Short Communication

The Construction and Application of an Internet-based Hospital-community-family Home Management Model

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Abstract

Objective: Based on the software, this study aims to develop a hospital-community-home management model and evaluate the impact of nursing interventions provided by home visiting nurses, aligning with national healthcare policies in China.

Methods: In the Dongying area, hospitals collaborate closely with local communities and families to facilitate the smooth implementation of Internet + Nursing Services. Patients schedule appointments for a range of medical care services through mobile phone software, with staff accessing orders through the platform to provide professional treatment and nursing care to patients.

Results: Currently, there are 214 registrants from 50 departments on the platform. From September 2021 to June 2023, a total of 3529 cases were handled the platform. The top 10 order items included heel blood collection (944 cases), graphic consultation (526 cases), neonatal jaundice measurement (463 cases), neonatal hearing screening (418 cases), gastrostomy tube care (368 cases), catheterization care (192 cases), venous blood sampling (155 cases), postpartum mammary gland unblocking (103 cases), surgical wound care (92 cases), PICC catheterization care (57 cases), and pressure tube placement care (57 cases).

Conclusion: The hospital has successfully established a hospital-community-family home nursing model with specialist nurses playing a central role. Through the implementation of Internet + Nursing Service, medical staff are able to provide quality medical and nursing care to patients who are unable to leave their homes, significantly improving patient convenience and conserving medical resources.

Keywords: Internet, nursing services, home management

1 INTRODUCTION

China's population is aging at an unprecedented rate, already reaching the characteristics of an aged society. As individuals age, they often face challenges in self-care due to some factors like comorbidity, frailty, and functional decline. These physical challenges can lead to an
increased risk of mental health issues such as depression or anxiety. With the rising prevalence of physical and mental health disorders in the elderly population, the demand for medical care service is Growing.

Home-based nursing services[4], already implemented in countries, including the United States, the United Kingdom, Australia, Japan and Russia, present a potential solution. In 2019, China issued the Notice on carrying out the pilot work of “Internet + Nursing Service”[5]. This initiative allows patients discharged from the hospital or with mobility limitations to book nursing services online, enabling hospital nurses to provide nursing services in patients’ home.

The increasing integration of the Internet into daily life has brought both opportunities and challenges to the medical industry[6,7]. While the government has issued a series of policies promoting the “Internet + Nursing Service” plan[8,9], this new service model remains in its early stage of exploration.

There is evidence[10,11] that there are various problems in the implementation of “Internet + Nursing Service”. Patients often express concerns about the effectiveness of the service in addressing their needs and are hesitant to adopt it, resulting in a limited number of service cases each month. Our hospital leverages a team of specialist nurses to serve patients according to their respective specialties, and to complete the “Internet + Nursing Service” jointly with hospitals, communities and patients' families. By working together under the hospital-community-home framework, a robust “Internet + Nursing Service” program established. This study aims to disseminate the knowledge gained through the implementation of this novel approach and its associated positive outcomes.

2 MATERIALS AND METHODS

2.1 Improve the Supervision of Mobile Applications

The regulation of mobile applications needs to be improved. First, a survey was administered to hospital staff to evaluate their willingness and interest in participating in this program. Following this, electronic questionnaires and semi-structured interviews were conducted without patient, inpatient and discharged patients. Finally, the hospital conducted in-person visits with community residents to gather a holistic understanding of patient and resident needs for home-based nursing services. The services offered by the phone's software are readily accessible to patients. Patients can schedule appointments for nursing service items by selecting the service time, available nurse, and entering the home address in the application of the mobile phone. A nurse in the hospital can monitor all incoming patient’s appointment information, and this nurse will arrange the appropriate nurse to visit the patient's home with the necessary supplies. If the patient does not choose the name of the nurse, the nurse will contact the patient by phone to discuss their individual needs and then select the dedicated nurse to provide required home care services.

2.2 Responsibilities of the Medical and Nursing Roles

Chinese nurses implement hierarchical management system based on experience and skill level, with higher the level correlating to stronger nursing abilities. In order to improve the enthusiasm of nurses when working, the hospital encourages senior nurses to participate by organizing rigorous examinations and assessments in nursing operations. Nurses who successfully pass both examinations are designated as online nurses. According to the specialty of nurses, all network nurses were categorized into six groups: venous pipeline nursing group, wound stomostomy nursing group, maternal and child nursing group, basic nursing group, pipeline nursing group and medical examination group. Correspondingly, all available nursing services are categorized into six groups, ensuring that the nurse assigned to a home visit possesses the specific expertise required to address the patient's appointment selection.

2.3 Platform Applications

Patients can schedule appointments through apps or public accounts, and the nurse at the hospital have real-time access to all patients’ appointment information, allowing them to monitor the entire service delivery process. For each appointment, two nurses are required to simultaneously visit the hospital, where they change into isolation gowns, and collect the necessary for nursing operation and first-aid kit. Upon arrival at the patient’s home, nurses introduce themselves and request the patient’s signature on the informed consent form. Following the completion of the service, the online appointment nurse needs to click the “end” button within the app. The nurse monitor the progress of each step and receive reminders within the APP if any tasks are delayed. Additionally, the background of the software allows administrators to access detailed information for each appointment and data exportation. After each appointment, patients have the opportunity to provide feedback and suggestions for improvement.

2.4 Hospital-community-family Model

Community nurses are only responsible for the basic health care work of community residents and perform simple nursing operations. Due to their role limitations, community nurses are unable to undertake complex nursing operations and conduct comprehensive disease assessment. To address this, our hospital has established a collaborative partnership with community hospitals. Regularly, our nurses visit these community hospitals to train their counterparts in more intricate nursing operations. In reciprocation, community nurses visit our hospital to further their education, ensuring uniform nursing standards across settings. This collaborative approach ensures community nurses have the resources and expertise to provide patients with the appropriate level of care, even for complex situations.
Our hospital establishes contact with the community. Each month, the hospital will organize experts of various professions visit community to conduct basic physical examination and offer medical consultations to residents community spaces. During these visits, medical professionals introduce our “Internet + Nursing Service” to residents. Additionally, community staff of the community constantly educate residents how to utilize the “Internet + Nursing Service” in their daily lives, including demonstrating its functionality to family members caring for elderly individuals with mobility challenges.

### 3 RESULTS OF THE OPERATION OF THE PLATFORM

Currently, our hospital has appointed 214 nurses as contracted online nurses. There were 132 service projects in 2021, there were 1,048 cases in 2022 and there were 2,349 in 2023. From September 2021 to June 2023, a total of 3,529 orders were fulfilled (Table 1). Classified by service item, the most frequently requested being heel blood sampling (944 cases), planar consultation (526 cases), neonatal jaundice measurement (463 cases), neonatal hearing screening (418 cases), gastric tube nursing (368 cases), catheterization nursing (192 cases), venotomy nursing (155 cases), postpartum breast unclogging (103 cases), surgical wound nursing (92 cases), and postoperative surgery. PICC placement nursing (57 cases), pressure sore wound nursing (57 cases), pressure sore wound nursing (155 cases). 57 cases), pressure ulcer wound care (28 cases), enema care (25 cases), telephone consultation (22 cases), intramuscular/subcutaneous injection (22 cases), aspiration care (22 cases), slow wound debridement and dressing change (15 cases), obstetric dressing change (14 cases), infusion port maintenance (9 cases), neonatal care (9 cases), and medication guidance (9 cases) (Table 2).

### 4 DISCUSSION

On September 16, 2021, our hospital pioneered the introduction of the “Internet + Nursing Service”, offering online nurse home visit service in Dongying. Research studies[12-14] have revealed that the staff's experience of the new working model had both positive and negative aspects.

As evident from the findings, the largest number of visiting projects in our hospital is the heel blood collection project, which has 944 cases, all falling under the maternal and infant nursing group. Consequently, during the screening process for the second batch of online contract nurses, our hospital adjusted the tenure requirement for obstetric nurses and augmented the team of obstetric online contract nurses to address patient demands. Additionally, with 192 cases of catheterization care, it became apparent that male patients preferred male nurses to provide door-to-door service. Consequently, we broadened the eligibility criteria for
male nurses and expanded their presence within the workforce. Furthermore, full-time nurses made concerted efforts to assign male nurses when attending to male patients in need of catheter care.

By examining the number of orders issued monthly, it becomes apparent that the online contract nurse service has been impacted by the COVID-19 pandemic. The number of orders issued from 2021 to September 2022 is relatively low, with a notable decline during the peak of the epidemic in China. However, as the country gradually gained control over the pandemic, the implementation of our hospital-community-family model is intensified. The number of online nurse orders has increased significantly due to the anticipation of a surge in COVID-19. The number of online contract nurses in our hospital is the largest number in our city, underscoring the effectiveness of the hospital-community-family model in facilitating the growth of online contract nurse services.

The top 10 procedures, including heel blood sampling (944 cases), neonatal jaundice measurement (463 cases), and neonatal hearing screening (418 cases), with infants accounting for the majority of the procedures. Parents of these infants, being young individuals, are more inclined towards utilizing online services, and are proficient in operating mobile phones. However, elderly individuals may encounter challenges with the “Internet + Nursing Service” due to unfamiliarity with its functionality and lack of proficiency in mobile phone operation, resulting in a reluctance to make appointment. Our hospital-

<table>
<thead>
<tr>
<th>Service Lines</th>
<th>Number of Orders (Cases)</th>
<th>Service Lines</th>
<th>Number of Orders (Cases)</th>
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</thead>
<tbody>
<tr>
<td>Heel blood collection</td>
<td>944</td>
<td>Neonatal care</td>
<td>9</td>
</tr>
<tr>
<td>Graphic counseling</td>
<td>526</td>
<td>Medication guidance</td>
<td>9</td>
</tr>
<tr>
<td>Measurement of neonatal jaundice</td>
<td>463</td>
<td>Care of newborns with umbilical infection</td>
<td>6</td>
</tr>
<tr>
<td>Newborn hearing screening</td>
<td>418</td>
<td>Bladder irrigation care</td>
<td>5</td>
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<tr>
<td>Gastric tube care</td>
<td>368</td>
<td>Ostomy care</td>
<td>4</td>
</tr>
<tr>
<td>Catheterization care</td>
<td>192</td>
<td>Replacement of tracheotomy tubes</td>
<td>3</td>
</tr>
<tr>
<td>Blood collection by vein</td>
<td>155</td>
<td>Intravenous indwelling needle care</td>
<td>3</td>
</tr>
<tr>
<td>Postpartum breast drainage</td>
<td>103</td>
<td>Subcutaneous analgesic pumps</td>
<td>2</td>
</tr>
<tr>
<td>Surgical wound care</td>
<td>92</td>
<td>Tracheotomy care</td>
<td>2</td>
</tr>
<tr>
<td>PICC maintenance care</td>
<td>57</td>
<td>Instruction in the training of compensatory feeding for swallowing function</td>
<td>2</td>
</tr>
<tr>
<td>Pressure ulcer wound care</td>
<td>28</td>
<td>Care of common skin disorders (pustules, rashes) in newborns</td>
<td>2</td>
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<tr>
<td>Enema care</td>
<td>25</td>
<td>Acupuncture treatment</td>
<td>2</td>
</tr>
<tr>
<td>Telephone counseling</td>
<td>22</td>
<td>Rehabilitation acupuncture massage for improving muscle tone in infants and young children</td>
<td>1</td>
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<tr>
<td>Intramuscular/subcutaneous injections</td>
<td>22</td>
<td>Breast physical therapy</td>
<td>1</td>
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<tr>
<td>Suction care</td>
<td>22</td>
<td>Nebulized inhalation administration</td>
<td>1</td>
</tr>
<tr>
<td>Slow trauma debridement and dressing change</td>
<td>15</td>
<td>Neurobehavioral developmental assessment and rehabilitation interventions for newborns</td>
<td>1</td>
</tr>
<tr>
<td>Obstetric dressing changes</td>
<td>14</td>
<td>Closed chest drainage care</td>
<td>1</td>
</tr>
<tr>
<td>Infusion port maintenance</td>
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community-family home care model can effectively addresses these issues, through the publicity of the community, the hospital can let more people understand the development of “Internet + Nursing Service”, while community staff patiently assist elderly individuals to operate. Moving forward, we are committed to enhancing measures to address this issue, aiming to increase users’ awareness and knowledge of the “Internet + Nursing Service” and to simplify the operation process.

Home visiting nursing[^15] has become an integral component of long-term care policies across many countries. While in China, the Internet + Nursing Service is still in the initial stage. Healthcare professionals assert that “Internet + Nursing Service” largely meets the objectives of enhancing resource availability and optimizing resource utilization. Moreover, this model[^16-18] will help to strengthen teamwork and interdisciplinary collaboration, and allow professionals to realize their full potential. The model of “Internet + Nursing Service” really provides people who have difficulties in traveling with a cell phone to place an order to enjoy the home nursing service provided by a tertiary hospital. Since the operation of the platform, users and caregivers have a high degree of satisfaction with the experience. After the nurses’ door-to-door service is finished, follow-up of patients, patients gave a high evaluation. “Internet + Nursing Service” enhances the nurses’ own sense of value.

However, several obstacles hinder the effective implementation of this model. Some nurses lack a clear understanding of the model’s significance, leading to confusion and inefficiency in the working process. Prior to the implementation of a working model, both management and staff must reach a consensus on the necessity of change and the potential benefits it could bring to patients[^19]. Greenhalgh et al.[^20] and McMullen et al.[^21] emphasize that clear leadership and well-defined goals are the cornerstones of adapting to organizational change. Establishing a collaborative framework among hospitals, communities, family members can facilitate smoother integration of “Internet” medical treatment, maximizing benefits for patients.

The promotion of “Internet + Nursing Service” falls short of meeting current needs of the society[^22], and the publicity and promotion of “Internet + Nursing Service” is not strong enough[^23]. On the other hand, some registered nurses remain uninformed the program. Service” is not strong enough[^24]. It can be seen from the results that the actual service items are relatively simple, and our “Internet + Nursing Service” has not been fully utilized.

5 CONCLUSION

This study introduced a new model of “Internet + Nursing Service” in Dongying City, effectively addressing the challenge of limited medical and health resources. Participants expressed confidence in the potential of the use of “Internet + Nursing Service” working mode in medical and health to enhance resource availability and optimize resource utilization. However, in the implementation process of “Internet + Nursing Service”, there are also challenges such as low acceptance of patients, single real service items and low cooperation degree of nurses. Addressing these challenges and achieving widespread acceptance of this model on a large scale have become key areas of research interest. It is our hope that this study can serve as a foundation for other regions to implement and refine “Internet + Nursing Service” initiatives.

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Conflicts of Interest

The authors declared no conflict of interest.

Author Contribution

Kang X designed the study, conducted the data analysis and drafted the manuscript. Yang W supervised the work. Both authors contributed to writing the article, read and approved its submission. Wei L, Chen H, Su X, Ding L, and Shi D provided favorable suggestions to the article. Ma L is responsible for the final revision and submission of the article.

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