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Evaluation of Smart Services in Shanghai Internet Hospital

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Abstract: The purpose of this study is to try to establish a set of evaluation methods for smart services by studying the smart services of 117 Internet hospitals in Shanghai. Through the statistics and analysis of the functions and services of the WeChat official account and mobile app of the Internet hospital, we can analyze the current mainstream smart services and development. The types of smart services are divided into 13 parameters: online pharmacy, home delivery, short video guide, Expert referral, video consultation, appointment visit, family doctor, online payment, online consultation, appointment registration, electronic file, disease self-examination, health live broadcast. Some hospitals are unable to provide full-coverage smart services, and lack short video guides and health live streaming functions. The intelligent service system of the Internet hospital is generally guaranteed by the operation of the WeChat official account, but if the operator lacks experience, it will also lead to the ineffective operation of the relevant functional modules.

1. Introduction

"Healthy China 2030" Planning Outline, "Guiding Opinions of the State Council on Actively Promoting the "Internet +" Action". All have made arrangements about Internet hospitals. Allowing people to run less errands and more data, and continuously improve the level of equalization, universalization and convenience of public services are also the development requirements of Internet hospitals in the future.[1-3]. At present, as of 2023, more than 100 medical institutions in Shanghai have been approved to obtain Internet hospital qualifications, including municipal hospitals, district-level hospitals, community health centers and some socially-run medical institutions[4,5]. In the services provided by Internet hospitals, the role of smart services is becoming increasingly prominent, and improving the smart service level of Internet hospitals can effectively optimize the allocation of hospital resources and greatly reduce the pressure of diagnosis and treatment of grassroots medical institutions[6,7].

1.1. Telemedicine and internet hospital

Due to the popularization and application of the Internet and big data, telemedicine has developed rapidly[8]. In the United States, 76% of hospitals use some form of telehealth to contact

patients. Telemedicine is most frequently used by physicians in radiology, psychiatry, and cardiology[8]. Telemedicine has effectively solved the shortage of psychiatrists in the United States and has also provided assistance to small rural hospitals[1,2,8].In Europe, Spain recommended to the European Urological Association to continue providing high-quality telemedicine services after the pandemic, based on the professional clinical care provided to patients during the coronavirus pandemic[9]. The countries with good construction of foreign Internet hospitals mainly include Canada, Finland, South Korea, Singapore and other countries. Among them, Canada's Symber Hospital is the first digital hospital in North America, which can provide services such as robotic automatic mixing and management of chemotherapy drugs and automated pharmacy.

1.2. Telemedicine and internet hospital in China

The construction, expansion, and improvement of the relevant functions of Internet hospitals have become the primary tasks and challenges of new Internet hospitals[10]. Actively improving the smart service system of Internet hospitals and enhancing their smart service capabilities can effectively use smart services to improve the operation level and efficiency of Internet hospitals, which has become the first issue to be considered in the construction of information systems for new Internet hospitals[3,5,7]. By December 2022, 117 government-announced internet hospitals in Shanghai have begun to operate and have played an active role in the last round of epidemic prevention and control[1]. Internet hospital refers to a one-stop service platform relying on physical hospitals, focusing on follow-up consultation and routine consultation, covering the intelligent service of the pre-diagnosis-diagnosis-in-post-diagnosis consultation process, and the scope of diagnosis and treatment is mainly for chronic diseases and common diseases[1]. The types of smart services are divided into 13 evaluation parameters: online pharmacy, home drug delivery, short video guide, expert referral, video consultation, appointment visit, family doctor, online payment, online consultation, appointment registration, electronic file, disease self-examination, and health live broadcast.

This research mainly aims to analyse the current mainstream smart services and development. The types of smart services and the basic information of the hospital is recorded. Shanghai logged on to the existing 117 Internet hospital public accounts and smart service types provided by the APP for statistical analysis[11].Through the existence of 13 evaluation parameters, the types of smart services of Internet hospitals in the region were tested and the Internet hospital level was counted, and whether the higher the hospital level, the more and more perfect smart services would be possible.

2. Methods

We followed a four-step process to extract and analyse data from the accreditation reports: (1) data sourcing and processing, (2) data extraction, (3) data labelling, and (4) data analysis (Figure 1).

2.1. Data sourcing and processing

The search keywords are "Internet hospital" and "smart service". Through text analysis technology, find the relevant questions raised by the relevant literature about the smart services provided by Internet hospitals, and summarize the problems into the introduction part.By searching the literature, the types of services provided by the main Internet hospitals in China were confirmed, and the services were classified and summarized.

2.2. Data extraction

Log in to the hospital's WeChat official account or APP one by one to confirm whether the following services are carried out: 1. Online pharmacy, 2. Home delivery, 3. Short video guide, 4. Expert referral, 5. Video consultation, 6. Make an appointment, 7. Family doctor, 8. Online payment, 9. Online consultation, 10. Appointment registration, 11. Electronic files, 13. Health live broadcast, 12. Self-examination of diseases.

2.3. Data labelling

Select one or more smart services of the recording hospital for further analysis. They were grouped according to three criteria: 1. they were a Grade A tertiary hospital, 2. they were using a smart service, and 3) whether their smart service was effective and available. 4. Whether the Smart Service 3.0 mode is used.

2.4. Data analysis

Use chi-square test (cross-analysis) to study whether the selected hospital is a Grade A tertiary hospital or not for having following services: (1) Online pharmacy, (2) Home delivery, (3) Short video guide, (4) Expert referral, (5) Video consultation, (6) Make an appointment, (7) Family doctor, (8) Online payment, (9) Online consultation, (10) Appointment registration, (11) Electronic files, (12) Self-examination of diseases,(13) Health live broadcast. A total of 13 differences can be seen from the above table: whether the selected hospital is a sample of a Grade A tertiary hospital for (1) Online pharmacy, (2) Home delivery, (3) Short video guide, (4) Expert referral, (5) Video consultation, (6) Make an appointment, (7) Family doctor, (8) Online payment, (9) Online consultation, (10) Appointment registration, (11) Electronic files, (12) Self-examination of diseases,(13) Health live broadcast. (This is shown in Table 1:13 parameters showed differences)

3. Results

3.1. Internet hospital smart service system of 117 Grade A tertiary hospitals

Through the analysis of the Internet hospital smart service system of 117 hospitals, we find that the smart service system provided by Grade A tertiary hospitals has many functions and is very complete, which perfectly covers the functional modules of family doctors and smart Q&A. At the same time, the smart service system of Grade A tertiary hospitals also generally uses the smart hospital 3.0 model, and the system perfection is relatively high. Under the premise of relatively sufficient funds, the hardware and software of the Internet hospital are perfect, relatively speaking, the medical and technical support personnel are sufficient, and the service experience is relatively good.

3.2. A total of 13 items showed differences, and specific suggestions can be combined with percentages in parentheses for comparison

Use chi-square test (cross-analysis) to study whether the selected hospital is a Grade A tertiary hospital for 1. Online pharmacy, 2. Home delivery, 3. Short video guide, 4. Expert referral, 5. Video consultation, 6. Make an appointment, 7. Family doctor, 8. Online payment, 9. Online consultation, 10. Appointment registration, 11. Electronic files, 13. Health live broadcast, 12. Self-examination of diseases. A total of 13 differences can be seen from the above table: whether the selected hospital is

a sample of a Grade A tertiary hospital for 1. Online pharmacy, 2. Home delivery, 3. Short video guide, 4. Expert referral, 5. Video consultation, 6. Make an appointment, 7. Family doctor, 8. Online payment, 9. Online consultation, 10. Appointment registration, 11. Electronic files, 13. Health live broadcast, 12. Disease self-examination. A total of 13 items showed significance ($p<0.05$), which means that different selected hospitals are not Grade A tertiary hospital samples for 1. Online pharmacy, 2. Home delivery, 3. Short video guide, 4. Expert referral, 5. Video consultation, 6. Make an appointment, 7. Family doctor, 8. Online payment, 9. Online consultation, 10. Appointment registration, 11. Electronic files, 13. Health live broadcast, 12. Disease self-examination. A total of 13 items showed differences, and specific suggestions can be combined with percentages in parentheses for comparison. (This is shown in Table 1:13 parameters showed differences)

Table 1: 13 parameters showed differences

No.	**13 parameters**	Chi	P value	GATH=Y	GATH=N	NGATH=Y	NGATH=N
1	Online pharmacy	12.483	0.000**	94.87%	5.13%	63.93%	36.07%
2	Home delivery	11.793	0.001**	84.62%	15.38%	50.82%	49.18%
3	Short video guide	18.903	0.000**	82.05%	17.95%	37.70%	62.30%
4	Expert referral	16.141	0.000**	84.62%	15.38%	44.26%	55.74%
5	Video consultation	16.452	0.000**	74.36%	25.64%	32.79%	67.21%
6	Make an appointment	6.156	0.013*	97.44%	19.67%	80.33%	2.56%
7	Family doctor	9.927	0.002**	66.67%	33.33%	34.43%	65.57%
8	Online payment	6.053	0.014*	92.31%	7.69%	72.13%	27.87%
9	Online consultation	10.321	0.001**	97.44%	2.56%	72.13%	27.87%
10	Appointment registration	4.180	0.041*	94.87%	5.13%	80.33%	19.67%
11	Electronic files	4.887	0.027*	94.87%	5.13%	78.69%	21.31%
12	Disease self-examination	7.629	0.006**	76.92%	23.08%	49.18%	50.82%
13	Health live broadcast	12.358	0.000**	61.54%	38.46%	26.23%	76.92%

(*=P<0.05, **= p<0.01, **GATH=**Grade A tertiary hospital, **NGATH**=NotGrade A tertiary hospital)
To summarize, it can be seen that whether the Grade A tertiary hospital samples of strongdifferent selected hospitals are for 1. Online pharmacy, 2. Home delivery, 3. Short video guide, 4. Expert referral, 5. Video consultation, 6. Make an appointment, 7. Family doctor, 9. Online consultation, 13. Health live broadcast, 12. Disease self-examination. (This is shown in Table 1:13 parameters showed differences)

4. Discussion

For internet hospital, the information department of the hospital is the intermediate force for maintenance; It is especially important to establish and improve the smart service system of Internet hospitals, promote the extensive participation of all departments of the hospital, and open services to cyberspace; Smart services can compensate for the disadvantages of traditional services; At the same time, family doctors can also expand their reach through the Internet hospital platform and promote medical service reform.

The smart service system of Internet hospitals is directly proportional to the scale and financial resources of hospitals. Under the premise that some hospitals have limited resources, it is difficult

to have enough personnel to support the operation of Internet hospitals. Internet hospitals not only need the support of information managers, but also relevant medical staff need to participate extensively. At the time of the outbreak, the number of medical staff was relatively insufficient, which may also lead to the paralysis of Internet hospitals. At the same time, when doctors consult with their own public hospitals and third-party commercial medical platforms, there are obvious differences in income (due to factors such as whether they use medical insurance to pay); Most public hospitals do not include online platform consultation in doctors' business assessments, so doctors' enthusiasm for Internet medical treatment is generally not high.

There are functional deficiencies in smart services, such as some hospitals cannot provide full-coverage intelligent services, short video guides and health live broadcast functions. At the same time, there are also some problems of difficult maintenance of functional modules, and the operation of good multi-functional modules lacks manual intervention and manual feedback. The smart service system of Internet hospitals is generally guaranteed by the operation of WeChat public account, but if the operator lacks experience, it will also lead to the ineffective operation of relevant functional modules.

5. Conclusion

During the new crown virus epidemic, the scale of Shanghai Internet Hospital has developed rapidly, and services such as online drug distribution, online consultation, and follow-up have brought convenient medical services to patients and promoted the sinking of high-quality medical resources. In the future, Internet hospitals need to gradually solve the problems of opening up the first diagnosis, optimizing and deepening service functions, continuing to carry out health management (especially chronic disease management services), collaboration between Internet hospitals, expanding online payment for medical insurance, and cultivating talents in both hospital operation management and new information technology applications. At the same time, the state should reform the medical insurance reimbursement system, give full play to the role of medical insurance regulation, and enable Internet hospitals to play a greater role in promoting the implementation of graded diagnosis and treatment.

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Author contributions

T.J. conceived the idea of the study. T.J. performed the experiments. XD. W, XM. L, YK.Z, TT, L and T.J. analyzed the data and wrote the paper.

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