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Application Research and Comparative Analysis of Nursing Information System in China and America

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ABSTRACT. *As an important subsystem of the hospital information system, the nursing information system plays an important role in improving the comprehensive nursing level and the process of informatization. However, the nursing information system in our country started late, developed slowly, and has limitations in the process. This article mainly introduces the application status of nursing information systems in my country and the United States, as well as the development of clinical nursing, nursing education and scientific research, compares the differences between nursing information systems in my country and the United States, and analyzes the shortcomings in the development of nursing information systems in my country. Provide reference for promoting the development of our country's nursing system.*

KEYWORDS: *Nursing Information System; America; Informatization; Comparison*

1. Introduction

A number of proposals in the "Two Sessions" held in Beijing on May 22, 2020 suggested the development of medical informatization, once again placing informatization construction in an important position, and informatization construction as the focus of my country's medical and health service system planning. It can ensure medical safety, promote medical quality improvement, reduce pressure on medical care, and at the same time strengthen hospital management and reduce costs. In 2016, the National Health and Family Planning Commission clearly stated in the "National Nursing Career Development Plan (2016-2020)" that it is necessary to strengthen the construction of nursing information[1]. Nursing Information System (Nursing Information System, NIS) is an important part of Hospital Information System (HIS). Its establishment and development have changed the traditional nursing model, optimized the nursing workflow, and promoted the nursing career to enter a new the era of informatization

and intelligence. The introduction of NIS not only makes the records of the nursing process continuous and progressive, but also saves time, improves efficiency, and reduces nursing errors for nursing staff. At the same time, NIS, as a storage room for standard information, can provide a way to deal with problems and make decisions. In the direction, nurses can check the patient's course and related examination reports recorded by doctors through NIS, and NIS can also provide information for other medical staff [2]. The development of nursing informatics in the United States is in a leading position. As early as 1992, nursing informatics was regarded as an important nursing course, and in 2006, the reform of nursing informatics was promoted. The United States is in a leading position in the construction of information systems in nursing management, scientific research and education [3].

Comparing the differences in NIS between my country and the United States, it aims to discover the gap between China and developed countries such as the United States and the problems in the development process, provide enlightenment for my country to develop NIS more effectively, and ultimately help nurses improve work efficiency and meet patients' needs The need for quality care.

2. Application Status of Nursing Information System in My Country

2.1 In Terms of Clinical Care

In clinical application, it can be divided into nurse workstation and mobile nursing information system (Mobile Nursing Information System, MNIS). As an important platform of HIS, the nurse workstation has been put into use since the mid-1990s. It has reduced the work pressure of nursing staff, further standardized the nursing work process, and reduced the occurrence of nursing errors. With the improvement of information technology, nurses the function of the workstation is gradually expanded. Scholars such as Chi Xiaofeng [4] designed the intelligent reminder function of the nurse station to remind patients of special or critical conditions and the nurse's missed work. The results show that the reminder function can reduce the risk of nursing errors. MNIS utilizes the existing information platform and uses equipment such as personal digital assistants (PDAs) to extend the nurse’s working point to the ward while accelerating the data update speed and realizing real-time tracking during the execution process. MNIS simplifies the execution the process improves the efficiency of nursing staff, reduces errors due to uncertainty, and ensures convenience and accuracy. Peking University People’s Hospital has established a closed-loop management process on the basis of MNIS. For example, when nurses administer medication, they first scan the drug transfer order to confirm, and then scan the patient’s wristband for identity confirmation. This complete process ensures the safety of the patient’s medication [5].

2.2 In Terms of Education and Scientific Research

Scholars pay more and more attention to the application of NIS in education and scientific research in my country. NIS is used in clinical education to innovate

traditional nursing education and management, which facilitates scientific and real-time education and management of nurses or nursing students, and helps improve the core competence of nurses. Relying on the digital information management system, scholars such as Du Juan [6] built a nursing education information system and used it for clinical nursing training. They analyzed the effects of nurses applying the information system before and after training. The results showed that the nursing education information system can optimize modern nursing training. Work and management mode, improve the effect of nursing training, and enhance the level of nursing management. Scholars such as Zhao Yuling [7] designed a mutual evaluation system between teaching and nursing students based on information systems, which is mainly used for teaching and evaluating nursing students and nursing students. The functions of teaching and the management of teaching by the administrator and nursing students. Through the intervention study of 150 nursing students, it is found that the mutual evaluation mode of the system is conducive to further optimizing nursing teaching activities while significantly improving the comprehensive quality of nursing students. NIS provides information storage space for nursing research work, improving efficiency while reducing data loss. In the process of nursing research, a lot of follow-up work needs to be done, but follow-up is not limited to hospitals, and more often needs to be performed outside the hospital. In this process, improper data management will lead to failure of follow-up information. Scholars such as Luo Zhongmei [8] introduced a nursing research follow-up information system to manage patient information, reducing data loss and improving the efficiency of follow-up work of researchers.

3. Application Status of American Nursing Information System

3.1 In Terms of Clinical Care

NIS is widely used in the United States, focusing on the development and application of specialized nursing, and applying specialized nursing information systems in key departments such as intensive care unit, emergency department, and operating room. The ICU situation is very complicated. Nurses need to monitor a large amount of patient information in real time while managing critically ill patients. The research conducted by scholars such as Eric Levesque [9] on the implementation of the ICU nursing information system has shown that the length of stay of ICU patients is shortened, and the risk of nursing staff errors is reduced. And the quality of nursing work has improved significantly. Scholars such as Seethal A [10] applied the pediatric health information system when investigating patients with sickle cell disease. The results showed that the survival rate of patients with sickle cell disease increased while the satisfaction with nursing care also increased. Although the cost of surgical supplies accounts for 40%-60% of the total supply of the hospital, the supply chain and management of the supplies in the operating room are weak links within the hospital. The supply and management are complicated due to poor management, low standardization, and lack of coordination between

departments. The development of a special operating room logistics and management system is conducive to reducing the cost of care while improving the quality of care, improving patient safety and satisfaction [11]. Accurately pre-checking and sub-checking patients in the emergency department is the key to speeding up treatment, which directly affects the quality and efficiency of work. The triage nurses implement the Manchester Classification System (MTS) after the patient arrives in the emergency room, which can increase the speed of pre-check and sub-check and optimize Process, strive for the maximum treatment time for the patient.

3.2 In Terms of Education and Scientific Research

American nursing scholars attach great importance to the application of NIS in education and scientific research. NIS records and integrates a large number of clinical data and information. It is an important resource for nursing research and education. In evidence-based nursing teaching, NIS can provide the latest clinical evidence for nurses. In general, the use of NIS can meet their information needs. A survey of nurses shows that the use of NIS to obtain evidence-based nursing teaching resources can provide effective nursing interventions for special patients, and improve the nurse's job satisfaction while improving the quality of nursing work [12]. Nursing researchers collect and analyze information through NIS, ultimately improve the quality of care, and generate a comprehensive intelligent information system based on the information provided by NIS. Common clinical problems such as: fall, use the fall information provided by NIS to develop a prevention system, and ultimately reduce the incidence of falls, integrate and analyze the data and information in the clinical work process for nursing research through NIS, and then use the results of nursing research Feedback is used to guide clinical nursing work [13].

4. Comparison of Nursing Information Systems between China and the United States

4.1 Late Start and Lack of Sharing and Extension

In the early 1970s, the United States and other countries began the construction of nursing information. Marilyn Plomann of the Hospital Research and Education Foundation of the Chicago American Hospital Association began to develop a system to assist hospital management [14], from the mid-1970s to the 1980s in the mid-term, the United States and other countries have successively developed and applied nurse appointment, scheduling and human resource management systems. NIS has been widely used in the 1980s. The development of NIS in my country began in the 21st century, and developed rapidly in Zhejiang, Shanghai, Jiangsu and other places. In May 1986, the Shijiazhuang Hospital of the Chinese People's Liberation Army Air Force developed the "WeChat Computer Aided Implementation of Responsible Nursing Software" according to the biological-psychological-social

model. Improve the efficiency of nursing work and reduce the work of nursing staff. This system is still used in some hospitals. Compared with the United States, my country's NIS is not perfect in terms of sharing and extension. The electronic records (EHR) that record patient health-related activities in the United States can realize the exchange and sharing of resources, improve the efficiency of medical care and reduce hospital costs [15] . However, in my country, sharing difficulties are caused by high costs and insufficient technical support. As one of the countries with the best development of telemedicine system, the United States has developed rapidly in its mobile system. By using mobile information technology, it can provide remote communication and monitoring for patients outside the hospital [16].

4.2 Lack of Standardized Language System

Standardized Nursing Languages (SNLs) is a unified language in the nursing field. It can realize cross-regional and inter-system communication, which is conducive to data sharing. At the same time, the standardized language system is the foundation of nursing informatization and an obstacle that nursing staff must overcome when using NIS to solve nursing problems. For example, nurses can use standardized nursing language to re-integrate and re-use nursing information during the process of recording electronic medical records through NIS, thereby realizing the sharing of nursing information [17]. The United States began to study standardized nursing language since the 1970s, and currently there are 12 standardized languages accepted in the United States [18]. Among them, the more commonly used standardized nursing language are: North American Nursing Diagnosis (NANDA-I), Nursing Intervention Classification (NIC) and Nursing Outcomes Classification (NOC) [17]. However, my country still lacks a unified, standardized nursing language system in line with international standards [19].

4.3 Ignore the Nursing Clinical Decision-Making System

Nursing clinical decision support system (NDSS) is an advanced stage of the development of NIS. It is an inevitable trend of information and knowledge development. It aims to help nursing professionals complete decision-making tasks, especially to help many inexperienced nurses make decisions. Correct nursing decisions and the new knowledge provided by NDSS will have a positive impact on the quality of care [20]. The decision-making process of related reference nurses is a complex process that requires consideration of multiple influences. The nurses' decision-making directly determines the quality of care. The support system provides nurses with scientific evidence to make decisions, which also complies with the requirements of evidence-based medicine [21]. The United States attaches great importance to the development and application of NDSS. Its NDSS not only provides nursing advice, but also contains various tools, including reminders for nurses, clinical guidelines, clinical data reports of patients, and diagnostic information [22]. In order to help nurses accurately assess the stage of a patient's pressure ulcer, Bonnie Alvey scholar [23] has a decision support system for pressure

ulcer classification. Nurses enter pressure ulcer information according to prompts, and the standards and knowledge base in the system will calculate the stage. The system can improve the accuracy of nurses' assessment of staging, especially in the staging of suspected deep tissue damage and stage I. Bowles et al. [24] implemented a discharge decision support system for 282 elderly people over 55 years old. After the system was used, the proportion of referrals or high-risk patients who were re-admitted within 30 days and 60 days decreased by 6% and 9%, respectively. However, the "Research Report on the Development of China's Hospital Informatization 2008-2013" shows that the proportion of my country's decision support system application is less than 20% [25]. At the same time, nursing staff in our country have misunderstandings about NDSS, and they believe that the system has caused them to lose control of nursing practice [26].

5. Enlightenment from the Development of Nursing Information System in My Country

5.1 Establish a Standardized Nursing Language System

Standardized nursing language system is the foundation of information construction, and the establishment of a unified standard is also the key to realize the sharing of nursing information between hospitals and countries [5]. my country has never had a unified nursing standard language, which has caused management malpractices for hospitals and is not conducive to the modernization of nursing [27]. Compared with the research on the mapping that has been carried out abroad, the domestic is basically still at the stage of research on the understanding, introduction and translation of terms, and there are few studies on the construction of the international nursing language system [1]. North American nursing diagnosis is a standardized nursing language system currently widely used in our country, but it was discontinued in 2002 due to legal disputes, which shows that the development of a nursing standard language system by foreign scholars is not entirely suitable for the development of nursing in our country [28, 29]. Therefore, my country needs to adopt international standards to maintain consistency with the international standard system, but more importantly, my country needs to establish a standardized nursing language system with Chinese characteristics in order to promote the development of nursing disciplines in China [30].

5.2 Face up to the Nursing Decision-Making System

NDSS is based on clinical guidelines, expert experience, nursing procedures and other knowledge bases. The data in the database can be converted into information through a computer, and then the information can be converted into knowledge to assist clinical nurses in making decisions, which can avoid nurses' lack of knowledge and experience Nursing errors caused by insufficient. Secondly, the standardized records of NDSS and the automatic generation of nursing records facilitate the use of nurses of different seniority and improve the quality and

efficiency of records. However, as an auxiliary decision-making system, it has disadvantages that cannot be ignored, and it is easy to cause distrust or over-dependence of clinical nurses [31]. Distrust leads to the low use of NDSS by nurses. Excessive trust can easily lead to the abuse of NDSS and nurses lose their own professional knowledge judgment. Chui Betty Khong [32] scholars found that junior nurses and senior nurses have different concepts and needs for NDSS, Junior nurses are more inclined to use NDSS and feel that the decision-making it provides is very feasible. Therefore, the development of NDSS should fully consider the level and actual needs of nursing staff. Before the introduction of the system, the nursing staff should be fully trained and the effect can be tested. The function of decision-making can be realized, helping nurses improve work efficiency and quality, and reduce the occurrence of nursing errors.

5.3 Realize Nursing Information Sharing

During the new coronavirus pneumonia epidemic, it was revealed that some hospitals in our country were still unable to share information. In addition to the rapid spread of new coronary pneumonia, many patients needed to be referred for treatment, but because the information could not be shared in time, this gave treatment during the epidemic. Work brings great inconvenience and increases the burden of medical care [33]. Therefore, it is urgent to establish a nursing information sharing platform. In the “Healthy China 2030” planning outline issued by the State Council on October 25, 2016, “establishing an information sharing and interconnection mechanism” [34]. Nursing, as an important part of guarding human health, requires a large amount of nursing information data and resources to break the development barrier while avoiding the formation of information islands. Therefore, speeding up the sharing of nursing information, sharing scientific and advanced nursing technical knowledge and evidence-based nursing data with other nursing workers will help improve the overall quality of nursing [35]. At the same time, the sharing of nursing information can also promote the development of nursing clinical education. The cooperation of colleges and universities through sharing teaching and clinical resources enables students to better grasp clinical knowledge and shorten the distance between clinic and classroom [36].

5.4 Extending the Mobile Nursing Information System

Patient care is not limited to the hospital environment. After discharge, although the nursing work in the hospital is completed, there are still some patients who still have health problems to be satisfied after discharge. Continuing care is part of the overall care, that is, the hospital care as an extension of the family and the community, MNIS is widely used in hospitals and has outstanding advantages. Based on the rapid development of mobile information technology, combining it with the continuous care model can provide new ideas for meeting the health needs of patients outside the hospital. Peking University People’s Hospital Nursing Department The use of mobile information technology for the continued care of

orthopedic patients after surgery has significantly reduced the postoperative complications of patients [37]. Scholars such as Li Aimei [38] applied mobile nursing information technology to PICC patients discharged from the hospital. Compared with the traditional follow-up method, the probability of patients with PICC catheter infection, blockage, and displacement decreased. This shows that the combination with MNIS can break through the limitations of the traditional continuous nursing model. The traditional model places high demands on nursing staff and increases the workload of nursing staff. The introduction of MNIS can reduce nursing workload and improve quality. Secondly, my country's two-way referral mechanism is imperfect, which makes the care of patients in the referral process discontinuous and incomplete. The MNIS joint nurse can directly communicate with patients through video and other methods, breaking through the distance and other limitations, and meeting the patients' out-of-hospital care needs.

6. Conclusion

The mature NIS in the United States has brought enlightenment to the development of our country. By comparing the differences between the two countries, we can analyze the current shortcomings of our country's NIS. The improvement of NIS will be of great significance to the development of my country's nursing career. At the same time, the development of NIS must be oriented towards the actual needs of clinical nursing work and actively cooperate with nursing staff to better improve the quality of nursing.

References

[1] National Health and Family Planning Commission of the People's Republic of China. National Nursing Career Development Plan (2016-2020). Chinese Nursing Management, 2017, 017(001):1-5.

[2] Nunes S R T, Rego G, Nunes R. The experience of an information system for nursing practice: the importance of nursing records in the management of a care plan. Computers, informatics, nursing: CIN, 2014, 32(7):322-332.

[3] Shi Zhenxian, Zhang Boyun, Li Lin, et al. Training nursing information leaders in the new nursing era. Chinese Nursing Management, 2016, 16(05): 696-699.

[4] Wang Huijuan, Chi Xiaofeng, Guo Yingjun, et al. Intelligent upgrade and application of nursing evaluation sheet of integrated nurse workstation. China Digital Medicine, 2018, 13(012):96-97,100.

[5] Wu Xiaoying, Wang Ling, Li Sen. Nursing informatization construction: we are on the road. President of China Hospital, 2015(15): 73-75.

[6] Du Juan, Yang Guihua, Yang Chunyan, Yuan Wei, Jiao Linlin. The application effect of education information system in clinical nursing training. Chinese Journal of Modern Nursing,2015,21(01):93-96.

[7] Zhao Yuling, Huang Yi, Zhou Yanqiong, et al. The influence of information system-based formative evaluation on the quality of post-clinical teaching of nursing interns. Health Vocational Education, 2020, 38(12): 60-62.

[8] Luo Zhongmei, Zhou Shuyun, Zhu Chongtao. Development and application of nursing research follow-up information system. Chinese Journal of Practical Nursing, 2012, 28(023): 86-87.
[9] Levesque E , Hoti E , Azoulay D , et al. The implementation of an Intensive Care Information System allows shortening the ICU length of stay. Journal of Clinical Monitoring & Computing, 2015, 29(2):263-269.
[10] Jacob S A , Mueller E L , Cochrane A R , et al. Variation in hospital admission of sickle cell patients from the emergency department using the Pediatric Health Information System. Pediatric Blood & Cancer, 2019(2).
[11] Karen Moons, Geert Waeyenbergh, Liliane Pintelon, et al . Performance indicator selection for operating room supply chains: An application of ANP. Elsevier Ltd,2019,23.
[12] Supporting Evidence-Based Practice for Nurses through Information Technologies. Worldviews on Evidence-Based Nursing, 2010, 7(1):4-15.
[13] Choi Jeeyae, Lapp Cathi, Hagle Mary E. Developing a Web-Based Nursing Practice and Research Information Management System: A Pilot Study.. Pubmed,2015,33(9).
[14] Li Baoluo, Ma Lian, Xu Yan. Application of Nursing Informatics and Information Technology. Chinese Nursing Management, 2009, 003(003): 76-78.
[15] Wilson Jennifer Fisher. Making electronic health records meaningful.. Annals of Internal Medicine, 2009, 151(4):293-6。
[16] Lu Zhongnan, Mao Jie, Lu Wei. A brief analysis of the current development and regulatory model of telemedicine in the United States. Chinese Journal of Health Inspection, 2018, 25(03): 352-355.
[17] Liu Yicong, Zhang Tingting, Zhang Zijun, et al. Application status of standardized nursing language in electronic health records. Chinese Journal of Practical Nursing, 2019, 035(009):717-721.
[18] Wang Xuan, Cheng Qingzhou, Chen Jing. The significance of international standardized nursing language in the development of nursing disciplines. Curriculum Education Research, 2016, 000(010):241.
[19] Du Jiamin, Xie Hong. The application progress of standardized nursing language and the feasibility analysis of its application in elderly care. Chinese Journal of Nursing, 2017, 52(07): 874-878.
[20] Bernardo Cánovas-Segura a, A A M, A J M J , et al. A lightweight acquisition of expert rules for interoperable clinical decision support systems. 2019, 167:98-113.
[21] Liu Xiaona, Pan Hongying. Application progress of nursing decision support system. Chinese Journal of Nursing, 2018,53(06):735-739.
[22] Jenders R A. Advances in Clinical Decision Support: Highlights of Practice and the Literature 2015-2016. Yearbook of medical informatics,2017,26(1).
[23] Alvey B, Hennen N, Heard H. Improving accuracy of pressure ulcer staging and documentation using a computerized clinical decision support system.. Journal of Wound Ostomy & Continence Nursing, 2012, 39(6):607.
[24] Bowles K H, Hanlon A, Holland D, et al. Impact of Discharge Planning Decision Support on Time to Readmission among Older Adult Medical Patients.

Professional Case Management, 2014, 19(1):29.
[25] Information Management Professional Committee of Chinese Hospital Association. Extract 3 from "Research Report on the Development of Chinese Hospital Informatization 2008-2013 (White Paper)". China Digital Medicine, 2014, 03(12): 7-19.
[26] Zhao Yongxin, Gu Ying, Zhang Xiaobo, et al. Application research progress of clinical decision support system in nursing field. Chinese Journal of Practical Nursing, 2019(11):877-881.
[27] De Cordova P B , Lucero R J , Hyun S , et al. Using the Nursing Interventions Classification as a Potential Measure of Nurse Workload. Journal of Nursing Care Quality, 2010, 25(1):39-45.
[28] Pi Xuehua. Discussion on the significance and difficulty of promoting nursing diagnosis. Journal of Nursing Science: Comprehensive Edition, 2008, 23(007): 75-77.
[29] Liu Ting. Structural analysis of inpatient nursing records and comparison with international classification of nursing practice. 2011.
[30] Ruifang Zhu, Shifan Han, Yanbing Su,et al. The application of big data and the development of nursing science: A discussion paper. Elsevier B.V.,2019,6(2).
[31] Ronald, Piscotty, Beatrice, et al. Nurses' use of clinical decision support: a literature review.. Computers Informatics Nursing Cin, 2014.
[32] Khong P C B , Hoi S Y , Holroyd E , et al. Nurses' Clinical Decision Making on Adopting a Wound Clinical Decision Support System. Cin Computers Informatics Nursing, 2015, 33(7):295-305.
[33] Guo Hongliang, Zhang Xiuyue. The problems exposed by the hospital information system in the process of prevention and treatment of new coronary pneumonia in Wuhan and the thoughts caused by them. Chinese Medical Education Technology, 2020, 34(02): 129-134.
[34] "Healthy China 2030" planning outline. National Health and Planning Commission of the People's Republic of China. [2019-12-13]. http://www.moh.gov.cn/.
[35] Li Xingfeng, Li Xuying, Li Jinhua, et al. Application progress of information sharing in nursing field. Chinese Journal of Nursing, 2019, 54(08): 1269-1273.
[36] Liu Junxiang, Ding Hongqiong, Zhang Jing, et al. Research and practice on the cooperative construction of a shared emergency nursing teaching resource platform by colleges and universities. Chinese Journal of Nursing, 2015, 50(01): 84-88.
[37] Zheng Qunyi, Zhan Ying, Wu Xiaoying. Research on the application of mobile information technology in orthopedic continuing nursing. Chinese Journal of Nursing, 2014, 49(07): 795-797.
[38] Li Aimei, Lin Yan, Yang Yuhui, et al. Application of mobile nursing information system combined with telephone follow-up in the maintenance of PICC catheters for discharged patients. Evidence-Based Nursing, 2018, 4(06): 565-567.