Impact of Electronic Nursing Documentation (End) In Terms Of Quality of Nursing Documentation

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Abstract: *There is no doubt that nurses as direct caregivers, play a crucial role in the planning and implementation of patient care. Documentation of the nursing activities is also critical for the effective communication among the members of the healthcare team. Thus, the importance of quality nursing documentation cannot be over emphasized. The much practiced, traditional paper-based documentation, however, fails to meet the required standards of nursing documentation. As a result, the use of technology to document patient data is at the forefront of healthcare discussions. As the inclination towards computerized health records continues, nurses will need to bring solid informatics skills to their workplace. The study evaluates the effect of electronic nursing documentation (END) program in terms of the quality of nursing documentation. A random sample of 152 paper-based patient records and 644 electronic patient records were analyzed before and after the implementation of END program respectively using an audit tool comprising of seven components (patient demographic information, health assessment upon admission, vital signs, intake output, medication administration, need based care and general considerations). Significant enhancement was established in the overall quality of nursing documentation after the implementation of END program. Component wise comparison of paper-based and END also revealed improvement in the quality of nursing documentation in all components of except vital signs. Findings pertaining to paper-based nursing documentation revealed that; 99.34% were written with blue or black pen; 99.34% used universally acceptable abbreviations;7.96% had errors marked by a single line with initials; 3.95% were timed correctly; 1.97% were recorded in chronological order; and only 1.32% were identifiable with signature. As the use of technology becomes imminent in the healthcare sector, it is imperative that nurses in addition to providing quality care develop, implement and embrace informatics in order to effortlessly adapt to the impending transition.*
Key words: *Electronic nursing documentation (END), Nursing documentation, Patient records, Nursing audits, Quality care*

I. Background

As member of the healthcare team, nurses play a crucial role and contribute significantly towards the delivery of quality healthcare. There is no doubt that nurses as direct caregivers, bear a huge burden in planning and implementation of care and are expected to perform diverse roles as they render care. One responsibility in particular that warrants attention is the maintenance of complete and accurate nursing records pertinent to the patients. Nursing record is a valuable means for demonstrating nursing knowledge, skills and judgment as per professional standards within the scope of nurse client relationship.[1]Nursing record is a true representation of a fact or act which may be written or graphic and therefore should clearly express all actions executed in the care provided to the patient.[2]It is a significant communication tool that nurses utilize to communicate their observations, decisions, actions and patient outcomes. Quality nursing documentation promotes good nursing care and is the cornerstone for nurses to meet professional and legal standards.It provides evidence of nurses' work and evaluates its success as a written record of the patient's journey.[3]Quality nursing documentation also aids in; risk identification; early detection of complications; audit support; research; allocation of resources and performance planning to ensure changing needs of the users.[4]Hence, nursing documentation remains a significant component of the nursing team functions and cannot be disassociated from high quality patient centered care.[5]In fact, nurses acknowledge that nursing documentation is an integral component that links nurses and their ability to render high quality patient care.[6]Quality care and patient safety is guaranteed when nursing documentation captures accurate patient information and is communicated effectively among members of the healthcare team to achieve collaborative care and subsequently improve the quality of care provided.

Nursing documentation should but does not show the rational and critical thinking behind clinical decisions and interventions, while providing written evidence of patients' progress. Different nursing

documentation techniques that guide nursing documentation do not necessarily meet the documentation needs of busy clinical areas in the current healthcare environment as they focus on single problem entries and patients are often complex with multiple problems.[7]Although critical for quality assurance and efficient communication within healthcare team, nursing documentation often remains a neglected part of the clinical documentation. It is often found that the nursing process is not integrated into nursing documentation. Reasons for poor implementation include high documentation effort and low quality of paper-based records.[8]Documentation audits conducted in all health disciplines show serious inadequacies in documentation. A study[9] found that most documentation efforts fail to meet legal and professional standards. This is in sharp contrast to the many care providers who believe that nurses' charting is "good" or "adequate". Nursing documentation continues to be a challenge as nurses continue to capture standard elements in their documentation.[10]

There is no room for deficiencies in nursing documentation, if quality care and patient safety is to be achieved.[11]Hence, quality nursing documentation remains an important challenge worldwide. As a result, the healthcare system is under steady pressure to improve quality of patient care efficiently and effectively. In addition, the need for documentation is on the rise as a consequence of management issues, practice standards and consistent regulatory requirements. Comprehensive records are essential, regardless of whether healthcare providers or the court settles the complaints. It is therefore crucial that nurses keep abreast of legal mandates and best practice in record keeping.[12]

Worldwide considerable interest to improve the quality of nursing documentationis being accomplished by establishing new systems, reevaluation of old systems and analysis logics for poor compliance with the compulsion to document. Increasing need for secure and accurate exchange of patient information among the healthcare providers is perhaps one of the rationales for increased stress on nursing documentation.In addition, the storage of large volumes of paper-based patient records is expensive, stockpiling a major problem and scanning and storage is a laborious process. Nursing errors are accentuated in nursing literature and how computerized documentation could impact these errors especially those that were the direct result of handwriting. Medication orders are often misread in particular due to the handwriting andmedication is administered too frequently or in wrong doses. The traditional paper-based documentation fails to meet the modern health requirements which could potentially be due to the manual documentation process whichis often repetitive.[13]

Considering the time to be right for computerized documentation in healthcare, many organizations began to market the hardware and software to impact these needs.[14]The use of technology to document patient data is at the forefront of healthcare discussions. The use of technology is not only being discussed as being more efficient in the delivery of healthcare, but also a means of enhancing patient outcomes.[15]Hence, the use of computers in healthcare has become a requirement for all providers and organization. It is believed that technology will help; enhance clinical decision-making ability; ensure better quality of patient care and contain healthcare cost.[16]Nursing documentation patterns have also been associated with patients' mortality.With further efforts, these associations could be utilized in real time to establish a threshold of concern suggesting risk of deterioration of patients'status.[17]

Computerized nursing documentation improves completeness of records of routine assessment and interventions as it is more accurate, complete and timely.[18]Keeping in mind the rapidly changing trends of health industry, growing needs of the patients, and increasing professional and legal mandates in nursing, the importance of quality nursing documentation cannot be undermined or ignored.The nursing process must be supported by electronic health recordsvia the integration of best care practices: smooth workflows exhibiting the right tools, evidence-based content, and timely information for optimal clinical decision making.[19]

Nursing trails behindin acceptance and application of computer programs. It was recommended that hospitals adopt and operationalize computer-based nursing documentation system while including nurses in further educating courses essentially pertaining to computer documentation system.[20]

Nurses are now finding themselves at the front end of this advancement and evolution in the healthcare sector. Therefore, in addition to providing direct care, communicating and education, nurses are now required to documents electronically. It is therefore important for nursing leaders to plan, develop and execute strategies to enhance quality of nursing documentation in order to meet the needs of rapidly changing healthcare industry.

The purpose of this study was to explore changes in quality of nursing documentation pre-implementation and post implementation of a new END program. The specific research question addressed was as follows:
1. How does computerized documentation change the quality of nursing documentation before and after the implementation of an END program?

II. Material and Methods:

A quasi-experimental with pretest posttest design was adopted for this twophased study. The phase I, retrospective audits of paper-based nursing documentation were conducted from day 1 to day 75. One hundred and fifty-two randomly selected paper-based nursing records were reviewed to examine the quality of paper-based nursing documentation.

In the phase II, Day 1 to day 5 were dedicated to; sensitization of nurses regarding basic computer functions; END and hands on practice by nurses to familiarize themselves with computers. END program was implemented from day 6 to day 99. The implementation of the END programcomprised of 24 days of training programfor the nurses from day 6 to day 24. Nurses received training on the five modules of END program that included demonstration of electronic documentation of the module by the investigator and hand on practice by the nurses till at least one correct return demonstration. Day 18 to day 24 were dedicated to handholding including; open discussions with nurses, feedback, clarification of doubts, practice and reinforcement of all the five modules of END program together. Concurrent audit of END (phase II) were conducted out from day; 25 to 49(E I); 50 to 74(EII); 75 to 99(EIII).

Tool

Audit tool was used to assess quality of nursing documentation with three options for scoring purpose. Each item had the option of; "yes", "no" and "not applicable. The maximum and minimum score for each item was one and zero respectively. For the retrospective audit the maximum and minimum possible scores were 80 and zero respectively.Whereas for concurrent audit the maximum and minimum possible scores were 72 and zero respectively as the general consideration section was inbuilt in the software. The audit tool comprised of seven sections.

- Section I comprised of 12 items pertaining to patient demographic information and admission
- Section II comprised of 11 items pertaining to health assessment upon admission including; vital signs, allergies, risk of fall, level of consciousness, pain assessment, risk of pressure ulcers, extent of assistance needed and informed consent
- Section III comprised of eight items pertaining to vital signs, communication with physician
- Section IV comprised of 23 items pertaining to intake and output record
- Section V comprised of 10 items pertaining to medication administration
- Section VI comprised of nine items related to need based care including; eye care, oral care, back care, steam inhalation, glucose monitoring, diet as ordered, specific positioning, seizure precautions, date, rate and method of oxygen administration, oxygen saturation
- Section VII comprised of eight items pertaining to general considerations including; date, time of entries, legibility of writing, chronological order of entries, entries identifiable with signature, use of blue or black pen, use of universally accepted abbreviations and appropriate correction of error.

Reliability and Validity

In order to establish the content validity, the audit tool was submitted to 13 experts from various departments viz; IT expert, medicine experts, and nursing experts. Reliability was established by interrater reliability and the established reliability using Pearson Product Moment was found to be 0.90

Development and description of END program

With repeated experts' reviews, consultation with software developer and research guide, END program was developed with five modules. The software was developed using php version 5.3, MySQL 5.6 database, html version 5, java script and posted on Linux server.(LAMP Environment). Five modules of END program were as follows:

- Module I:Patient profile
- Module II: Health Assessment (part A and part B)
- Module III: Vital signs
- Module IV: Intake and output
- Module V: Medication administration and need based care (part A and part B)

Salient Features of END program:

- The home page of the END program displayed all the five modules each of which could be directly accessed by the nurse from home page
- All entries by the nurse were dated and timed by selecting the date from the calendar and entering time in 24-hour format

- Once the patient information was entered and submitted in patient profile (module I), this information was automatically linked to the other four modules
- Upon entering the IPD Number in modules II, III, IV and V, the patient's name and diagnosis was displayed on the screen. An additional red "allergies button" was displayed in medication administration (module V)
- Each module had a green "submit" button at the bottom of the page. It was mandated that the nurse clicked this green button after entering patient information into the system. Upon clicking the green "submit" button, a "data submitted successfully" window was displayed on the screen and the information was permanently saved. Nurses had access to the reports where they could view the entered information without the possibility of making any changes
- Incomplete information was not accepted by the system. The nurse entering the patient information had to ensure that all fields in the specific module were complete before clicking the green "submit" button
- All the electronically entered patient information was retrievable in the form of patient reports which was primarily used by the investigator for audit purpose. The investigator could view the data entry time by the nurses also the identity of the nurse.

Setting

The setting was an 830 bedded teaching tertiary care hospital in rural area. Permission was granted to conduct study in the ICU (23 bedded), surgical ICU (12 bedded) and emergency unit (38 bedded) only.

Sample

Data was collected from April 2013 to February 2014.The sample comprised of;
- One hundred and fifty-two randomly selected paper-based patient records of patients discharged from ICU, surgical ICU and emergency unit for retrospective audit of paper-based nursing documentation.
- Six hundred and forty-four randomly selected electronic records of patients admitted to ICU, surgical ICU, and emergency unit for concurrent audit of electronic nursing documentation.

Ethical Consideration

Ethical approval for the study was obtained from institutional ethical committee of the Maharishi Markandeshwar University. Permission was obtained from the Medical Superintendent of Hospital to conduct the research study. As part of the approval process, the rights and confidentiality of the sample were guaranteed. To protect the identity of the patient, confidentiality of the research data was maintained through the use of pseudonyms for all the reviewed patient records. To mask the identity of the patients, all patient records were numbered and list of patient name with corresponding IPD numbers were kept separately at location known only to investigator. The audit sheets along with consent forms were kept in locked cabinet. Computer data, patient data and nurses ID were stored in researcher's personal password protected computer. Written consent was obtained from staff nurses.

Data Collection

The training of END program was implemented from day 1 to day 24 in ICU, surgical ICU and emergency unit of the selected hospital. Nurses working in ICU, surgical ICU and emergency unit were trained regarding use of END program by the investigator. Training sessions were held in all the selected units coordinating with the availability of the nurses in all three shifts. Nurses were first oriented to basic computer functions and electronic nursing documentation. The nurses were introduced to END modules and demonstration as well as return demonstration was conducted until at least one correct return demonstration of each module. As new modules were introduced, nurses continued to practice electronic documentation of patient records until all modules were complete. Upon introduction of all modules, next seven days were assigned to practice of ENDof patient records including all the modules.

III. Results
Overall comparison of quality of paper based and electronic nursing documentation

The quality of nursing documentation was assessed using the audit tool. Unpaired t test was used to compare paper based and electronic nursing documentation. Findings revealed that mean percentage and standard deviation of quality scores of paper-based and END were 61.69±12.81 and 89.79±12.83 respectively. The computed 't' value of 24.27 was found to be statistically significant at 0.00 level of significance thus suggesting that the END program was effective in enhancing the quality of nursing documentation. **(See table 1)**

Table 1: Comparison of quality scores of paper-based and electronic nursing documentation

Nursing documentation	n	Mean%±SD	M_D	SE_{MD}	't' value	df	p value
Paper based	152	61.69±12.81	28.09	1.15	24.27*	794	0.00
Electronic	644	89.79±12.83					

Phase wise comparison of quality of paper based and electronic nursing documentation

Unpaired t test was used to compare retrospective paper-based nursing documentation phase I (day 1 to day 75) and concurrent ENDphase II (day 25 to day 99); day 25 to day 49 (EI); day 50 to day 74 (EII); day 75 to day 99 (EIII).

The mean percentage and standard deviation of quality scores of paper-based and ENDEI, EII and EIII were; 61.69±12.81, 86.41±14.95, 87.46±14.19 and 94.12±7.88 respectively. The computed 't' values of 16.54, 17.48 and 28.18 were found to be statistically significant at 0.00 level of significance thus suggesting that the END program was effective in enhancing the quality of nursing documentation. **(See table 2)**

Table 2: Phase wise comparison of quality scores of paper-based and electronic nursing documentation E1, EII, EIII

Nursing documentation	n	Mean%±SD	M_D	SE_{MD}	't' value	df	p value
Paper based	152	61.69±12.81	24.73	1.03	16.54*	344	0.00
EI	194	86.41±14.95					
Paper based	152	61.69±12.81	25.77	1.03	17.48*	344	0.00
EII	194	87.46±14.19					
Paper based	152	61.69±12.81	86.24	1.03	28.18*	406	0.00
EIII	256	94.12±7.88					

The mean percentage of quality scores of phase I (day 1 to day 75) paper based nursing documentation and phase II (EI, EII, EIII) END pertaining to components; patient profile; vital signs; intake and medication administration**(See figure 1)**
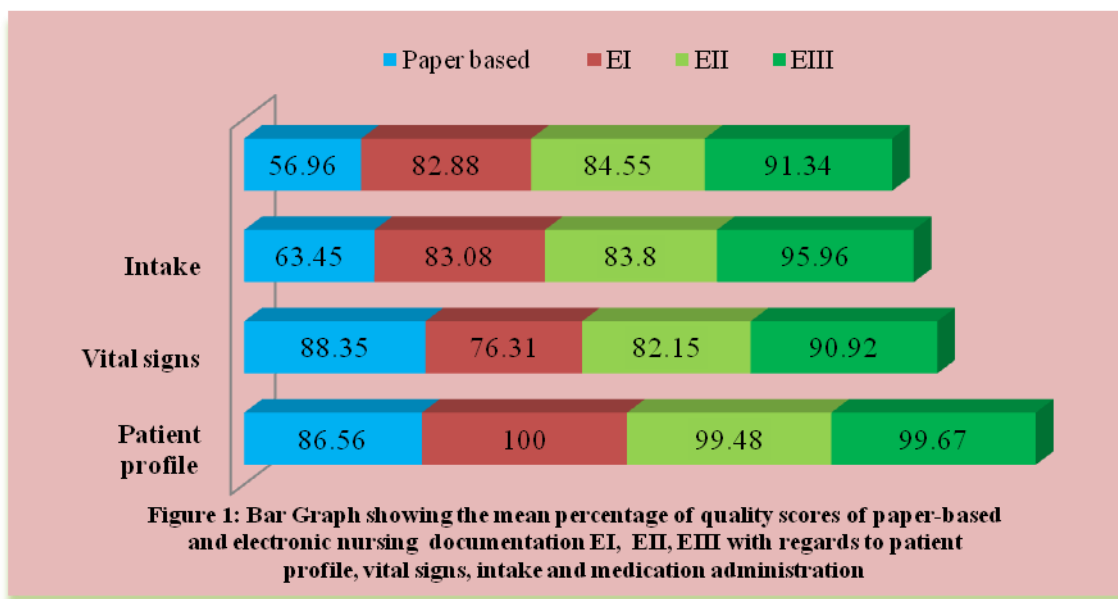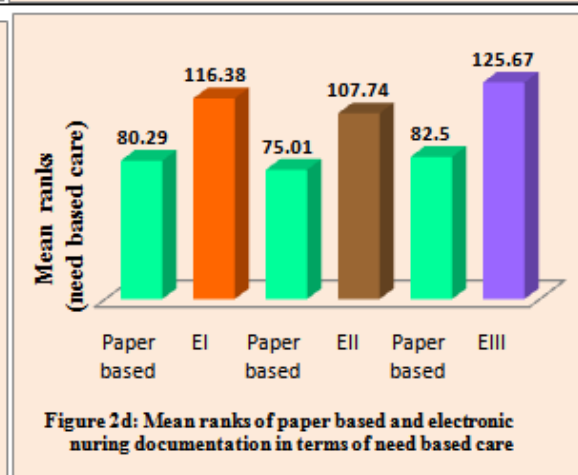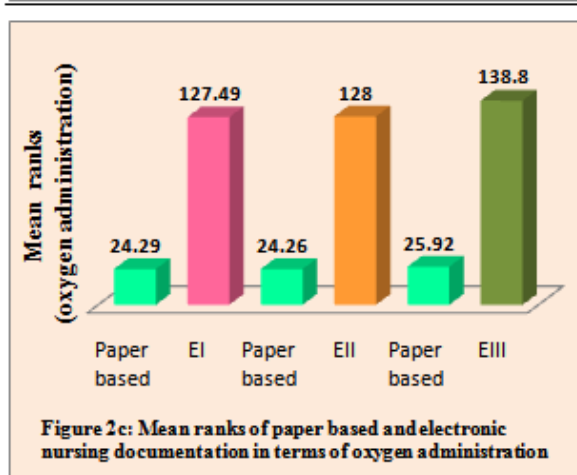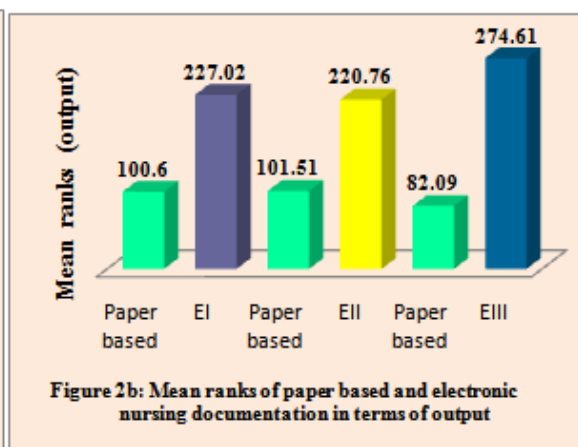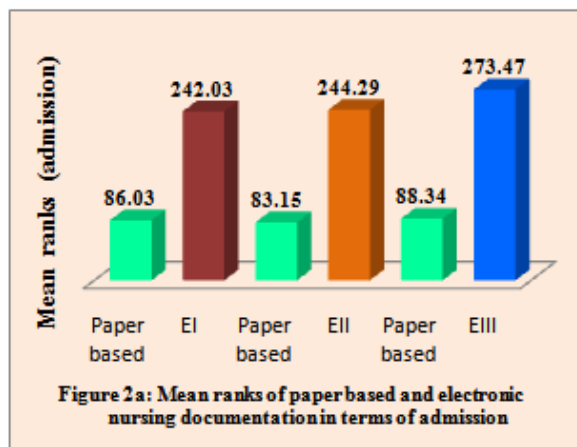

Figure 1: Bar Graph showing the mean percentage of quality scores of paper-based and electronic nursing documentation EI, EII, EIII with regards to patient profile, vital signs, intake and medication administration

The mean ranks of quality scores of phase I (day 1 to 75) paper based nursing documentation and phase II END(EI, EII, EIII) with regards to components; admission, output, oxygen administration and need based care. Results revealed that the END program was effective in improving the quality of nursing documentation

with regards to components; admission, output, oxygen administration and need based care in all the phases viz. EI, EII and EIII. See figures 2a, 2b, 2c and 2d.

Figure 2a: Mean ranks of paper based and electronic nursing documentation in terms of admission

Figure 2b: Mean ranks of paper based and electronic nursing documentation in terms of output

Figure 2c: Mean ranks of paper based and electronic nursing documentation in terms of oxygen administration

Figure 2d: Mean ranks of paper based and electronic nuring documentation in terms of need based care

Other Findings
1. Item wise analysis of the eight items on general consideration revealed that;
- Almost all of the nursing documents (99.34%) were recorded with blue or black pen
- Almost all of the nursing documents (99.34%) used universally acceptable abbreviations
- Maximum percentage of nursing documents (87.5%) were dated correctly
- Nearly three fourth of the nursing documents (71.71%) were legible
- Less than one tenth of the nursing documents (7.69%) had errors marked by a single line with initials
- Only 3.95% of the nursing documents were timed correctly
- Only 1.97% of the nursing documents were recorded in chronological order
- Only 1.32% of the nursing documents were identifiable with signature

Unit wise frequency and percentage of the items related to general consideration was also computed.
Analysis revealed that with regards to;
- Abbreviations;100% (ICU); 100% (surgical ICU) and 100% (emergency unit) of nursing documents used universally acceptable abbreviations
- Blue or black pen; 97.97% (ICU); 100% (surgical ICU) and 100% (emergency unit) of nursing documents were recorded with blue or black pen
- Date; 71.11% (ICU); 90.47% (surgical ICU) and 96.92% (emergency unit) of nursing documents were dated correctly
- Legibility; 48.89% (ICU); 78.57% (surgical ICU) and 83.07% (emergency unit) of nursing documents were legible
- Time; 6.67% (ICU); 2.38% (surgical ICU) and 3.07% (emergency unit) of nursing documents were dated correctly

- Marking errors; zero percent (ICU); 5.26% (surgical ICU) and zero percent (emergency unit) of nursing documents were marked errors by a single line with initials
- Chronological order; 2.22% (ICU); zero percent (surgical ICU) and 3.07% (emergency unit) of nursing documents were recorded in chronological order
- Signature; zero percent (ICU); zero percent (surgical ICU) and 3.07% (emergency unit) of nursing documents were identifiable with signature

IV. Discussion

Documentation is a critical element in the function of nursing team and cannot be isolated from quality patient centered care. Analysis of data of the current study revealed an overall improvement in quality of ENDas compared to the paper-based nursing documentation. The improvement was found in terms of completeness as well as documentation of morenumber of nursing activities. A similar study undertaken by Firouzeh M[5] compared the quality of nursing documentation in electronic and paper-based systems before and after the implementation of electronic system. Results revealed that the electronic system was significantly better than the paper-based documentation systems. On similar grounds, Akhu-Zaheya[21]compared 434 records of both paper-based and electronic records. Findings revealed that electronic health records were better than paper-based health records in terms of process and structure. Upon comparing paper written notes to electronic notes, Jamieson T[22] et al also reported that overall, the note quality was significantly higher in electronic versus paper notes.

In the present study, nearly three fourth of the nursing documents (71.71%) were legible, whereas Rijal A[23]reported that the handwriting was unreadable or difficult to read in 49.2% of the handwritten cardex. Findings of current studies also revealed that; 87.5% of paper-based documents were dated correctly; only 3.95% of the paper-based nursing documents were timed; 1.32% of the paper-based nursing documents were identifiable with signature. Whereas in the END, these features were built-in, thus they were 100% correctly done.

V. Conclusion

Electronic nursing documentation program was effective in enhancing the overall quality of electronic nursing documentation and was effective in enhancing the quality of electronic nursing documentation of seven out of the eight components. Findings of current study recommends studies to determine the effectiveness of END in terms of nurses' satisfaction, barriers and inhibitors to adapt electronic nursing documentation, patient record redundancy, time spent providing direct patient care and patient outcomes. It is recommended that hospitals adopt and implement computerized nursing documentation and train nurses on how to efficiently document electronically.

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