Application Progress of Information Technology in Intravenous Infusion Management System

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Abstract

Intravenous fluid therapy is one of the important treatment methods for hospitalized patients, and it is also an important part of nursing work. Traditional intravenous infusion therapy has many problems in the aspects of medicine preparation, operation, inspection and quality control. The application of intelligent information technology in the field of medical care continues to develop and expand. The construction of nursing information is an inevitable trend for nursing care to adapt to social development. Applying intelligent information technology to intravenous therapy can innovate intravenous infusion nursing operations, optimize nursing service procedures, improve the efficiency of intravenous therapy, ease the imbalance between supply and demand for nursing staff, and ultimately improve patient satisfaction. This article mainly reviews the three aspects of the application of information technology in the intravenous infusion management system, including the IPAD-based mobile intravenous infusion quality management system, the intravenous medication intelligent error management system, and the intelligent equipment to optimize the intravenous infusion treatment process. It is proposed to empower the nursing staff with the application of modern intelligent nursing information technology, and build an overall intravenous therapy collaborative nursing quality management information system, in order to provide a reference for comprehensively strengthening the application of information management in intravenous therapy.

Keywords

Information Technology, Intravenous Infusion, Nursing Management, Review

1. Introduction

With the rapid development of computer intelligent information technology, intelligent information technology has penetrated into all fields of society, and intelligent hospitals have also become a new trend in medical development and construction. Intravenous fluid therapy is one of the most common clinical operations [1] and it is also an important part of nursing work [2]. According to statistics [3, 4], China has about 5 billion infusions per year. The average infusion rate for inpatients is 73.35%. 85% of nurses spend more than 3/4 of their total working time on intravenous treatment. The spectrum of diseases is becoming more and more complicated, the methods of administration and the types of drugs prescribed by clinical doctors are constantly changing, and the problems in the widely used intravenous infusion therapy are also becoming more prominent. The supply and demand of Chinese nurses are imbalanced [5]. It is mainly based on regular inspections by medical staff that cannot always
change the patient’s liquid medicine in time, and it is difficult to know and deal with abnormal situations during infusion in time [6]. The indwelling time, indwelling method, and infusion speed of intravenous infusion therapy are gradually becoming more refined. In order to reduce the risk of infusion, it is necessary to strengthen the supervision of the quality and safety of nursing care during intravenous therapy. Modern hospitals use intelligent information technology to assist medical staff in implementing intravenous treatment to ensure that the collected data is complete and true, to ensure the safety of patient infusion, provide accurate data for intravenous infusion quality management, promote nursing quality improvement measures and implementation, and realize many aspects of intravenous treatment Intelligent information management [7]. Apply intelligent information technology to the intravenous therapy system, innovate intravenous infusion care operations [8], make the infusion more intelligent and accurate, reduce the incidence of complications in patients with intravenous treatment, improve the efficiency of intravenous treatment, reduce the workload of medical staff and relieve doctors and patients Disputes increase patient satisfaction. This article summarizes the application progress of intelligent information technology in intravenous infusion management system, aiming to provide medical staff with a deeper understanding of intelligent information technology in the nursing vein treatment process, thereby speeding up comprehensive information management, and developing intelligence for domestic hospitals Information technology provides the basis.

2. IPAD-based mobile vein infusion quality management system

The intravenous infusion quality management system based on mobile terminals, wireless WLAN technology and software system with IPAD as a tool assists intravenous infusion, which can realize the quality control and tracking management of the whole course of intravenous treatment. Standardize the quality management of intravenous treatment, realize the paperless inspection process and the accuracy of information. There are related studies [9] through the WCF service and the hospital information system (HIS) docking, IPAD access to the WCF service published by the wireless network terminal can view the real-time data in HIS and Nursing Information System (NIS) to achieve timely data transmission Share with. Import the quality management standard of intravenous infusion into the system as a fixed template, enter the corresponding inspection method and score, match the template standard with the corresponding ward, set tasks and quality control; Nursing quality control personnel can use the handheld IPAD on-site bedside quality control, check the progress through the system, automatically summarize data, and generate reports. Another related research [10] reported that combining the business characteristics and processing flow of intravenous therapy, relying on the hospital intranet, based on the latest network technology and database technology, using dynamic website production technology, developed an intravenous therapy management information system. The system includes the intravenous therapy group and relevant characteristic department profile module, intravenous therapy system specification module, HCC management information system module, intravenous therapy quality management module and communication field module. The venous treatment information system improves the quality of special care, is conducive to the collection and extraction of venous treatment-related data, ensures the authenticity and integrity of data collection, and realizes knowledge sharing among departments of the hospital. The development and application of the intravenous treatment management information system has realized the scientific, comprehensive and practicality of intravenous treatment, while improving the quality of clinical nursing work. However, the information system is still in its infancy in the domestic clinical nursing work, and its unique advantages cannot be fully utilized. If it is necessary to obtain a wider range of popularization and application in the field of intravenous therapy, research and thinking are still needed.

3. Intelligent error management system for intravenous medication

3.1 Barcode technology

Due to the heavy workload of intravenous treatment in hospitals, the management of errors in daily work becomes increasingly important. In order to record and statistically analyze the errors that have occurred conveniently and quickly, Jiang Ying [11] used barcode scanning to identify the infusion label, reasonably completed the drug discharge review and medication review, and passed the process when extracting and reviewing the drug withdrawal. Convenient input of product names speeds up the efficiency of drug search. The application of barcode technology can prevent errors, improve data accuracy, and assist medical care in efficient work, and the operating error rate is significantly reduced [12]. Studies have shown [13] that perfect barcode technology and rea-
sonable management can reduce 100% of dose and formulation errors for pharmacists and nurses, 92% of missed dose errors, and 77% of medication time errors.

3.2 Intelligent error management system for intravenous

Medication The Intravenous Drug Blending Center (PIVAS) has played an important role in improving the quality of intravenous infusion in hospitals and ensuring the safety of patients’ medication. In recent years, centralized drug blending of intravenous drugs has become an important part of modern hospital pharmaceutical services. Research report [14] the hospital formed an intelligent drug delivery system on the basis of PIVAS, which changed the cumbersome and inefficient situation caused by manual operation in the past, and realized the links of drug delivery, labeling, classification and entry, withdrawal, and inventory, intelligent operation, while optimizing the dispensing process. The received infusion label is personalized in the background, and the operation mode of placing medicines according to the type of medicine is realized. Due to the many links involved in the deployment of PIVAS positions, the process is complex, and errors are prone to intelligence, in order to conveniently and quickly record and statistically analyze the errors that occur. Shen Guorong [15] used barcode technology and intelligent drug delivery system to form an intelligent error management system for intravenous medication based on the PIVAS barcode management information system. Process optimization for error records and error statistical analysis, convenient operation, clear traceability of error-related persons responsible, complete and clear record content, no need to fill in manually, the generated error statistical report can also be used as a reference for personal performance evaluation, realizing intravenous medication error management Intelligent and information technology.

4. Intelligent optimization of intravenous infusion treatment process

4.1 Application of intelligent infusion monitoring equipment in intravenous therapy

The traditional method requires manual attention to the infusion process. When the liquid is infused or does not drip, it is necessary to use a pager to notify the nurse. In this traditional method, when the calls are intensive, nurses are too late to respond, resulting in decreased patient satisfaction and prone to various vein-related complications. For nurses, increasing work pressure and long-term stress can easily reduce nurse satisfaction. At present, there have been many technical researches on the automatic alarm function after infusion. Wen Mingfeng [16] adopt wireless communication technology, and realize real-time automatic monitoring of the whole process of intravenous treatment through the combination of microprocessor photoelectric sensor and wireless communication module with wireless network. Management improves the safety and work efficiency of intravenous therapy. This technology can directly transmit alarm information to the nurse’s PDA, eliminating the alarm in the first time, but the sensitivity is questioned and it is easy to false alarm. Wang [17] and Kong Xuehui [18] and others used infrared photoelectric sensors to monitor the infusion in their work. Infrared photoelectric sensors consist of an infrared photosensitive triode and an infrared light-emitting diode to form the transmitting end and the receiving end, respectively. Refraction will occur between the transmitting end and the receiving end if the drop of medicine is affected, so that the light received by the receiving end is relatively weak, while the light received by the receiving end is relatively strong when no liquid medicine passes through. It can be judged whether there is an infusion droplet passing by in this way, but this way will cause false alarms due to other uncertain light interference. Zhou Tao [19] and others designed an infusion monitoring system based on a gravity sensor. The principle of this device is to suspend the entire infusion equipment on the gravity sensor. There is a special material inside the gravity sensor. When there is gravity, its interior will be polarized, which changes the strength of the built-in electric field and converts the received gravity into an electrical signal output through circuit conversion. The drip rate and remaining amount of medicine are obtained by monitoring the change of gravity in the whole process. However, the weight of the body of the infusion bottle is included in the remaining liquid medicine obtained, which will affect the effect of infusion monitoring and cause false alarms. Dong Dan [6], the computer vision technology based on deep learning can intelligently identify the material, specification and manufacturer of the infusion bottle by extracting information from the image of the infusion bottle to solve the error caused by the weight of the infusion bottle and improve the infusion monitoring based on the gravity sensor. The system makes the infusion more intelligent and precise, reduces the work pressure of medical staff, relieves doctor-patient disputes, and promotes the establishment of intelligent medical care. Shen Guoli [20] and others combined sensors and wireless Internet of Things technology to centralize a single monitoring data to the supervisor’s guard station through a wireless network to realize a systematic intelligent monitoring system. The system can adapt to most infusion liquids, and
is well adapted to the sloshing of the Murphy’s dropper and the wall hanging of water droplets. The droplet measurement error is less than 1%, the volume prediction error is less than 5%, and the end prompt rate is greater than 99%. The intelligent infusion monitoring system organically integrates the monitoring and alarm of each link in the infusion treatment process, becoming the eyes and legs of the nurse, reducing the labor intensity of the medical staff, and ensuring the accuracy and safety of the patient’s intravenous infusion treatment while reducing the workload of the nurse.

4.2 Intelligent control of infusion sequence

Studies have shown that manually marking the infusion sequence through intelligent reminders can effectively avoid contraindications between groups caused by continuous infusion, and can ensure the stability of the finished infusion and the correctness of the medication sequence (Such as the use of preventive medication before chemotherapeutic drugs, medication at the optimal time of pharmacology, order-dependent drug interaction order, etc.) At the same time, it can reduce adverse reactions, improve treatment effects, and ensure drug safety [21]. Since December 2018, Binhu Hospital in Hefei City, China has adopted the Markov chain machine learning method, using intelligent reminders to manually mark the medication orders in the infusion sequence stage as historical data, and realizes the change from “intelligent reminder manual marking” to “artificial intelligence”. “Infusion sequence control” upgrade [22]. Practice results show that the correct rate of the infusion sequence marked by the two is equivalent, which proves that the artificial intelligence infusion sequence control can effectively ensure the quality of the infusion sequence, increase the marking rate, improve the efficiency of the infusion sequence, and ensure the quality of the label.

4.3 Intelligently change the speed of intravenous infusion

When nurses perform intravenous infusion operations, they usually need to follow the doctor’s advice or manually change the infusion speed according to the patient’s condition. The automatic fluid management system developed in the United States uses AI’s deep learning technology to monitor the patient’s continuous response to intravenous infusion flow control, and then learn to adjust the flow at any time, which can avoid adverse reactions caused by untimely adjusting the drip rate. Reduce the workload of nurses [23].

5. Summary

The construction of nursing informatization is the inevitable trend of nursing care to adapt to social development, and it is also a new direction for the modern development of quality management of intravenous infusion treatment. My country’s medical informatization started relatively late, and there are still many problems such as non-standardized application of intelligent informatization software by medical staff and incomplete use of functions. Therefore, medical staff needs to actively explore and improve in daily practice, and explore the application of modern information technology in infusion quality control. In addition, with the steady development of information technology in China this year, the application of modern intelligent information technology should be empowered by nursing staff, and information equipment should be fully utilized to greatly reduce the workload of medical staff and make them more complicated. Freed from work, devote more time and energy to disease treatment and psychological care of patients. Promote the application of information technology in the intravenous infusion treatment management system, optimize the nursing service process and work efficiency, combine the information process with nursing work, improve the nursing management model, improve the quality of nursing management, and gradually form a comprehensive intelligent intravenous treatment system. It also promotes the development of hospital informatization and digitalization.

References


