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The Effect of Implementation of a Nursing Information System

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Abstract –

It is revolutionary to adopt a nursing information system since it allows nurses to conduct numerous evaluations and treatment records more rapidly while also simplifying manual labour. As a result, doctors and inter-disciplinary teams are able to query information and provide the most accurate therapy. For rookie nurses, recording time per shift dropped from 66.2 ± 15.0 minutes to 37.16 ± 15.7 minutes, while for senior nurses with more than 10 years of experience, it decreased from 45.4 ± 6.65minutes to 29.1 ± 4.23 minutes after the adoption in the case hospital of a nursing information system. The nursing department and the information department worked together to construct the nursing information system, which established the groundwork for the case hospital to develop other information systems in the future.

KEY WORDS: Effectiveness, Improvement, Nursing information system

1. Introduction

People from many walks of life have grown to favour smart items as information and wireless networks have advanced. Many companies have also utilised information to reduce laborious

manual tasks. Additionally, nurses are typically required to complete a large number of evaluation and care records when caring for patients. Many scenarios might increase the number of hours that nurses spend running back and forth between the nursing station and the patient units. This makes it hard to immediately tell patients of their test findings since nurses must wait until the computer responds before doing so. Another example is that nurses must wait for the computer to produce drug administration and treatment records after the physician makes a medical decision. In addition, a prescription is customarily documented in handwriting before being transferred to the paper-based medicine administration and treatment record, extending the working hours of the nurses even more. If a nurse is distracted by the patient's family, physicians, or other members of the care team while taking notes, the record is more likely to be incorrect or incomplete than not. Other issues include having to record the same thing many times. Catheter records, nursing records, discharge records, and so on, all need the sizes of different catheters to be documented time and time again in the event that the data is incorrect. Because doctors' handwriting is often unreadable, it may be difficult to decipher the content and semantics of their writing. To avoid having to produce several medical records, nurses generally focus on treating patients rather than documenting their work.

A 2- to 3-hour delay in their off-duty time was cited by new nurses in the Nursing Department during their orientation as a reason for their frustration with composing nursing records.

Mobile nursing stations integrate wireless networks, information systems, and equipment to enable nurses to complete documentation quickly, reduce repeated writing time, increase direct patient care, and process the computerization of nursing records to increase efficiency and reduce the work load of nurses.

Computerized medical records and a decrease in the time nurses spend documenting physician instructions improve patient safety, hence.

According to Hou and Yu, the average observation time dropped from 10.5 minutes to 8.4 minutes following the introduction of a nurse admission assessment information system. There was a 1.4-minute decrease in average observation time after the daily nurse physical assessment information system was put into place. Gao and Chen found that shortening the recording duration is impacted by the perceived utility and the support of the supervisors. Improved record-keeping times were achieved by using information technology in the field of nursing (NIS). Electric recording was superior than handwritten in terms of completeness and documentation quality.

An NIS is therefore a revolutionary change, as it can eliminate computer congestion at the nursing station, simplify the tedious and repetitive writing of nursing records so that more time can be spent at the patient's bedside to accurately complete various nursing assessments and record the results in NIS, and avoid the redundant process in which results must first be recorded on paper before being formally transferred to the NIS. Additional benefits include the ability for doctors and other members of multidisciplinary teams, such as therapists and nutritionists, to access pertinent tests and treatments online and provide patients with timely and accurate rehabilitation and nutrition recommendations.

The NIS's ability to be deployed effectively is dependent not only on the software design but also on the level of acceptability of the system within the nursing staff.

5 If the system is able to reduce the amount of time spent on handwriting and the amount of work that nurses have to do, it will be more widely accepted. A NIS was put into place, and the results of this research looked at how it affected the results. Nursing records are being written in less time and off-duty time is taking longer to complete, both of which are being addressed. Results may serve as a guide for other hospitals interested in implementing NISs and promoting nursing practises. Hospitals can boost nurse retention and decrease turnover by lowering the time and effort required to collect patient information.

2. LITERATURE REVIEW

Nursing Informatics and Clinical Practice

It's difficult for nurses to do their clinical job since they have to do so many exams and records in addition to really caring for the patients. Many medical facilities' research and nursing practises have benefited greatly from the advent of new information technologies. Efforts at informatization in clinical, education, administration, and community care should be done as part of the NIS's development and planning process. Improvements in job efficiency, patient safety, the quality of nursing care, management effectiveness, educational excellence, and research efficacy are all made possible by technological advancements.

A comprehensive information system can ensure that patients get the same level of treatment and decrease the amount of time and effort that is required to record it. In addition to increasing the efficiency of traditional records, it also makes it easier for multiple healthcare teams to communicate immediately about a patient's clinical information and decreases human mistakes during communication.

Prescription signing, emergency examination categorization, intake and output amount recording, nursing issue and process recording and drug administration recording are some of the most common uses of a NIS. System designers and managers should focus on creating a system that can seamlessly integrate nursing processes and therapeutic activities while ensuring patient safety. There must be a user-friendly interface and an easy-to-use system for nurses to be satisfied and productive.

CLINICAL PROFESSIONAL COMPETENCY ADVANCEMENT SYSTEM FOR CLINICAL NURSES

The ability to be a competent nurse is dependent on a thorough education in the field. The results of a research showed that graduates of nursing schools have a wide range of clinical competence. In the 1970s, a competence grading system for clinical nursing was created. In Taiwan, a competence progression system for nurses was established in the 1980s. According to the authors, the promotion of the nursing competency advancement system, encouragement of nursing staff to learn in a systematic and progressive manner, increase in self-affirmation, improvement of work attitude, stimulation at the workplace, and improvement of teaching and

management competencies are all benefits of using nursing competency to establish the job hierarchy..

Guidelines for front-line nurse competency advancement have been developed by the Taiwan Nurses Association, which hospitals can use as the basis for a clinical professional competency advancement system, which is designed to increase professional competency, ensure a stable workforce, and ensure patient safety. It's possible to get a clinical competence grade in nursing by completing activities such as basic patient care, critical care, teaching, and research, or by earning a N1 (less than one year of experience) or a N1, N2, N3, or N4 (at least four years of experience).

Benefits and Promotions of the Nursing Information Systems The burgeoning industry of nursing information integrates nursing with information technology. Medical information systems are being developed and used by big hospitals as a means of improving their competitive position. Human resource management, shift management, and the creation of network learning systems may all benefit from this technology, which allows nurses to study whenever and wherever they choose, improving their professional skills and the quality of nursing education.

In 2016, Liou et al18 found that a computerised model of performance-based assessment could objectively test the performance-based competence of nursing pregraduates and clinical nurses.18. Clinical competency may be improved via the customization of nursing education. Rapid reaction teams and early warning systems were shown to be effective by Heal and colleagues19 in their 2017 research. Patients' electronic medical records were updated with a set of early warning indications system criteria. The head of the quick response team followed up on any total score surpassing an allocated threshold to ensure safe and effective treatment.

The use of a NIS, electronic medical records, and early warning systems improves patient outcomes by enhancing cooperation among healthcare providers.

Improve patient safety and quality of nursing care by using a NIS. NIS may eliminate repetitious work and prevent omissions, reduce transcription and recognition mistakes caused by doctors' handwriting, and provide quick medical advice.

Key Factors Affecting the Promotion of a Nursing Information System

In the last two decades, information has become the most powerful external change agent. Managers confront a big difficulty since "change" implies the breakdown of an established norm and stability. As a result, clinical practise is radically altered when a NIS is put into place. This is why, in addition to following the trend, nursing managers must also pay attention to staff responses, thoroughly analyse the sources of resistance and encourage informatization. The promotion of the information system inside the company benefits greatly from managers' combined assessment of internal demands and external trends.

NIS adoption and use will be more challenging if it does not fit the demands of nursing practise. That's why we're looking for an easy-to-use and controllable NIS that meets clinical demands while integrating cross-domain knowledge applications. As a result, the process of introducing

new information should include assessing and verifying the requirements, designing and correcting the system, testing and introducing the system, and ultimately evaluating the system.

Nurses' opposition to computerization was examined by Kirkley and Stein24 In-depth interviews revealed that, although many organisations encountered opposition when pushing online documentation or computer-related services, the major worry was the addition of a new job to the already heavy workload rather than the computer technology itself. It was found that clinical nurses spent 15% to 20% of their daily time putting up case notes in a 1995 research by Moody and Snyder While indirect nursing time accounted for the majority of nursing staff time in Taiwan, the most time-consuming activity of indirect nursing was keeping track of patients' medical histories. Nursing records represent a significant burden for clinical nursing personnel, according to these data.

The invention, communication channel, social structure, and temporal variables all have a role in the dissemination of new ideas, according to Rogers'27 theory. Changes in the innovation programme may be impacted by user characteristics and information cognition throughout the dynamic adaption process of informatization. User happiness and perceived utility are the most important factors influencing the usage of the NIS, according to a 2017 research by Huang et al. The effectiveness of the system depends heavily on the nursing personnel. Management should thus encourage innovation by first gaining support from early adopters before extending usage via training courses, operational learning and opinion exchanging followed by adaptive learning. There should be an emphasis on demonstrating how the NIS helps nurses be more productive so that they may devote more of their time to patient care and professional development rather than just spreading the word about the system. The introduction of the information system may be accomplished using this strategy.

3. RESEARCH METHODS

Nursing assessment systems (NIS) for patients admitted to a facility, their bodies, pressure sores, falls, issue resolution planning, restraint care, and catheter records were among the new NISs adopted.

Using a three-by-three grid, the nursing information interface presents data to users. To access the operation page, a personal account number and password are necessary. Nurses may do numerous nursing assessment and documentation tasks at the bedside thanks to a wireless network and a mobile E-nursing trolley. All NIS data are included into a patient's electronic health record. The online schedule for the NIS was prepared by the information supervisor. Supervisory meetings were held on a weekly basis to discuss and follow up on the progress of projects. An online two-stage introduction to NIS is based on the diffusion of innovation hypothesis. The first step was to assign a nurse who was interested to a demonstration unit of one internal medicine and one surgical ward. Interested nurses were directed to the system's general hospital baseline to learn about NIS operations and discuss information requirements. Information technologist put up and launched the test information system.

Training in the use of the Information System As a speaker on nursing information systems, the system's general hospital's information nurse was asked to participate. After the demonstration

unit was a success, the system was rolled out to other units simultaneously in the second step. The NIS is introduced to the case hospital by interested nurses.

The effective use of nursing information technology requires meticulous forethought. An information supervisor was created in the case hospital's nursing department to plan the implementation of nursing information systems. Using the requirements of patients and nurses as a guide, this information supervisor collaborates with the system's general hospital's information technology centre and the department of nursing to develop and modify appropriate NIS material.

The idea of diffusion was used to the training of interested nurses and the construction of the demonstration unit model. As a result of the efforts of enthusiastic nurses, NIS was effectively implemented in 12 of the hospital's wards.

Study Participants

Ethics approval for this investigation was granted by a committee of scientists concerned with research integrity (case no. 201401035RINC). A conflict of interest did not exist. As part of this research, purposive sampling was performed to identify patients with at least three months of experience on the wards that were using NIS.

Participant rights were maintained throughout the research procedure, which meant that only after the objective of the study was explained and personal agreement was gained was the time and questionnaire data collected. More than 70 people signed up for the research.

Study Procedures

1. A timer was used to record the amount of time it took to write each nursing operation.
2. This data was obtained at a period of 4 months following the introduction of the NIS, and the time each participant spent using the information systems was assessed using a timer.
3. Comparing recording times before and after the NIS was implemented allowed us to confirm its impact.
4. A study looked at the variation in recording times based on the number of years of nursing experience.
5. We looked at the differences in recording times based on participants' abilities.
6. The variation in recording times between different educational levels was studied.

Data Analysis

Analysis of variance (ANOVA), descriptive statistics, and paired t tests were carried out using IBM SPSS Statistics 18 (IBM, Armonk, NY) statistical software to verify and examine the efficacy of NIS implementation.

4. RESULTS

Biographical Data Statistical Analysis With 32 (46.4%) from internal medicine and 13 (18.8 %) each from surgery and orthopaedics departments, the total number of participants was 69.

Participants with experience levels ranging from one year to ten years comprised 36.2 %, followed by 30.4 % (5.8 % with five to ten years of experience, 14.5 % (10 participants) with more than ten years, 11.6 % (8 participants) with one to three years of experience, and 7.2 percent (five participants) with three to five years. Some 40.3 percent of the participants had a N2 ability level, followed by 30.4 percent of those with N, and % of those with N1. For every 25 people with a college degree (36.2 %), there were 18 with a four-year technical school, 16 (23.2 %) with a two-year technical school and 10 (14.5%), with a two-year college degree.

Before and after changes in the amount of time spent on the new patient nursing process Before and after NIS installation, the 69 participants spent a total of 69 hours on new patient procedure data, as shown in Table 1. From December 16 through December 30, 2013, time measurements were taken. There was an SD of 14.06 minutes in the previous average of 56.9 minutes. From May 26 to June 6, 2014, time measurements were taken. With an SD of 12.08 minutes, the mean total duration was 36.4 minutes. The average time spent by participants on new patient nursing procedure records before and after the study was 20.5 minutes, with a standard deviation of 12.92 minutes. The findings revealed that the installation of the NIS decreased the amount of time spent on different evaluations and nursing records by a significant amount.

Table 1. Total Time Spent on New Patient Nursing Process Before and After

	Before	After	Difference	Pairwise t	(N = 69) P
Average	56.9	36.4	20.51	13.19[a]	.00
SD	14.06	12.08	12.92		

The 69 participants underwent a paired t test to examine the difference between their pre- and post-intervention status. The findings were statistically significant, indicating that less time was spent on paperwork. Importing data or assessments from a patient's prior record was done automatically by the NIS, so that the patient only had to fill out one form and they were then automatically imported into the required forms, saving time.

Recording Times Depending on Education

Recording time for students of various educational backgrounds is shown in ANOVA in Table 2. There was no statistical difference in the amount of time it took to implement for various educational levels. Those with a four-year technical school degree spent less time (53.33 ± 13.0 minutes) before implementation, whereas those with a five-year college education spent more time (58.64 ± 12.30 minutes).

Different educational levels had no statistically significant effect on the amount of time it took to install the system. Implementation resulted in participants with a 2-year college degree spending an average of 33.80 minutes each session, compared to 39.50 minutes per session for those with a 2-year technical school degree. The average time spent before and after implementation was 56.6 and 58.5 minutes, respectively, but the average time spent after implementation was 33.8 and 39.50 minutes. An NIS was shown to reduce the overall time spent as well as the disparities among participants with various educational levels.

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The findings for various levels of schooling before and after adoption were not statistically significant (P >.05). For participants with a 5-year college degree, the time changes before and after implementation were the most substantial, decreasing from 58.64 ± 12.30 minutes to 35.80 ± 8.86 minutes; for each new patient admission, the recording time was decreased by 22.84 ± 15.56 minutes. This showed that training and individual job productivity was not impacted by academic degrees due to the system's simple interface and the ease of automated import.

Table 2. Education Degrees and Recording Time

Level	Education Degree	Average	SD	F	(N = 69) Postcomparison
Total time spent before improvement	5-year college	58.64	12.30	0.57	Not applicable
	2-y college	56.60	14.26		
	2-y technical school	58.50	17.83		
	4-y technical school	53.33	13.00		
Total time spent after improvement	5-y college	35.80	8.86	0.52	Not applicable
	2-y college	33.80	11.07		
	2-y technical school	39.50	13.82		
	4-y technical school	36.00	15.03		
Time difference before and after improvement	5-y college	22.84	15.56	0.81	Not applicable
	2-y college	22.80	9.48		
	2-y technical school	19.00	12.91		
	4-y technical school	17.33	10.34		

5. DISCUSSION AND CONCLUSION

NIS can be successfully implemented with the help of interested early adopters who have been trained and a demonstration unit model has been set up. Using this example, other hospitals may learn how to implement NIS. Due to the NIS, nurses no longer had to devote as much time to keeping paper records, and as a result, their productivity increased.

New hires' recording time per shift dropped from 66.2 ± 15.0 minutes to 37.16 ± 15.7 minutes after the NIS was implemented, while the recording time for veterans with more than 10 years of experience dropped from 45.4 ± 6.65 minutes to 29.1 ± 4.23 minutes. Participants of various ability levels also saw a reduction in recording time each shift, with 69.24 ± 14.57 minutes down to 39.38 ± 17.11 minutes for participants of N ability level, and 26.50 ± 3.54 minutes down to 26.50 ± 3.54 minutes for participants of N4 ability level. Participants with a five-year college degree had their recording time cut from 58.64 minutes to 35.8 minutes; participants with a four-year technical school degree saw their recording time cut from 53.33 minutes to 36.0 minutes. The system also reduced the recording time difference between participants of different educational levels. A simple operational interface and ease of use made the system useful for users with varying degrees of experience, skill level, and education, according to these findings. As a bonus for new employees, it might assist them learn and build their confidence in the workplace.

According to clinical practise and study analysis, fresh participants were shown to be more proficient and accepting of computers than their more experienced counterparts. This is most

likely due to the fact that today's younger generation is more likely to have a quicker typing speed than their older counterparts. Senior personnel complained about their lack of familiarity with computer and information system functioning during installation. These senior nurses, however, were delighted to accept the NIS after it was told that only those patient-related evaluations that needed to be rectified once the initial information was inputted because of new import features were necessary. The information leader of each unit was chosen early on to guide others in discovering the advantages of utilising the NIS. This individual was proficient with computer operations and had an interest in the information system. A successful introduction was made possible because to an improved understanding of how the system worked.

Introducing the National Information System (NIS) represents a paradigm shift. Nurses may spend more time at the patient's bedside, properly conduct systemic and nursing evaluations, and instantly record assessment findings in the NIS with the use of a nursing record management system. For the therapists and dietitians who work with patients, the system provides them with the most up-to-date and accurate rehabilitation or nutrition recommendations possible, since they can review the patient's relevant evaluations or treatments online at any time. This is what makes this research so effective. To avoid mistakes in medicine delivery, the study's case hospital implemented an operational information system for medication administration. It was advised that a bar-code medicine delivery system be used in the future to effectively avoid erroneous drug administration because of the "three people read, five people verify" approach.

Hospital managers must pay attention to the social interaction, supervisor support, user participation, information system quality, and technical support components.

30 The NIS has a broad scope. When it comes to simplifying nurses' job, it is the role and task of nursing management to choose how to best use information. When nurses have access to information, they are able to remain longer by the patient's side, reducing their off-duty delay and boosting treatment quality and patient satisfaction at the same time.

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