Global Telehealth 2015: Integrating Technology and Information for Better Healthcare
G. Gillis et al. (Eds.)

doi:10.3233/978-1-61499-505-0-27

Building a Patient-Centered Hospital Web Site: Best Practices in China

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Abstract. In this case study, based on six criteria, four Chinese hospitals were chosen from a national sample to showcase, through content analysis and in-depth interviews, the best practices of serving patients online. The extensive findings have addressed the following three questions: what these hospitals have in common in their Web development, what problems and challenges they are facing, and how they have excelled in serving their patients online. The study concludes that, like larger hospitals, smaller hospitals can also excel in creating an outstanding Web site to serve their patients so long as they truly care about their patients, have a clear vision and strong expertise in IT development. The study also concludes that Chinese private hospitals can learn from these state-owned hospitals in establishing a good reputation through professional and responsible interaction with patients. The four hospitals studied may shed light on the Web development in many other Chinese hospitals that are going through the same healthcare new media adoption. The findings from this study can also help Chinese hospitals form their visions in serving patients online.

Keywords. Hospitals, Web sites, Interactive tools, Videos, China

Introduction

At the end of 2007, China became the largest online market in the world.[1] McKinsey Global Institute [2] predicts that the Internet will contribute 7% to 22% of GDP growth in China and that "[t]he Internet can save some ¥110 billion to ¥610 billion in annual healthcare expenditures, which is 2 to 13 percent of the growth in health-care costs projected from 2013 to 2025" (p. 12). The report has sent a clear message to Chinese hospitals: get on the digital bandwagon. This study has attempted to find out how digital technology can help Chinese hospitals better serve their patients online. Four Chinese hospitals have been chosen to showcase the best patient-centered hospital Web sites in China today.

China started to build its healthcare network in 2003 [3]. Ten years later, only 42% of Chinese hospitals had a Web site [4]. Many hospitals in China still take their Web sites as "a window to conduct propaganda to the world" (p. 959) [5]. As a result, numerous Chinese hospitals' Web sites convey only what a hospital wants its visitors to see and has hardly taken into consideration what the visitors truly need when they visit a hospital Web site; such a Web site often have not provided a platform for visitors to efficiently interact with the hospital [6,7]. This hospital-centered mentality has not played a positive role in attracting visitors [8]. Many Chinese scholars and

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hospital professionals have called on hospitals to make their Web sites truly patient-centered [8-11].

But what is a patient-centered hospital Web site like? Several scholars both in and outside of China have proposed design models. Bai and Yang [3] maintain that a good hospital Web site should incorporate a hospital information system (HIS), which enables medical treatment documentation, financial processing and analysis, administrative management, etc.; doctors and patients can share and search the information from the system through an interactive interface; and functions such as telemedicine, online payment, online appointment-making, and online inquiry can become routine. Xue [9] suggests that hospitals reduce the amount of propaganda content and make a site more engaging—to do so, every aspect of design should regard patients' needs as the top priority in a Web site design and make the Web site part of the hospital's service system. Huang [12] argues that interactivity and multimedia are the two most important features for the Web and concludes that both interactive tools and e-health videos should be extensively implemented to engage patients.

1. Literature review

Studies on Chinese hospital Web sites have been seen from time to time; however, most of such studies have suffered from the following problems. Some were not studies at all; the authors simply jumped to conclusions [13]. Some were studies, but the conclusions were not based on findings. For instance, Liu, Bao, Liu, and Wang [14] investigated the quality of leading general hospitals' Web sites in China. The authors concluded, "[Chinese] hospital Web sites showed a good performance in content..." (p. 1559). However, the study neither investigated any user nor defined what constituted good content. Some did not explain how their data were derived. For instance, Liu and Huang[7] stated that their study investigated 4,165 hospitals in China and in other countries, but the authors never explained how they had sampled these hospitals and which countries had been sampled. Some sampled a few hospitals in a local area [10,15], and some even stayed on the "our hospital"-level [5,8,16,] and came up with findings and conclusions that could not be applied to most parts of China. In short, making casual claims without evidential support is popular among these Chinese scholars. As of today, extremely few studies have methodically investigated how Chinese hospitals have developed their Web sites to meet patients' needs.

Based on a systematic probability sample drawn from a comprehensive list of Chinese hospitals, Huang, Wang and Liu [17] found in total 14 interactive tools used on Chinese hospital Web sites in 2013, but the average number of interactive tools used per Web site was only 3. The authors also found that only 5.1% of Chinese hospitals' Web sites had a dedicated menu listing interactive tools on their home pages to make their site action-driven, and even fewer hospitals allowed patients to execute private functions, such as checking lab results, in a personalized and registration-requiring patient portal (1.3%). The authors concluded that Chinese hospitals needed to more systematically implement interactive tools on their Web sites to provide quality healthcare. In a sister study, Huang, Liu and Wang [4] found that only 21.8% of Chinese hospital Web sites contained video(s), and 44.3% of the Web sites that carried videos carried only one video. The study concluded that Chinese hospitals needed to learn how to turn videos into an integral part of their marketing strategy so as to create

both conceptually and technologically user-centric Web sites to serve themselves and, more importantly, to serve their patients.

Based on the earlier studies, this study attempted to answer the following three questions:

RQ1: What do these hospitals have in common in their Web development?

RQ2: What problems and challenges are these hospitals facing in their Web development?

RQ3: How have these hospitals excelled in serving their patients online?

2. Methodology

This study has used a case study approach. Content analysis and in-depth interviews were used to triangulate findings from different perspectives and to find themes through comparisons. This study comprises four cases. Using "small sample" to discount a case study misses the point [18]. Although case studies generally do not require a random sample, uncovering best-practice hospitals mandates a thorough investigation of the hospitals in China. In addition, some selection criteria should be set prospectively. Therefore, 2,385 (12.5%) out of a total of 19,084 Chinese hospitals were sampled and examined. For any of these hospitals to be included in this case study, the hospital Web site had to contain:

1. At least 70% of the links that directly pertain to patients in above-the-fold space on the home page (News links were ignored. Links about hospital leaders, Communist Party activities, or hospital teaching, for instance, were not related to patient service.),
2. At least 10 interactive tools,
3. At least 20 e-health videos for patients,
4. A personalized patient portal,
5. A menu that contained interactive tools, and
6. A menu or a section that contained patient-related videos.

With such stringent criteria, only 9 out of 2,385 hospitals were left, and none of them was a private hospital. Eventually, the following four hospitals willingly participated in this study:

1. China-Japan Friendship Hospital (China-Japan).
2. Dongzhimen Hospital (Dongzhimen).
3. Pinggu District Hospital (Pinggu).
4. Sun Yat-sen Memorial Hospital (Sun Yat-sen).

Each of the four hospitals has a unique context. Sun Yat-sen is the largest of the four in terms of the number of beds and is ranked 44th overall among Chinese hospitals [19]. China-Japan is also a large hospital and ranked 81st nationally, but unlike the other three hospitals that are affiliated to universities, China-Japan is affiliated to the central government [19]. Dongzhimen is highly reputable nationwide as a Chinese medicine hospital and is ranked No. 3 in the neurology category in 2014 in China [20], but its size is much smaller. Pinggu is a rural hospital and mainly serves the patients from the Pinggu District in Beijing.

A content analysis on the above hospitals' Web sites was conducted by two coders in the summer of 2014. The intercoder reliability, using Scott's Pi, reached an average of .867 for all variables. Because human subjects would be involved in interviews, the protocol of data collecting received university institutional review board (IRB) approval first. The study information sheet and interview questions were all written in Chinese and were sent to the interviewees before an interview began. The initial interviews with the person or people in each of the chosen hospitals were conducted by the author in person in China from August to October 2014. The interview data and the content analysis data were compared. Follow-up interviews via email were conducted for interviewees to clarify and supplement their earlier answers.

3. Findings

Table 1 provides a synopsis of the four hospitals.

Table 1. Quick Overview of the Four Hospitals

	China-Japan Friendship Hospital	**Dongzhimen Hospital**	**Pinggu District Hospital**	**Sun Yat-sen Memorial Hospital**
Web site	zryhyy.com.cn	dzmyy.com.cn	pgyy.com	syshospital.com
Location	Beijing	Beijing	Beijing	Guangzhou
Affiliation	National Health and Family Planning Commission	Beijing University of Chinese Medicine	Capital Medical University	Sun Yat-sen University
Hospital Reputation	III-A[1]	III-A	III	III-A
Number of beds	1500	574	960	1800
Average daily Web site visits	45,000	33,000	2,100	30,000
Annual budget for Web development (RMB)	75,000	30,000	5,000	83,000
Who built the site	External	External	External	External
Number of employees responsible for development & operation	2	35	2	>100
Personalized patient portal	✓	✓	✓	✓
A menu for interactive tools	✓	✓	✓	✓
A menu or section for videos	✓	✓	✓	✓
Above-the-fold links for patients	79%	75%	93%	100%
Number of videos for patients	270	85	24	66
Median of video views[2]	1413	1533	579	271
Number of interactive tools	12	12	13	13
Interactive Tools				
Site Search	✓	✓	✓	✓
Online Appointment	✓	✓	✓	✓
Finding A Doctor	✓	✓	✓	✓
Doctors' Service Schedules	✓	✓	✓	✓
Online Inquiry	✓	✓	✓	✓
Cost Search	✓	✓	✓	✓
Social Media	✓	✓	✓	✓
Interactive Maps	✓	✓	✓	✓
Online Surveys	✓	✓	✓	✓
Hospital's Mailboxes	✓	✓	✓	
Patient Self-test Tools	✓	✓	✓	

Finding Medical Staff's Qualifications	✓	✓		
Checking Lab Results			✓	✓
Mobile App			✓	✓
Virtual Hospital Tours				✓
Checking Lab Exam Progress				✓

1. In China, III-A hospitals are the best hospitals in its ranking system.
2. Since the central tendency of the number of times the videos were viewed was highly skewed for each hospital (from 0.66 to 8.8), median was used instead of mean to describe central tendency in this case.

Table 1 has self-evidently presented much about how these four Chinese hospitals have used their Web sites to serve their patients. Here are more of the commonalities and differences among the four hospitals, as revealed in Table 1, further content analysis, and in-depth interviews.

First, all four hospitals have a predominantly patient-centered design on their home page. For instance, the China-Japan home page features its online services in six different ways from top to bottom of the home page, as a menu item, as two section bars, and as three side sections. Except for the hospital news stories, almost all links above the fold of the home page are for patients. The bottom space presents online services for doctors and for internal communication. The Dongzhimen home page and Pinggu home page are very similar to the China-Japan counterpart in terms of page structure. Guoyong Yu, Director of the Department of Social Work at Dongzhimen said: "Our hospital leaders and I agree that most patients are not interested in seeing our hospital leader' photo or even news. Patients want to find out on our Web site how their own medical problems can be solved."

Weidong Liu, Director of External Relations at Pinggu concurs: "When our patients get on our Web site, they are probably already in anxiety, and we want them to feel at ease through our clear and simple design. Unlike private hospitals' Web sites, which focus on marketing, our Web site focuses on serving our patients."

The Sun Yat-sen home page is unique. Four big buttons—Doctors' Service Schedule, Finding A Doctor, Online Appointment, and Online Inquiry—are clearly seen in the middle of the page. Clicking on any of these buttons will guide a visitor to its Hospital Service sub-site. In order to best serve its patients, the hospital has designed eight sub-sites to target different kinds of visitors so that patients will not get exposed to the content irrelevant to them. The Hospital Service sub-site home page carries a highly user-friendly Hospital Visiting Guidance section to guide the patients to find what they want based on the logical flow of a typical hospital visit. Almost all Chinese hospital Web sites carry and usually promote the information about their Communist Party activities. Sun Yat-sen's Hospital Service sub-site does not, and such information is tucked away deep in another sub-site. When asked why the party information is so de-emphasized, Weixiong Chen, Deputy Director of the Communist Party Committee Office, a dermatologist, and an autodidactic IT developer at Sun Yat-sen, said: "Serving our patients is the focus of the hospital. Making our Web site patient-centered is our hospital party committee's top priority."

Second, each of the four hospitals has at least one shining point in their Web development.

- Since China-Japan has so many healthcare videos, the site has provided different ways, including "videos recommended by the experts," "most watched videos," "videos by theme," and "healthcare lectures," for its videos

to be easily found. Its Doctors' Service Schedule shows clearly who from what department serves at what hours, how much appointment fee is for each doctor, and who has no service at what hours.

- The design of the Dongzhimen site can be described with one word: organic. Once a patient has landed on a doctor's profile page, the patient can see detailed information about the doctor, including phone number and email—extremely rare among Chinese hospitals. Three buttons on the right of the profile: "Online Inquiry," "Online Appointment," and "Online Follow Up" pertain only to this particular doctor. All departmental pages contain not only basic departmental information but also patient education articles pertaining to the focus of that department and a list of answers to the questions raised posted by patients. If a visitor cannot find a satisfying answer, a button "I Want To Ask" is by the list. Only 8.5% of Chinese hospital Web sites carry videos showing patient stories [4]. Dongzhimen is one of them. Yu from Dongzhimen has recommended her doctors to two highly famous Chinese medicine TV programs, in which doctors tell stories about their experiences with patients. Sometimes, patients also appear to supplement a doctor's talk. Dongzhimen then puts such patient stories, which promote both the doctors and the hospital on its Web site to attract online traffic.
- Though not as reputable nationally as the other three hospitals, Pinggu is one of the very first hospitals in the nation that have developed a mobile app and has promoted it on its home page. It even allows its patients to check lab results, a tool that China-Japan and Dongzhimen do not yet have.
- On the Sun Yat-sen site, in each doctor's profile page, there are rich interactive tools to interact with a particular doctor. For instance, a patient can see the doctor's service schedule, make an appointment with the doctor, scan the doctor's WeChat information, see the doctor's information on Weibo.com and Yihu.com, ask the doctor a question, fill out a satisfaction survey for the doctor, and scan barcode to open his or her information on a smart phone so that a patient can interact with the doctor in WeChat or do the above functions on the go. The information under doctors' service schedules is updated automatically by the hospital's HIS.

Third, all four hospitals have taken advantage of external resources when building their Web sites. For instance, for every hospital to develop an Online Appointment system is a daunting task. Some municipal governments and private companies have developed common systems for local or regional hospitals to use. The three hospitals from Beijing use the Beijing Uniform Online Appointment Platform while Sun Yat-sen uses 1m1m.com and yihu.com. In addition, Sun Yat-sen and China-Japan allow patients to make an appointment via WeChat. All three Beijing hospitals got their information in Cost Searches regarding Chinese medicine prices, Western medicine prices, and medical service prices from a page owned by Beijing Municipal Commission of Development and Reform. All four hospitals have claimed Online Inquiry as their most-often-used interactive tool, and all of them have taken advantage of Good Doctors (haodf.com), an independent site on which doctors from different hospitals answer patients' questions and compete for patients.

Fourth, all four hospitals have noticed the importance of serving their patients on the go. Sun Yat-sen and Pinggu have already built and are using their mobile apps. Sun Yat-sen has even seamlessly integrated its mobile app into the WeChat platform. As a

result, when a visitor opens WeChat, he or she can connect to the hospital's mobile site, and everything on the site can be easily shared within WeChat. Dr. Chen from Sun Yat-sen, has promoted the mobile site in different ways. For instance, in the name of holiday greeting, Chen sent doctor's profile pages to the respective doctors so that, in the future, a doctor can easily share his or her information with his or patients. China-Japan and Dongzhimen were close to being done with their mobile app development at the time of interview. Tieshan Zhang, Director of the Department of Information at China-Japan, said: "Instead of spending more time on developing our Web site, we will spend much more effort on developing our mobile app." Dongzhimen was taking advantage of Weiguanwang (meaning mini official Web site) (www.wgwchina.com)—a way for enterprises to promote themselves in WeChat—to build its Web site for mobile devices.

Fifth, Three of the four hospitals wish to enhance their search functions, especially the Finding A Doctor function, so as to attract desired patients. Pinggu, as a smaller hospital, does have the financial pressure to attract as many patients from its district as possible. Therefore, Liu from Pinggu hopes to improve its unguided site search and add more interactivity to its doctor's profile pages. The other three hospitals have too many patients to handle, but they all wish to find the patients who truly need their doctors' expertise. Zhang from China-Japan said, "A patient with a common cold does not have to see an expert who is specialized in difficult respiratory diseases. Our online interactive tools, if well designed, can help us find the kinds of patients we desire." The Sun Yat-sen site is the only site that allows a patient to find a doctor by disease type on top of name and department, but it is completing and improving its database to include more precise terms for disease types so that patients can more easily use its search tool. Chen from Sun Yat-sen said, "We need to use a language that patients can understand to tell the differences among some departments that can be confusing to patients." Dongzhimen already has a very mature search function coupled with its detailed information about each doctor and department.

Finally, all four hospitals are experiencing some problems and challenges in their Web development;

- None of the four hospitals has done a return on investment (ROI) assessment for their Web development.
- None of these hospital Web sites went through rigorous user testing. As a result, diversified problems are observed.
- None of the four hospitals has implemented the Online Payment function though they are each developing one.
- Though all four hospitals have various mailboxes for visitors to file online complaints or make suggestions, these mailboxes have been hardly used.
- All four hospitals are trying to come up with an appropriate proportion of online appointments since many patients do not visit hospital Web sits and prefer to walk in.
- Although the Online Inquiry tool is the most-often used interactive tool on all four hospitals, these hospitals are still trying to find ways to encourage their doctors to answer the questions.
- Pinggu and Sun Yat-sen have yet to make videos an integral part of online marketing and patient education, and both wish to do much more to promote their Web sites to their patients since they have not got the expected amount of exposure.

- Sun Yat-sen has used no Patient Self-testing Tools while the other three hospitals used only three or five tools. In contrast, Peking Union Medical College Hospital, the top hospital in China, has developed 133 of such tools—the most in China.

4. Discussion and Conclusions

As of 2014, these four Chinese hospitals have made outstanding progress in their Web development in comparison to thousands of their peers. Chosen from more than 2,000 Chinese hospitals, they are the best in China in serving their patients online. Since September 2013, the cell phone has become the No. 1 device to access the Internet in China [21]. Therefore, these four hospitals are on the right track to serve more and more patients on the go. It is understandable that larger hospitals tend to have more resources, manpower, and expertise to develop their online presence. However, Pinggu, a smaller local hospital, is not inferior to hundreds of much larger hospitals in China in its Web development. This small hospital even has a mobile app and the Checking Lab Results feature. Considering the fact that, in 2013, only 3.6% of Chinese hospitals' Web sites had this feature and no hospital Web site had a mobile app, Pinggu and, actually, all the other three hospitals are on the bleeding edge of hospital Web site development in China. Dongzhimen is also a small hospital, even smaller than Pinggu. Nevertheless, it has one of the most well-rounded, most visited, and organic hospital Web sites among the four hospitals, and it demonstrates clear caring for its online visitors. Most important, all these four hospitals have designed their Web sites by taking patients' needs as their top priority. Yu from Dongzhimen said: "Our peers like our Web site and wish to redesign theirs based on our template. But the most important concept they need to learn is to make a site patient-centered. If they don't understand this concept, their redesign won't go very far." These findings suggest that taking advantage of new media to serve patients online is hospital-size-free. Pinggu's and Dongzhimen's exceptional performances have demonstrated that smaller hospitals can also excel in coming up with an outstanding Web site to serve their patients online so long as they truly care about their patients.

Another lesson from these findings is that developing a highly competent hospital Web site to well serve patients requires a clear vision on top of expertise. Although all these four hospitals commissioned an external company to (re)design a site for them, they have strong in-house expertise, especially at China-Japan and Sun Yat-sen. Dr. Chen from Sun Yat-sen, for instance, is a medical doctor and an IT guru. His insight into hospital Web site development as an insider is unique and rare among his peers in the nation and has brought up one of the best hospital Web sites in China. However, although he has a team to support him, he often handles most of the development and updating and even answers questions from Online Inquiry by himself. As a result, he often feels burned out, and his misunderstanding of multimedia may have hurt his site. For instance, because he devalued the importance of e-health videos, he misplaced them and made them very difficult to find; Sun Yat-sen's extremely low number of video views is the lowest among the four hospitals—not something such a large and nationally reputable hospital deserves; his patient education materials are hardly supported by multimedia. Such mistakes have also resulted from the fact that the Web site did not go through rigorous user testing—a problem that permeates the four hospitals. All the interviewees from these four hospitals said that they were

understaffed, and their low or extremely low budgets support their claims. Pinggu has the fewest videos and wishes to produce more videos in-house. It can certainly borrow experience from China-Japan. These four hospitals have 12 to 13 interactive e-health tools, but 21 e-health tools were found on U.S. hospitals [22]. Many tools, such as ER Waiting Times, Online Flower/Gift Shop, Online Nursery, Online Patient Caring, and Online Payment, have been hardly found in China. Health self-test tools have been very under-used. Numerous Chinese hospital Web sites have prioritized Communist Party activities on their home pages. These four hospitals have, however, consciously chosen to prioritize patients' needs because of their similar visions.

The fact that no private hospitals in China were chosen in this study cannot be ignored. They were not chosen because they did not meet the criteria. Although Chinese private hospitals were significantly more aggressive in adopting interactive e-health tools [17] and in using e-health videos [4] than their state-owned counterparts, their overall performances were lacking in comparison to these four state-owned hospitals. One very big difference probably lies in the use of the Online Inquiry tool. None of these four hospitals' Online Inquiry tools is real-time while almost all the counterparts on Chinese private hospitals are. All questions for these four hospitals are answered by their doctors. Since doctors in any hospital have to work with patients, non-medical staff members usually have to answer questions from visitors on private hospitals' Web sites in real time. Such answers oftentimes are shallow and even irresponsible [11,23]. What is worse is that the Online Inquiry tool on numerous Chinese private hospitals' Web sites are designed in such a way that "it stays no matter where a user navigates on a page; it blocks the content behind it; when a user clicks to close it, it comes back after a few seconds; it shakes to call attention" (p. 81) [17]. In short, such an Online Inquiry window is very annoying and intrusive. Chinese private hospitals are financially self-sustaining. It is understandable why they need to aggressively market themselves online, but they have much to learn from these four state-owned Chinese hospitals in terms of establishing a good reputation by interacting with patients' responsibly and professionally and developing their Web sites with their patients' interests as the top priority.

In his diffusion of innovation theory, Rogers [24] characterized adoption participants into five categories from innovators, early adopters, early majority, late majority and laggards. He wrote, "In deciding whether or not to adopt an innovation, we all depend mainly on the communicated experience of others much like ourselves who have already adopted" (p. 293). In other words, the early adopters of an innovation can profoundly affect the innovation decisions of late adopters. The four hospitals in this study are all early adopters of healthcare new media. Their outstanding performances today can shed light on the Web development in many other Chinese hospitals that are going through the same healthcare new media adoption. The findings and conclusions from this study can also help Chinese hospitals form their new visions in serving patients online.

Acknowledgements

The author would like to show great appreciation to Tieshan Zhang, Director of the Department of Information at China-Japan Hospital; Guoyong Yu, Director of the Department of Social Work at Dongzhimen Hospital; Weidong Liu, Director of External Relations at Pinggu District Hospital; and Dr. Weixiong Chen, Deputy

Director of the Communist Party Committee Office. Without their time and input, this study would have been impossible. The author would also like to thank many kind people who helped along the way to make all the interviews possible. The author is especially thankful to the Indiana University–Purdue University Indianapolis for its support in his sabbatical leave, which provided the valuable time for data collecting. The author would also like to thank Stephanie Huang, a student at the University of Houston Law Center, for her proofreading and valuable insight into the improvement of this manuscript.

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