HEALTH FOR ALL PROSPERITY FOR ALL

Innovative Applications of Patient Experience Big Data in Modern Hospital Management Improve Healthcare Quality

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Abstract It is important for modern hospital management to strengthen medical humanistic care and build a harmonious doctor-patient relationship. Innovative applications of the big data resources of patient experience in modern hospital management facilitate hospital management to realize real-time supervision, dynamic management and scientific decision-making based on patients experiences. It is helping the transformation of hospital management from an administrator's perspective to a patient's perspective, and from experience-driven to data-driven. The technological innovations in hospital management based on patient experience data can assist the optimization and continuous improvement of healthcare quality, therefore help to increase patient satisfaction to the medical services.

THE *Healthy China initiative* gives strategic priority to the health of people in the country's policy-making machinery. To provide safe, effective, convenient and inexpensive public health services for people by modern hospital management system is a political, fundamental and long-term strategic issue, and will certainly provide strong healthcare support for Chinese people.^[1]

The *Guiding Opinions on Promoting and Standardizing the Application and Development of the Big Data of Health Care* issued by the General Office of the State Council clearly points out to "integrate health

care big data into the national strategic layout for big data, comprehensively use big data resources and information technology to improve the hospital evaluation system, promote and deepen the public hospitals reform, perfect the modern hospital management system, and optimize the distribution of health care resources."^[2]

TRANSFORMATION TO PATIENT-CENTERED MODERN HOSPITAL MANAGEMENT IN CHINA

Generally, lagging management concept and management mode exist in the practice of hospital management in China, which restricts the improvement

of efficiency in comprehensive management of hospitals.^[3] The traditional hospital management mode is administrator-centered, where hospital administrators make decisions from their own perspective and experience for management. However, due to the differences in cognition, understanding, demand, expectation, perception and medical knowledge of diseases between patients and healthcare providers in reality, the medical services from patients' perceptions are different greatly from that recognized by healthcare providers. The deviation of doctor-patient perspective is a fusion product of psychology and economics, originated in the context of the current physical state and external environmental conditions, and is generated by processing and judging of expectation, understanding, demand, actual perceived quality, as well as perceived value to the healthcare service they received.

From the perspective of hospital administrators, doing a good job in hospital management usually focuses on disciplines, talents, scientific research, income, safety and quality; while from perspective of patients, whether a hospital doing a good job depends on therapeutic outcome, service quality, price, environment, and diet, etc. Even the quality that both parties attach importance to is still quite different. The discrepancy of hospital administrators on patients' perception leads to dislocation of patients' expectations, healthcare support, as well as internal management efficiency, which causes implicit deep problems in multiple aspects, such as hospital brand building, decision-making orientation, service quality evaluation, work flow, implementation efficiency. These issues could develop blind areas in hospital management. Especially, when the effect exists in multiple hospitals, it superimposes and the social indifference appears, which may lead to conflicts between doctors and patients.

Hospital administrations are urged to re-examine the medical services from the perspective of patients, transfer the hospital management system from "disease-centered" to "patient-centered". As the receiver of medical services, patients are the core stakeholder of medical services. Therefore, based on patient experience to reform and innovate hospital management is more conducive to meet patients' true needs, improve their experience and enhancing their satisfaction.

Providing medical services to satisfy patients' needs has become a core value of modern hospital management. Currently, the medical and healthcare policy of the nation has been gradually transformed

to "patient-centered". In the *Guidelines for Preparation of Hospital Evaluation* (2015 Edition), evaluation from publics has become one of the four resources for performance evaluation in hospital grading. The *Action Plan for Further Improvement of Medical Services (2018-2020)* adheres to the principle of "patient-centered" and encourages innovations to enhance people's sense of gain. In 2019, *Opinions on Strengthening the Performance Evaluation of Tertiary Public Hospitals* issued by the State Council regards patient satisfaction and experiences as one of the four dimensions in performance evaluation for public hospitals, which measures patients' sense of gain through their satisfactions.

From the transition of the national healthcare policies, it can be seen that the management philosophy of hospital is changing into "patient-centered", and patient experience plays an important role in improving doctor-patient relationship in China. With the vigorous promotion of national policies and the regulations on performance appraisal for public hospitals, medical services closely focus on the needs of patients, and information technologies become essential to enrich the service content, optimize service workflow, increase convenience and speediness of care service, so that to continuously improve the quality of healthcare.

ADVANCES OF PATIENT EXPERIENCE MANAGEMENT IN PUBLIC HEALTHCARE SYSTEM IN CHINA

Patient experience refers to the subjective and objective evaluation of the received medical services by patients after comparing expectations with feelings under the influence of various factors.^[4] It is not only a perceptual experience process, but also an emotional experience process. The results of evaluations on these two aspects constitute the quality of patient experience.^[5] Studying the evaluating system of patient experience is of great theoretical and practical significance for further developing management theory of healthcare quality, guiding medical institutions to improve patient care quality, and winning patients' trust as a result.^[6] Patient experience management is not only important to measure healthcare quality and social benefit of public hospitals, but also can provide important quality indexes for reform and governance of public hospitals, as well as help the construction of harmonious doctor-patient relationships.^[7]

The theoretical and methodological researches on patient experience started in European and American countries.^[8] At present, patient experience data have been incorporated into the insurance reimbursement, governmental evaluation, and hospital choosing by publics in some of these countries. Research reports by Britain's National Health Service (NHS) and the PricewaterhouseCoopers show that the management of patient experience is the most difficult but greatest rewarded part in the dimension-pyramid of hospital management.

The National Health Commission responds actively to the call of the *Healthy China* initiative. It highlights that public hospitals adhere to the basic principles of "maintaining non-profit nature, arousing enthusiasm, and ensuring sustainability",^[9] the National Health Commission has actively explored new pathway for modern hospital management and public hospital performance evaluation system. The big data and artificial intelligence technology have been introduced into hospital management for the purpose to improve healthcare quality and enhance patients experience, as well as sense of gain of medical staff. Peking University People's Hospital has been entrusted to set up "Research Base for Doctor-Patient Experience" (hereinafter referred to as the research base) under the direct leadership of the Medical Management Center, National Health Commission. As the organizer, Peking University People's Hospital had committed itself to the construction of the research base in conjunction with a number of well-known universities, hospitals, and research institutions in the country. At present, it has served as a think-tank for formulation of informatization standards on data collection, data analysis, evaluating methods and standardized application in the domain of doctor-patient experience.

The research base focuses on the methods and means of doctor-patient experience management and evaluation methods,^[10] helping hospitals, government and insurance institutions with decision-making by quality holographic portrait, full-cycle data management, and industry credit evaluation based on doctor-patient experience data, and improving satisfactions among patients and medical professionals. Big data, artificial intelligence, block chain technologies are applied to enhance the utility of doctor-patient experience data in continuously improving health care quality. At the same time, the National Health Commission launched a third-party survey program on patient satis-

faction in 2017, which collect satisfaction data from in- and out-patients using mobile internet and big data technology, and has constructed a national platform of patient satisfaction where tertiary hospitals and second class public hospitals across the country have been included. In 2019, satisfaction assessment was formally incorporated into the performance evaluation as a mandatory monitoring index for public hospitals across the country. The governmental policy has taken patient experience management as an effective grip to strengthen the internal operation efficacy for healthy development. A long-term working mechanism of patient satisfaction survey has been build up for the purpose to continuously improve hospital management quality.

The research base has attached great importance to the collection and research of patient experience data. For the first time, standardized, large-scale surveys among Chinese patients regarding their personal experience in hospital have been collected systematically and continuously, with purposes of assisting hospitals to monitor and improve health care quality by fine-grained data tracking and problem solving. The surveys were conducted in more than 1,000 medical facilities from 31 provinces across the country, archiving 248 million data records on patient experience. Currently, the "National Doctor-Patient Experience Big Data Intelligent Cloud Platform" is serving with a full-dimensional, wide-range, long-term, and real-time monitoring mechanism. Through big data analysis and mining, patients' experience of multiple hospitals can be assessed in terms of healthcare capability, healthcare quality, health education, safe medication, and other aspects, so as to give full play to the big data platform in continuously improvement of management quality of hospitals.

THE BIG DATA OF PATIENT EXPERIENCE SUPPORT INNOVATIONS IN HOSPITAL MANAGEMENT

The modern hospital management demands to enhance quality of data collection and depth of data mining, through which the big data technology can be fully apply into multi-aspects and multi-dimensional hospital management. By activating historical data, managing existing data, and expanding new data, the big data can take a full role in informative support of decision-making.

The management of the patient experience data intend to inspect the quality of healthcare services from the perspective of patients, help hospital administrators quantify the quality indexes, subdivide and optimize quality indicators, and therefore perfect the performance appraisal system. Digitalization, datamation, and intelligent interconnection provide technical supports for innovative application in modern hospital management, which deepen the medical reform. Taking full advantage of the patient experience big data with data analyses and data mining can effectively improve the evaluation system, prediction scheme and decision-making in hospital administration (**Figure 1**).

Patient experience management targets on the experiences of out-patients and in-patients during whole processes of medical care they received and the timeliness of care service. The evaluation scope covers all clinical departments, auxiliary technical departments, as well as administrative and logistics section of a hospital.

Referring to the authoritative hospital construction standards of home country and abroad, such as the hospital grading standards and Joint Commission International (JCI) accreditation system, the expert panel built an index pool for assessment. Through multiple rounds of industrial expert evaluations, the meaningful evaluation indexes were identified using Delphi method, and selected for standard questionnaires of patient experience survey.

The items in questionnaire dock with the national core medical policies and the construction standards in hospital grading system. The dimensions for analysis are comprehensive, including implementation of diagnosis and treatment protocols, efficiency of the implementation, attitudes of service providers, care

quality of nursing and auxiliary departments, logistics supports, which track and reflect the qualities of the whole processes of patient care in a hospital. Through in-depth analysis of mathematical models, we established a quality index to actually and objectively reflect the service capability, providing a means for hospital to trace back and optimize elements of care quality. The innovation in hospital management based on patient experience has become an important starting point for hospital to build patient's loyalty and hospital brand.

For the medical governance, with the large-scale patients experience data, rapid cloud statistical analyses, real and comprehensive feedback on care quality, quality holographic image of healthcare facilities can be realized, which provides decision-making support for hospital administrator with data from macro to micro, from current status analysis to longitudinal monitoring, and from regional parallel comparison to industrial big data mining.

Applications of big data and artificial intelligence in patient experience management fulfill the digitalization of doctor-patient experience, health care quality mapping, intellectualization of hospital administration, and visualization of industry supervision. Through these ways, modern hospital management can truly transit from experience-driven to data-driven, and help in deepening reform of medical system and constructing novel developmental model for hospitals in China.

SUMMARY

In the era of big data, massive patient experience data are assisting to improve and optimize hospital management mode, promoting standardized, refined, and

Figure 1. Systematic structure of doctor-patient experience big data intelligent cloud platform.

scientific hospital management with aims to provide safer, more efficient and higher quality services for patients. The integration of the patient experience big data into modern hospital management gives full play to the value of patients experience in constructing a patient-centered modern hospital care in China. It is believed that data-driven hospital management will provide strong informative supports for continuous improvement of the healthcare quality as well as patient satisfaction to the medical services, and ultimately help to increase the health of Chinese people.

Conflict of interests

All authors declared no conflicting interests.

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