtual healthcare services that can overcome service disparities between rich areas and poor. But the lack of technical standardization complicates take-up and adoption of unified e-healthcare solutions. The stakes are high for the government – and for international technology companies seeking position in this large and fast-moving market.

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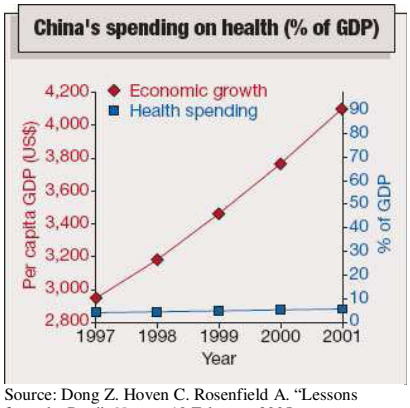
Like the U.S., China's healthcare costs have soared in recent years. Outpatient costs were 12 times higher in 2006 than in 1990 though incomes increased by only 5-7 times during the same period.[1] Spending on healthcare amounted to about $185 billion or 5.67% of China's GDP in 2007, yet healthcare investments have clearly not kept pace with China's miraculous economic growth.

To redress "imbalances" in the system, including wide discontinuities in healthcare availability and quality between rich and poor areas, the government has initiated a RMB 850 billion ($124 billion) spending stimulus for 2009-2011. Some RMB 350 billion ($52.2 billion) will be allocated from the central government budget and is targeted principally at rural investments. This direct investment – rather than a more customary cost share with provincial governments – underscores the importance Beijing places on improving living standards and ensuring social stability in the countryside. The balance of RMB 500 billion ($74.6 billion) is aimed primarily at reducing urban hospital crowding and improving primary care, and will be provided by provincial and municipal sources.



Source: Dong Z. Hoven C. Rosenfield A. "Lessons from the Past". *Nature*. 10 February 2005

The stimulus plan seeks to address five policy objectives:

1. Increase the number and quality of healthcare facilities. China has 19,000 county-level hospitals, 45,000 at the township level, and 315,000 health organizations nationwide. Rural area facilities dramatically lag behind the cities in terms of quality, scope of services, and doctor/patient ratios. In 2000 China ranked 188 out of 191 countries in the World Health Organization's ranking for fairness of healthcare finance. The government is keenly aware that people are getting impatient. The stimulus will lead to the construction of county 2000 hospitals and 5000 township clinics.

The Ministry of Health (MoH) additionally expects to build 2400 urban community or neighborhood **primary care clinics** to alleviate pressures on big hospitals. The number of patients registering at city hospitals doubled from 2005 to 2007. Beijing's three largest hospitals each support more than 8000 new patient visits *per day*. Efforts will be made to link medical centers of excellence in the cities with outlying areas.

[1] Gu, Edward "Towards Universal Coverage: China's New Healthcare Insurance Reforms" (forthcoming), cited in *Averting Crisis*

2. Establish universal healthcare insurance. The government hopes to provide a safety net for the uninsured. This initiative is especially important in the current economic downturn as millions of migrant laborers have lost jobs and returned to the countryside. MoH Health Minister Chen Zhu stated in March 2009 that about 77% of the population is currently covered by personal healthcare insurance, either through government, individual, or rural co-op medical schemes. The target is to reach 90% of the population in the next three years.

Industry observers doubt the government's figures. One company's research suggests that fewer than 30% of China's population has medical insurance today. It estimates that over 40% of urban and 57% of rural populations have no coverage at all.[2] Nearly 50% of healthcare costs in China are borne by individuals and are typically paid out-of-pocket. In the poorest areas, encompassing hundreds of millions of citizens, people cannot afford to pay for even basic healthcare service. Chinese commercial insurance companies have expressed interest in underwriting health policies through public-private partnerships but Beijing has been reluctant to cede control – and potentially introduce market risk. Health insurance is expected to remain administered directly by the state.

3. Reform pharmaceutical and drugs distribution. In the market reforms of the 1990s state-owned enterprises and collectives in the healthcare sector were downsized or dismantled and hospitals became independent profit centers, albeit state-owned. Hospitals were allowed to mark-up pharmaceuticals by 15% and drug distribution became a lucrative profit center. Today more than 40% of hospital revenues are derived from sales of pharmaceuticals, according to the China Hospital Information Management Association, the sector's most authoritative research source. The result is endemic over-proscribing of medications and over-charges to patients.

A proposed national drug administration and management policy, *"State-owned Hospital Procurement for Drugs,"* first vetted in 2008, is expected to require hospitals to divest drug dispensing operations. To enact this transformation the MoH is exploring how to reinvent the drug distribution supply chain, including introducing end-to-end enterprise resources planning (ERP) and centralized pricing controls.

4. Improve public healthcare. With the outbreak of SARS in early 2003 China profoundly improved capabilities related to infectious disease surveillance, mitigation and control. It has implemented a four-tier disease surveillance and response system utilizing a variety of devices, sensors, incident management and decision support systems and operational procedures, some of which were developed with assistance from the US Centers for Disease Control and Prevention (CDC). The system is reportedly highly resilient and proved effective with the subsequent Avian Flu outbreak. It remains a cornerstone to monitoring

[2] The corporate statistics are supported by *Averting Crisis,* a white paper prepared for the Carnegie Endowment for International Peace, *"Averting Crisis: A Path Forward for China's Healthcare System,"* by Meredith Wen.

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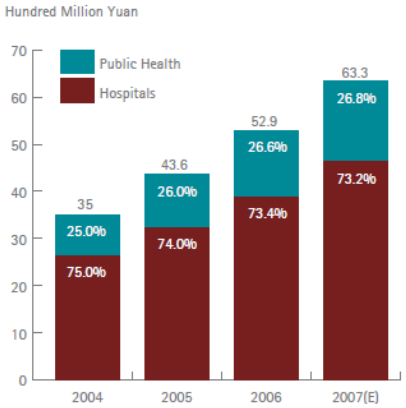
seasonal influenza and for bio-terrorism surveillance. With the advent of TB/HIV, China has also begun to address blood safety, particularly following well-publicized incidents of contamination in recent years. Curiously, analysts suggest that in response to the SARS crisis China may have *over*-invested in complex public health systems at the expense of basic healthcare reform. All the same, MoH plans 330 new emergency medical centers around the country.

5. Hospital reform is aimed at better training for professionals[3] as well as increased investment in healthcare IT. An essential dimension of hospital reform is to establish "digital hospitals" through investments in healthcare IT as well as adoption of electronic medical records. According to Wang Caiyou, Vice Director of the Center for Health Statistics at the Ministry of Health, "Our vision is to move toward a person-centric – or patient-centric – healthcare network and IT is one of the main supporting tools." Aspects of the reform agenda depend on new structural capabilities that can only be made possible through comprehensive application of information and communications technologies. Improved transparency, lower costs, higher efficiency, remote healthcare, universal insurance, and interoperability among systems and shared resources all depend on new information technology platforms.



Source: *The White Paper on China's Hospital Information Systems*, CHIMA and Accenture (May 2008)

Interestingly, Beijing's stimulus package dedicates only a single paragraph to the enabling information infrastructure required to achieve the strategic policy goals. No mention is made of funds that will be allocated specifically for ICT. MoH and private sector players alike are scrambling for position to earn favor and define funding proposals for the money.

The Healthcare IT Market

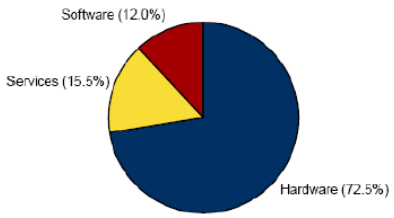
Healthcare IT spending hit RMB 6.5 billion ($970 million) in 2007, up 62.7% from the previous year, according to CHIMA. Growth has averaged about 20% per year since 2004.

[3] MoH statistics indicate that only 2.9% of healthcare personnel working in township (rural) healthcare centers hold a BA degree; 24.9% have received a junior college education; 56.5% have secondary technical school backgrounds; and 15.8% have received a high school level of education or below. For hospitals, the figures are: 38.8%, 33.2%, 20.7% and 3.6% respectively.

Compound annual growth for 2007-2012 is estimated at 21.2%. Sales could reach $1.2 billion this year, before the addition of new investment from the stimulus package.

Network Dynamics estimates China will allocate 1.2% to 1.8% of the total $124 billion stimulus budget toward healthcare IT, or approximately $1.45 billion to $2.6 billion incremental spending for 2009-2011. Total healthcare IT spending could thus top $2 billion per annum in the years ahead.

Healthcare market Segment by Solution, 2007



Source: IDC China Healthcare Industry IT Solution Forecast

The bulk of spending, about 73%, has been within hospitals themselves.[4] Future spending will be concentrated in establishing Regional Healthcare Information Networks (RHIN): data centers and telecommunications networks to share data and clinical services among geographically dispersed communities. Few hospitals and regional health authorities have begun implementing RHINs – sometimes referred to in China as "regional collaborative medical services" – though regional health is a centerpiece of the government's reform effort. Most healthcare IT investments have been in systems and hardware rather than software and applications (see pie chart).

Chinese hospitals invest 2%-5% of operating revenues on average into IT compared to 12%-15% in the US, according to CHIMA estimates. It bears noting that there is wide disparity in spending levels by geography, with most extensive commitments having been made in the wealthy Eastern provinces. Rural spending on healthcare IT is minimal.

Hospital capital spending is highly decentralized with each facility making its own purchasing decisions. A lack of standardization has led to a plethora of unique or customized technical systems, with limited interoperability. The inability to transfer data effectively restricts patient and clinical care options and raises overall healthcare costs. Most systems in place today are associated chiefly with administrative management. Only the largest, wealthiest and most sophisticated hospitals have expanded their information systems to include clinical diagnosis, decision support, and electronic patient records.

Competition in the HIT market is heavily fragmented. Spending decisions are local and made at the discretion of hospital information management departments. Consequently there are many niche players competing for market share. CHIMA estimates that fewer than 20 out of the 300 Chinese independent software vendors (ISVs) involved in health informatics have more than 100 staff. Even the largest ISVs – Bsoft, Kingstar Winning, Neusoft – have failed to earn more than 8% market share. With so many buyers of hospital systems, and so many sellers, there are few industry norms. The notable exceptions are

[4] CHIMA and Accenture, *"The White Paper on China's Hospital Information Systems,"* May 2008

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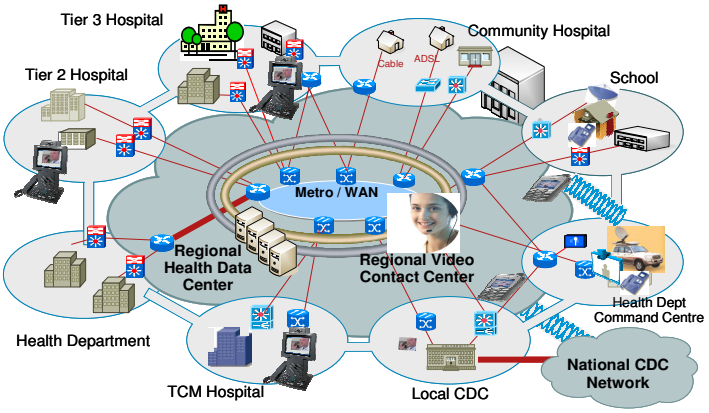
hospitals associated with the People's Liberation Army, which have a unified technological approach for many IT platforms and services.

Healthcare IT Standards

The lack of standardization complicates take-up and adoption of unified e-healthcare solutions. Unlike the U.S. – where the Obama Administration's proposal to include electronic medical records in the stimulus package has led to partisan hand-wringing – China is determined to overhaul its healthcare system with aggressive adoption of information technology. It has the funds to invest. The challenge is agreeing the finer points of standards definition

China has been struggling in recent years to define standards for two important technical frameworks: Electronic Medical Records (EMR), the data standard for formatting "cradle-to-grave" patient medical history information; and, Electronic Health Records (EHR), the standard to govern the transmission and interoperability of medical data between healthcare facilities and insurers, doctors, pharmacies and the wider healthcare establishment. EHR is coupled closely with the need to develop regional health information networks (RHIN) Both the EMR and EHR/RHIN standards are crucial to widespread adoption of healthcare information technology in China.

Regional Healthcare Information Network (RHIN)



Source: Cisco

"Interoperability between data formats and systems by adapting proven international standards is critical to achieving universal healthcare for all," according to Dr. Li Baoluo, CHIMA's Executive Director. But reaching commonality of the scope of standards has proven elusive.

Serious technical debate – and serious bureaucratic competition – prevails within the industry. At MoH there is tension between those advocating fundamental adoption of international standards, which can be modified for the Chinese market, and those who prefer to develop and mandate a Chinese standard from scratch. International firms strongly prefer to have the Chinese adopt standards that comply with globally accepted international approaches, for example HL7 CDA and IHE XDS[5]. A "China standard", by contrast, could raise concern about barriers to trade.

As the Ministry attempts to specify "national" standards, provincial authorities are moving ahead with regional field trials. They hope their efforts become accepted as "golden pilots": demonstration projects that become *de facto* standards – in effect putting the market ahead of government decree. Each project is competing against other regions (and in some cases against Beijing) for first-mover advantage.

The MoH created the Electronic Records Standards Technical Steering Committee in 2006 with international information technology companies to develop draft national standards for EMR and EHR/RHIN. In April 2009 MoH published a 170-page "EHR Guidebook"[6] to steer debate but observers note that it falls short of codifying a national EHR standard.

EHR/RHIN is vital, in part, because of pressures on social services created by increased personal mobility within China. The pace of internal migration is accelerating compared to stringent restrictions on travel just a few years ago. As many as 300 million rural residents will move to the cities by 2020, according to the World Health Organization. Today it is virtually impossible for a person from one province to gain access to medical reimbursements, social security, pensions and so on in another. Technical medical standards would ensure that healthcare data is portable.

From a technical perspective, the challenge is defining the data vocabulary and structure that can capture the myriad of approaches to data reporting already in use by hospitals and health administrators. But the greater obstacle to EHR/RHIN, perhaps, is supporting take up and adoption of a national standard while regional and local solutions continue to proliferate. This applies equally to efforts to create a new standard for EMR.

Essential to the EHR/RHIN vision is the potential for enabling the next generation of "tele-medicine" services: powerful telecom networks, shared applications and data centers that allow patients in poor areas to obtain clinical services "virtually" from rich ones, using advanced information and communications technologies. Tele-radiology, video diagnosis, drugs databases, public health disease surveillance, and proved management of medical emergencies are just a few applications that can be provided electronically to remote

[5] For reference, see: http://www.hitsp.org/

[6] *Scheme for the Construction of a Regional Health Information Platform for Medical Records (For Discussion)*

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regions. By leveraging shared infrastructure, poor areas will be able to participate in modern medical network services without having to replicate capital investments locally.

The opportunities are excellent for international firms to supply China's emerging market for healthcare networks and applications. Best prospects, which Network Dynamics has examined in detail, will be found in:

- Data center platforms
- Telecom networking
- Network security
- Decision support systems
- Databases
- Emergency response
- Solutions integration
- Insurance systems
- Drug retailing
- Enterprise resource planning (ERP)
- Hospital management systems.