Using WeChat to solve the Three-Long & One-Short Dilemma: Insights from a paradigmatic case

Yingfeng Huang

Instituto Universitário de Lisboa (ISCTE-IUL), ISTAR-Iscte (University Institute of Lisbon), Lisboa, Portugal. School of Health Management, Southern Medical University, Guangzhou, Guangdong, China
Email: huangyingfeng-dmh@qq.com

Bráulio Alturas *

Instituto Universitário de Lisboa (ISCTE-IUL), ISTAR-Iscte (University Institute of Lisbon), Av. Forças Armadas 1649-026 Lisboa, Portugal
Email: braulio.alturas@iscte-iul.pt

*Corresponding author

Gonçalo Paiva Dias

School of Technology and Management of Águeda/ Research Unit on Governance, Competitiveness and Public Policies, University of Aveiro, Portugal
Email: gpd@ua.pt

Jiang Hong

University of Shantou, Shantou, Guangdong, China
Email: hjiang@stu.edu.cn

Abstract: In this article, a case-based research, aims to find to what extent social media applications such as WeChat can contribute to solving the dilemma of "Three-Long & One-Short" (long waiting time for registration and payment, long waiting time for getting medicine, long waiting time for treatment and short time of diagnosis) dilemma in Chinese large public hospitals. To achieve this objective, the case of implementation of the 'WeChat plus outpatient medical services' in the Guangzhou Twelfth People's Hospital was studied using a SERVQUAL multiphase inventory measurement. It is concluded that social media-based platforms can effectively contribute to alleviating the 'Three-Long' part of the dilemma, but solving the 'One-Short' will need a more holistic approach. It can be seen that the construction of "WeChat + outpatient service" platform has improved the patient's medical experience, increased the satisfaction of patients and the medical staff, and promoted employees' awareness of active service.

Keywords: hospital information systems; total quality management; e-government; social media; WeChat; China.

Reference to this paper should be made as follows: Huang, Y., Alturas, B., Dias, G. P. & Hong, J. (2023) 'Using WeChat to solve the Three-Long & One-Short Dilemma: Insights from a paradigmatic case'*, Int. J. Healthcare Technology and Management, Vol. X, No. Y, pp.*

Biographical notes: Yingfeng Huang is Doctor of Management from the University Institute of Lisbon (ISCTE-IUL), Portugal, and the Southern Medical University (SMU), Guangzhou, Guangdong, China. He has many years of experience in managing hospitals in China, and currently is working at TCM Hospital of Guangzhou Medical University. His scientific research interests are in hospital management, process management, business process reengineering and information technology.

Bráulio Alturas is Associate Professor of Department of Information Science and Technology of Instituto Universitário de Lisboa (ISCTE-IUL) (University Institute of Lisbon), Lisbon, and researcher of the Information Systems Group of ISTAR (Information Sciences, Technologies and Architecture Research Center). He holds a PhD in Management with specialization in Marketing, a MSc in Management Information Systems, and a BSc in Business Organization and Management, all from ISCTE-IUL. His scientific research interests and publications are in acceptance and use of technology, digital marketing, social media, e-commerce, information management, information systems, direct selling and consumer behaviour. ORCID: 0000-0003-0142-3737.

Gonçalo Paiva Dias is Associate Professor at the School of Technology and Management of Águeda (ESTGA) and full researcher at the Research Unit on Governance, Competitiveness and Public Policies (GOVCOPP) at the University of Aveiro. He held several positions at the University, including Vice Rector, Dean of ESTGA, and Director of the degree in Information Technology. He is a member of the International Editorial Review Board of the International Journal of Electronic Government Research (IJEGR), the Editorial Advisory Board of the Journal of Information Systems Engineering & Management (JISEM), and the Scientific Committee of the Iberian Journal of Systems and Information Technology (RISTI). He publishes regularly on the subjects of e-government, information systems and technologies, and higher education. ORCID: 0000-0002-8599-3798.

Jiang Hong is the current Party (CPC) Secretary of Shantou University, received her PhD. in Management from Management School of Jinan University, and is professor and doctoral supervisor. Prior to joining Shantou University as the Party Secretary & President in March 2017, Dr. Jiang was the Deputy Party Secretary and Secretary of Disciplinary Inspection & Supervision in Southern Medical University. Dr. Jiang's research interests focus on capital operation and financial management, auditing theory and application, internal control and risk management, as well as public health policy and management. She also holds concurrent posts as Vice-chairman of China Health Law Society, Chairman of Guangdong Research Association of Health Law, member of the Asian Science Camp International Committee (ASCIC), and has been appointed by China Education Association for International Exchange as one of the founding members of the Special Committee of Education, Women & Sustainable Development.

1 Introduction

China is a country with a large population of over 1.3 billion (National Bureau of Statistics of the People's Republic of China, 2011). It is overcrowded, whether on the streets or other public places. Similarly, an endless stream of outpatients is often seen in China's public hospitals. According to the National Health and Family Planning Commission of People's Republic of China (2015), the daily number of visits to doctors in the large-sized public hospitals ranges from 3,000 to 10,000 (National Health and Family Planning Commission of People's Republic of China, 2015). In these hospitals, medical staff, even overworking, fails to meet the demands of patients for seeking medical advice and getting personalized services.

Long waiting lists in outpatient clinics are a widely recognized problem (Lewis *et al.*, 2020). One of the scarcest resources in healthcare is physician time. Due to uncertainty in the demand for appointments, it is difficult to provide an exact match between planned physician availability and appointment requests (Aslani *et al.*, 2020). Due to the large and uncontrollable number of outpatients, many hospitals impose an upper limit to the daily number of patients allowed to register, based on full-load work. Consequently, in order to register, patients get up much earlier or even hurry to the hospital from other places. Before opening time, people waiting for registration form long queues in the registration offices. This is known as the "long registering time" phenomenon.

Later, those who managed to register swarm forward related departments for awaiting diagnosis. Due to large number of patients waiting to visit doctors, it often takes half or even one to two hours before diagnosis (Zhao, 2011). During waiting time, some patients become so restless and anxious that they leave the waiting room bench; since there are too many patients, those who had no access to the waiting room have to stand, and often enter the consulting room and stand around the doctors office table, waiting anxiously. They even turn a deaf ear to doctors and nurses who try to persuade them to leave the room so as not to affect their work and other patients' privacy. Thousands of patients look on doctors and patients seeking medical services. This is known as the 'long waiting time and onlooker' phenomenon.

Due to the large number of patients waiting for diagnosis, the interference of onlookers, and complaints from patients at the end of the queue, doctors must complete diagnosis and treatment as soon as possible. For some simple symptoms, such as cold, fever, or pain in the waist and lower extremities, doctors listen to the complaints of patients while making a prescription at the same time or send them to perform the radiograph check to reduce the pressure resulting from excessive patients (Wang, 2004). This often leads to patients' complaining that they spend over one hour on registering and waiting for diagnosis while doctors only treat them for several minutes. This is known as the "long waiting time, short treatment time'.

After leaving the consulting room, patients would first go to the prescription pricing and cashier before getting the medicine or being checked. At this moment, patients would once again queue up. This is known as the 'long time to pay and get medicine' phenomenon.

The combination of the aforementioned phenomena in outpatient departments in China's large-sized public hospitals is generally known as the "Three-Long & One-Short" dilemma (Yang, 2009). It refers to the "long waiting time for registration and payment, long waiting time for getting medicine, long waiting time for treatment and short time of diagnosis". This phenomenon bothers both patients and doctors. As a result, hospitals are

often criticized for non-action or bad service attitude, which becomes one of the reasons for the strained doctor-patient relationship and more and more medical dispute.

In May 2015, considering the "Three-Long & One-Short" dilemma of 'Three-Long and One-Short', Guangzhou's Twelveth People's Hospital (hereafter referred to as the T hospital) decided to develop a new WeChat-based application named 'WeChat plus outpatient medical services'. This application was expected to contribute to optimising outpatient service procedures while allowing developers, operators, and banks to make a profitable business from it. The long-winded goal was to contribute to solving the "Three-Long & One-Short" dilemma in outpatient services, improving outpatient service quality, and improving patient satisfaction. A patient is also a customer of the hospital, and customer satisfaction is determined by three factors, namely, customer perceived quality, customer expectations, and customer perceived values (Chen, 2014). Customer satisfaction includes also customer loyalty, consumption habits of the customers, market shares, and customer satisfaction itself (Keiningham *et al.*, 2014), and the primary component of customer satisfaction is the satisfaction to suppliers of the services and attraction to the customers (Pulles *et al.*, 2016).

The lifestyle app "WeChat" (Chinese "Wēixìn") by Internet giant Tencent has more than 1 billion daily users and is THE (digital) centre of life for many Chinese people - especially due to the strong mobile use. WeChat offers different account types with individual menus, mini program integrations and games, e-commerce functions as well as payment services and therefore combines many functions of western platforms like Facebook, WhatsApp, PayPal, and Amazon in only one "all-in-one" App (Seebacher, 2021). The official WeChat official account (WOA), which is now widely adopted by hospitals in China, enables health care providers to connect with local citizens, allowing them, among other actions, to send regular updates through mass circulation (Shen *et al.*, 2019).

The work presented in this article aimed to measure the improvement in service quality induced by the introduction of 'WeChat plus outpatient medical services" in the T Hospital. It is, thus, a case-based research.

The underlying research question is the following. To what extent can WeChat-based applications contribute to solving the 'Three-Long & One-Short" dilemma? The remaining of the article is organized as follows: The case studied is briefly presented in the second section; the methods used to assess quality are described in the third section; the results are presented in the fourth section; discussion is made in the fifth section; and conclusions are addressed in the sixth and final section.

2 The studied case

The T hospital was established in 1970 as a sanatorium focussing on occupational disease prevention and control. In 2000, it was transferred to the urban area of Guangzhou, expanded as a comprehensive tertiary hospital and became a teaching hospital of Sun Yat-sen University and other colleges and universities.

The establishment of 'WeChat plus outpatient medical services" was planned based on theories of Total Quality Management (TQM). According to Juran (2010), quality management consists of a series of operations to realise the fitness of the organisation, including planning, organising, leading, and controlling. These include formulating quality policies and quality objectives, planning for quality, and provide for quality control, quality

assurance, and quality improvement. The last three constitute the Juran Trilogy (Juran, 2010) and are required to produce high-quality products and provide high-quality services. These general principles are suitable for all types of organisation. However, the implementation of TQM and its impact depend on the ability of managers to adopt and adapt its values and concepts in professional healthcare organisations (Mosadeghrad, 2014).

In a recent study in 3 Italian hospitals Chiarini and Baccarani (2016) found that through specific implementation paths, TQM theories and Lean Management Theories can improve patient satisfaction and hospital performance (Chiarini and Baccarani, 2016).

Information technology deployment can improve healthcare performance (Enam *et al.*, 2022). Internet-based medical services is the name of a new-type medical and healthcare service industry that is supported by the Internet by means of information technology (including mobile communication technology, cloud computing, Internet of things, and big data) and integrated with traditional medical and healthcare services (Meng *et al.*, 2017).

Many professionals connect with consumers through mobile app technology. It is no surprise that healthcare providers have explored this technology as a tool to reach patients. Despite increasing accessibility, willingness to use mobile technology, such as healthcare apps, can be affected by several different factors (Milner *et al.*, 2021).

As previously mentioned, WeChat is a Chinese social media application (instant messaging, commerce, and payment services) developed by Tencent (Li *et al.*, 2019). WeChat was chosen for this study due to the broad impact of WeChat in China, where it has already been used in the health sector.

Taking into account the above discussion, the first step in establishing the platform 'WeChat plus outpatient medical services' consisted of formulating its strategic direction: optimising outpatient diagnosis and treatment procedures to solve the "Three-Long & One-Short' dilemma. Strategic goals were then set to satisfy the customers, benefit the society, improve service quality, and provide excellent services and remarkable performance. This platform, which innovates outpatient diagnosis and treatment procedures, promotes participation of all employees, as well as motivates and excites employees' patient-centered service awareness. Through the conclusion and analysis of the historical evolution of the conventional diagnosis and treatment pattern, it was considered that the goals can be achieved by optimising outpatient diagnosis and treatment procedures and saving the time used by these procedures.

The approaches of using the integrated platform of mobile phone "WeChat app" and "WeChat pay" so as to realize the goal of optimizing outpatient diagnosis and treatment procedures are demonstrated as follows:

First, the establishment of the platform 'WeChat plus outpatient medical services' could simplify the registration and payment procedures on site. With the help of this platform, patients can complete the aforementioned procedures by phone outside the hospital, optimising outpatient diagnosis and treatment procedures, and eventually the registered time and waiting time on site for registration are reduced.

Second, the platform 'WeChat plus outpatient medical services' performs appointment registration, diagnosis, and treatment in phases in time, resulting in reducing the flow of unwanted patients and waiting patients for diagnosis in unit time, and finally saving waiting time for diagnosis. Besides, the resolution of doctors being influenced by onlookers indirectly prolongs treatment time and improves diagnosis and treatment environment and experience.

Third, on the "WeChat plus outpatient medical services" platform, doctor prescriptions are automatically priced in the HIS system after diagnosis and treatment, so patients could use the WeChat app on their mobile phones to pay the medicine fee and examination fee on this platform when leaving the consulting rooms. In this way, waiting time for the payment of the medicine fee is saved and patients can get the medicine from the pharmacy directly before leaving or go to the examination rooms in question. In this regard, patients' waiting time for getting medicine is decreased indirectly for the problem of over-crowdedness in unit time are solved.

Based on the above-mentioned thoughts, it is hoped that the platform "WeChat plus outpatient medical services" could be conducive to deal with the "Three-Long & One-Short" dilemma.

Meanwhile, on the platform, hospitals will provide more information to educate and popularise health knowledge to increase patient understanding of diseases; hospitals could receive follow-up feedback from patients and provide reservation services such as hospitals' catering reservations. In addition, as the continuous development and function perfection, hospitals are capable of providing many more additional services that include services for inpatients.

The platform was envisioned to contribute to the innovation of outpatient diagnosis and treatment procedures, promote participation of all employees, and motivate the awareness of patient-centred services by employees.

Considering the above, problem-focused design was chosen as the preferable development approach. The main operational goals of the platform were defined as:

To simplify on-site registration and fee payment by allowing patients to complete those procedures using their smartphone outside the hospital facilities;

To perform appointment registration, diagnosis, and treatment in phases in a time scale, thus reducing patient flow and waiting times and eliminating onlookers, and indirectly improving diagnosis and treatment;

Automated prescription price of the doctor after diagnosis and treatment, so that patients could use the WeChat application to pay for the examination and medical fees after leaving the consultation rooms.

3 Methodology

To assess quality, a structured questionnaire was launched to patients and medical personnel of the T hospital. The questionnaire survey research method is a popular method to contact a broad sample of the given population at a relatively low cost. This study, therefore, started with designing the instrument for data collection.

The questionnaire includes a total of 39 questions, organised in three parts: basic information (15 questions); expectations and satisfactory degree, including tangibles (questions A1 to A6), reliability (B7 to B12); responsiveness (C13 to C15), assurance (D16 to D19) and empathy (E20 to E23); and total satisfactory degree (improvement over expectations; one question with six options). Each one of the questions A to E addressed a specific topic and was responded by means of two 5-point Likert scales, one assessing expectations for that specific topic and the other assessing the satisfactory degree concerning that topic. A total of 1050 questionnaires were distributed, of which 995 were received and 800 were considered valid (80.4%). The field work took place from May to July 2017.

A convenience sampling method was adopted to select the respondents. The questionnaire followed the SERVQUAL multiphase inventory method of service quality measurement (Parasuraman, 1998; Parasuraman *et al.*, 1985), which includes four parts: basic information, patient expectations, actual services provided by the hospital and the perception of patients of improving service quality. Patients' expectations and actual hospital services were measured using five dimensions: tangible, reliability, responsiveness, assurance, and empathy.

In a study carried out in 2018, on satisfaction with various hospitals of Delhi NCR, India, SERVQUAL was also used and it was found that the five dimensions of SERVQUAL, that is, tangibility, reliability, responsiveness, empathy, and assurance, have a positive effect on overall satisfaction and overall satisfaction has a positive effect on brand loyalty (Singh and Singhi, 2018).

Regarding the demographic information of the respondents, 60,4% were females; 70.1% were young adults (from 18 to 40 years old); 40.5% had a bachelor degree; 39.4% were doctors, nurses, and managers of the T hospital; 38.6% had an annual income ranging from 60,000 yuan to 100,000 yuan; and 93.9% had an annual income of less than 200,000 yuan. Concerning the second and third parts of the questionnaire, internal consistency was verified using Cronbach's Alpha, and validity was verified using Spearmen correlations. Results were further analysed by means of descriptive analysis and an orderly multi-class logistic regression.

4 Results

4.1 Analysis of adoption

Taking into account the valid responses, 14.5% of the official WeChat account of the respondents did not use the T hospital. From those, 78.9% were older than 60 years old and only 8.6% had between 31 and 40 years old. Regarding education background, the basic trend was that the lowest education background corresponded to the highest proportion of nonadopters (Junior school or lower education levels accounted for 55.6% of non-adopters). In terms of professions, peasants represented the highest proportion of non-adopters (32.4%). The physicians, administrative staff, and nurses of the T hospital exhibited the lowest proportions of nonadopters, with 3.0%, 4.3%, and 5.6%, respectively. Lastly, those earning over 500,000 yuan accounted for the lowest proportion of non-adopters (0.0%), while respondents earning 300,000 to 400,000 yuan account for the highest proportion (40.0%). The main reasons given by respondents for not using the WeChat official account were not being familiar with it, being unable to use it, and being bothered to follow it (namely because it is unnecessary for short diagnosis time).

In their turn, adopters represented 85.5% of the total of respondents. Appointment registration, information query (including hospital's profile, departments' introduction and doctors' introduction), as well as diagnosis and fee payment were the three WeChat official account functions most used by respondents. Of those, 87.1% claimed to be able to use the application adroitly, while 12.9% did not. Moreover, 88.7% considered that the waiting time for diagnosis was shortened, being that 76.3% said it was reduced by at least 30 minutes. Still among adopters, 92.0% stated that the registered time was also shortened, 77.5% that the payment time was reduced, and 69.6% that they used less time to get the

medicine. However, 52.1% of adopters said that treatment time remained unchanged, 45.3% claimed that it was shortened, and 2.6% said that it was extended.

4.2 Expectations versus actual services

Regardless of the dimension analysed, the average expected value indicated by the patients ranges from 4.06 to 4.13, while the average actual average service value ranges from 3.79 to 3.94. Therefore, hospital quality of the services as assessed by patients fails to live up to their expectations. The maximum difference appears in the dimension of empathy, while the minimum difference appears in reliability (see Table 1).

Table 1 Comparison between Patients' Expectations and Actual Services

Dimensions of service quality	Expected value (average)	Actual value (average)	Difference
Tangibles	4.06	3.79	0.27
Reliability	4.13	3.94	0.19
Assurance	4.12	3.86	0.26
Responsiveness	4.11	3.89	0.22
Empathy	4.1	3.79	0.31

4.3 Logistic regression

To explain the perception of improving service quality, an orderly logistic regression analysis was performed with the proportional odds assumption. Actual service results for tangibles, reliability, responsiveness, assurance and empathy were used as independent variables. Gender, age, educational level, profession, education background, and annual income were included as dummy variables. Apply an orderly logistic regression analysis that conforms to the proportional odds assumption to explore the influence factors on the perception of quality improvement by patients. X^2=49.926, P=1, the result of parallel testing shows there is a proportional odds assumption so as to conduct an orderly multiclass logistic regression analysis.

Profession categories, tangibles, reliability, and empathy proved to be statistically significant. The relevant professional categories were doctors, nurses and administrative managers of the T hospital (see Table 2).

Table 2 Logistic Regression Analysis of Influence Factors of Patients' Perception of Service Quality Improvement

Parameters	B	S. E.	Waldχ2	df	P	OR(95%CI)
Doctor	0.724	0.3471	4.348	1	0.037	2.062 （1.044，4.071）
Nurse	0.865	0.2939	8.672	1	0.003	2.376（1.336，4.227）

Administrative manager	0.864	0.3735	5.347	1	0.021	2.372（1.141，4.931）
Tangibles	0.522	0.2591	4.052	1	0.044	0.594（0.357，0.986）
Reliability	0.538	0.25	4.63	1	0.031	1.713（1.049，2.796）
Empathy	1.098	0.2531	18.817	1	＜0.001	2.997（1.825，4.922）

The tangibles are negatively correlated with patients' perception of service quality improvement; the reliability and empathy are positively correlated with patients' perception of service quality improvement by patients. Probably due to the fact that the platform "WeChat plus outpatient medical services" is in the early stage where the implementation of a lot of work is insufficient and patients need more time to adapt the platform, it exerts a negative impact on the perception of service quality improvement. While through staff training, reliability and empathy could be embodied in medical service quality provided by the hospital, and hospital's staff attach great importance to supply of "Internet Plus" medical services quality; therefore, there is a positive correlation between the reliability and empathy of service quality in regression equation and patients' perception of service quality improvement.

4.4 Overall perception of service quality

Table 3 presents the results obtained for the third part of the questionnaire. As shown, 67.25% of the respondents who adopted the platform 'WeChat plus outpatient medical services' thought that the hospital's service quality improved according to their expectations, while 25.29% thought that the improvement was below their expectations and 7.46% that it exceeded their expectations.

For 74.71% of the respondents who have followed and used the hospital'WeChat plus outpatient medical services' platform, that is, most patients thought the quality of the service was in accordance or exceeds their expectations when using the hospital'WeChat plus outpatient medical services' platform.

Table 3 Overall Evaluation of Patients' Perception of Service Quality

Options	Frequency	Percentage
Far below expectations	23	3.36%
Slightly below expectations	150	21.93%
According with expectations	460	67.25%
Beyond expectations	38	5.56%
Far beyond expectations	13	1.90%
Total	684	100%

5 Discussion

Based on the results, it is evident that the "WeChat plus outpatient medical services" platform contributed to solve or alleviate the "Three-Long" part of the "Three-Long & One-Short" dilemma, while the "One-Short" part remained essentially unchanged. In fact, according to the perceptions of most adopters, the waiting times to register, diagnose, pay, and get medicine were reduced while the treatment time remained unchanged. The introduction of the platform contributed improve the overall perception of the hospital's service quality. However, the quality of services continues to not meet patient expectations.

The results provide a strong indication that information and communication technologies such as We Chat can help partially solve the "Three-Long & One-Short" dilemma. However, further actions are needed to improve diagnosis and treatment experiences. Among them, the deepening of the hospital's quality culture seems fundamental. Fortunately, TQM-based initiatives such as the one presented in this article can also make a valuable contribution to this goal.

In any case, under the realistic condition of a large population base, solving the problem of over-crowdedness in outpatient departments of China's large-sized public hospitals will always depend on additional measures such as adopting hierarchical diagnosis and treatment, stress the information-based means, enhance health education, raise public awareness of diseases, and promote the health of the people. Indeed, that is a long-term task.

6 Conclusion

The main conclusion of the study is that the "WeChat plus outpatient medical services" platform was effectively able to alleviate the "Three-Long" part of the "Three-Long & One-Short" dilemma in T Hospital, but it failed to solve its "One-Short" component. Indeed, solving the "One Short" part of the dilemma may need a more holistic approach that, among other factors, includes deepening the culture of quality, reorganizing diagnosis and treatment processes, and promoting health and health culture among the population.

Other conclusions linked to the process of developing the "WeChat plus outpatient medical services" platform include: (i) the involvement of all the staff in improving service procedures contributed to strengthen employees' awareness to serve actively, keep improving outpatient service quality, and further increase the satisfactory degree of patients and medical staff; (ii) although the TQM approach proved essential to help build the hospital's quality culture, there are relevant particularities in its implementation in a hospital environment, mainly due to the prominent individuation of medical staff's operations being very different from what is usual in corporate line production; (iii) the successful implementation of the platform greatly depended on intense interaction with stakeholders, including dealing with government barriers, assuring cooperation and support from partners and staff, and getting feedback and assistance from customers.

Although the final research conclusions have been made, with certain theoretical and social contributions, there are still some limitations, which are shown as follows:

- This research has only been conducted in one hospital, featuring an incomprehensive research basis and the possibility of overgeneralization. This research has provided some practical experience, which, however, can only be used as references;

- The Grade III Level A hospitals in China boast enormous outpatient visits, which lead to even severe "Three Longs and One Short" dilemma. But T Hospital has only 500 sickbeds, and compared with other large-sized public hospitals, the number of its outpatient visits is much smaller. The "Three Longs and One Short" dilemma in T Hospital is less severe than that in large-sized public hospitals. As a result, the conclusions are not universal.

This research has an obviously practical significance. Under the guidance of the State Council policy of developing Internet Plus healthcare, hospitals are expected to further improve the facilities and soft power of hospitals' "WeChat plus outpatient medical services", perfect their coverage of WIFI, enhance the interconnection of "Pacs" and other systems, and prepare to perfect the infrastructure for medical insurance settlement docking, in order to finally bring forward the one-stop services. Moreover, intelligent pharmacy can be established according to the actual situation, which can accomplish the full automatic dispensing system to better solve the long-term problem of obtaining medicine.

Meanwhile, conducting comparative studies on samples from several hospitals, and learning from the strengths of others to offset their own weaknesses, will deepen and develop the research on Internet Plus' medical services.

In addition, as the in-depth research continues, it is indispensable to enhance staff's recognition and understanding of the "total quality management theory". With information construction as the means, update hospitals' service concepts and develop the quality culture, to eventually establish the hospitals' culture of "innovating service mode with patients as the center, and improving service level with quality as the criterion", which is the development direction and ultimate goal of this research.

Acknowledgements

This work is an outcome of the doctoral thesis of the first author, undertaken at the University Institute of Lisbon (Instituto Universitário de Lisboa (ISCTE-IUL)), Portugal, and the Southern Medical University (SMU), Guangzhou, Guangdong, China. It was partially funded by the Portuguese Foundation for science and Technology (Grant UID/GES/00315/2019).

References

Aslani, N., Kuzgunkaya, O., Vidyarthi, N. and Terekhov, D. (2020) 'A robust optimization model for tactical capacity planning in an outpatient setting', *Health Care Management Science*, Springer, Vol. 24, pp. 26–40, doi: 10.1007/s10729-020-09528-y.

Chen, Y.T. (2014) *Quality Management*, Beijing Jiaotong University Press, Tsinghua University Press. In Chinese, Beijing, China.

Chiarini, A. and Baccarani, C. (2016) 'TQM and lean strategy deployment in Italian hospitals', *Leadership in Health Services*, Vol. 29 No. 4, pp. 377–391, doi: 10.1108/LHS-07-2015-0019.

Enam, A., Dreyer, H.C., Ingvaldsen, J.A. and De Boer, L. (2022) 'Improving healthcare operations with IT deployment: A critical assessment of

literature and a framework for future research', *International Journal of Healthcare Technology and Management*, Vol. 19 No. 3/4, pp. 185–217, doi: 10.1504/ijhtm.2022.10051288.

Juran, J.M. (2010) *Juran's Quality Handbook: The Complete Guide to Performance Excellence*, 6th ed., McGraw-Hill Education, USA.

Keiningham, T., Gupta, S., Aksoy, L. and Buoye, A. (2014) 'The high price of customer satisfaction', *MIT Sloan Management Review*, Vol. 55 No. 3, pp. 37–46.

Lewis, A.K., Taylor, N.F., Carney, P.W. and Harding, K.E. (2020) 'Reducing the waitlist of referred patients in a medical specialist outpatient clinic: an observational study', *Journal of Health Organization and Management*, Vol. 35 No. 1, pp. 115–130, doi: 10.1108/JHOM-08-2020-0321.

Li, J., Liu, X., Ma, L. and Zhang, W. (2019) 'Users' intention to continue using social fitness-tracking apps: expectation confirmation theory and social comparison theory perspective', *Informatics for Health and Social Care*, Taylor & Francis, Vol. 44 No. 3, pp. 298–312, doi: 10.1080/17538157.2018.1434179.

Meng, Q., Yin, X. and Liang, C. (2017) 'The current situation and development of China Internet plus healthcare', *Chinese Journal of Health Informatics and Management*, Vol. 14 No. 2, pp. 110-118 In Chinese.

Milner, M., Winter, S., Mehta, R., Rice, S., Pierce, M., Anania, E., Candelaria-Oquendo, K., *et al.* (2021) 'Patient perception of interactive mobile healthcare apps: a predictive model', *International Journal of Healthcare Technology and Management*, Vol. 18 No. 3–4, pp. 129–152, doi: 10.1504/IJHTM.2021.119162.

Mosadeghrad, A.M. (2014) 'Why TQM does not work in Iranian healthcare organisations', *International Journal of Health Care Quality Assurance*, Vol. 27 No. 4, pp. 320–335, doi: 10.1108/IJHCQA-11-2012-0110.

National Bureau of Statistics of People's Republic of China (2011) *China Statistical Yearbook-2011*, Beijing, China.

National Health and Family Planning Commission of People's Republic of China (2015) 'Action plan for further improving medical services', *Chinese Practical Journal of Rural Doctor*, No. 13, pp. 16-18 In Chinese.

Parasuraman, A. (1998) 'Customer service in business to business markets: an agenda for research', *Journal of Business & Industrial Marketing*, Vol. 13 No. 4/5, pp. 309–321.

Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1985) 'A Conceptual Model of Service Quality and Its Implications for Future Research', *Journal of Marketing*, Vol. 49 No. 4, pp. 41–50, doi: 10.2307/1251430.

Pulles, N.J., Schiele, H., Veldman, J. and Hüttinger, L. (2016) 'The impact of customer attractiveness and supplier satisfaction on becoming a preferred

customer', *Industrial Marketing Management*, Elsevier B.V., Vol. 54 No. 4, pp. 129–140, doi: 10.1016/j.indmarman.2015.06.004.

Seebacher, U.G. (2021) *B2B Marketing: A Guidebook for the Classroom to the Boardroom*, Springer.

Shen, L., Wang, S., Chen, W., Fu, Q., Evans, R., Lan, F., Li, W., *et al.* (2019) 'Understanding the function constitution and influence factors on communication for the WeChat official account of top tertiary hospitals in China: Cross-sectional study', *Journal of Medical Internet Research*, Vol. 21 No. 12, pp. 1–18, doi: 10.2196/13025.

Singh, B. and Singhi, R. (2018) 'SERVQUAL impact on overall satisfaction and brand loyalty: an empirical study in Delhi-NCR hospitals', *International Journal of Healthcare Technology and Management*, Vol. 17 No. 1, pp. 49–60, doi: 10.1504/IJHTM.2018.091825.

Wang, X.D. (2004) 'Problems resulted from the sharp increase of number of outpatients and emergent patients and countermeasures', *Chinese Journal of Hospital Administration*, Vol. 20 No. 10, pp. 602-604 In Chinese.

Yang, C.G. (2009) 'Avoid patients' unexpected misfortune caused by the 'three longs and one short' dilemma in hospitals', *Health for Everyone*, Vol. 15, p. 21 In Chinese.

Zhao, Y.G. (2011) 'The 'three longs and one short' dilemma in large hospitals', *Yunnan Daily*, p. 001. In Chinese.