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Quality of nursing documentation: Paper-based health records versus electronic-based health records

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Aims and objectives: To assess and compare the quality of paper-based and electronic-based health records. The comparison examined three criteria: content, documentation process and structure.

Background: Nursing documentation is a significant indicator of the quality of patient care delivery. It can be either paper-based or organised within the system known as the electronic health records. Nursing documentation must be completed at the highest standards, to ensure the safety and quality of healthcare services. However, the evidence is not clear on which one of the two forms of documentation (paper-based versus electronic health records is more qualified.

Methods: A retrospective, descriptive, comparative design was used to address the study's purposes. A convenient number of patients' records, from two public hospitals, were audited using the Cat-ch-Ing audit instrument. The sample size consisted of 434 records for both paper-based health records and electronic health records from medical and surgical wards.

Results: Electronic health records were better than paper-based health records in terms of process and structure. In terms of quantity and quality content, paper-based records were better than electronic health records. The study affirmed the poor quality of nursing documentation and lack of nurses' knowledge and skills in the nursing process and its application in both paper-based and electronic-based systems.

Conclusion: Both forms of documentation revealed drawbacks in terms of content, process and structure. This study provided important information, which can guide policymakers and administrators in identifying effective strategies aimed at enhancing the quality of nursing documentation.

Relevance to clinical practice: Policies and actions to ensure quality nursing documentation at the national level should focus on improving nursing knowledge, competencies, practice in nursing process, enhancing the work environment and nursing workload, as well as strengthening the capacity building of nursing practice to improve the quality of nursing care and patients' outcomes.

KEYWORDS
content, electronic health records and audit instruments, paper-based, process, quality of nursing documentation, structure

1 | INTRODUCTION

Nursing documentation is a significant indicator of effective patient care delivery (Wilson, Hauck, Bremner, & Finn, 2012). Documentation can be either paper-based or electronic-based, as per the electronic health records (EHRs), which include all information related to patient care. Regardless of the method of documentation, nursing documentation has to be conducted at the highest standard, to ensure the delivery of safe and high-quality healthcare services (Noureldin, Mosallam, & Hassan, 2014). A high quality of nursing documentation is expected in every area of care and in every setting (Wilson et al., 2012); it is considered an important responsibility of nursing, to ensure the continuity of effective patient care (Asamani, Amenorpe, Babanawo, & Ansah Ofei, 2014) and to improve patients' outcomes (Stevenson & Nilsson, 2012).

Nurses, the largest group of healthcare providers in the healthcare system, play a crucial role in every area of performance improvement in healthcare organisations. The role demands documenting and managing patient information through coordinating patient care and communicating with other interdisciplinary team members. It is believed that paper-based documentation does not meet the requirements of high-quality documentation and communication among healthcare providers, because it is time-consuming, repetitive and inaccurate (Yu, Zhang, Gong, & Zhang, 2013).

Problems arise when attempting to obtain information from paper-based records, as it is considered labour intensive. Health care is built upon and revolves around information. The introduction of electronic health records (EHRs) as a method of documentation is more legible and more accessible (Nguyen, Bellucci, & Nguyen, 2014). The increasing amount of data makes managing information difficult to assemble and more importantly, more difficult to provide the best care to patients. The challenge of transforming data into information and knowledge and using both to improve health communication has led to the development of the health information system (HIS). HIS, EHRs, patient health records and a computerised patient record system are used interchangeably within the literature and are necessary to improve the quality of patient care (Ajami & Bagheri-Tadi, 2013; Middleton et al., 2013).

Electronic health record documentation has been used by many nurses for documenting nursing care including the nursing process, such as entering orders and accessing laboratory results, as well as supporting healthcare professionals in processing, managing and communicating data in a variety of settings. It has the potential to improve patients' safety, enhance healthcare professionals' access to a patient's healthcare information, ensure appropriate use of resources and finally, improve the communication among healthcare professionals (Secginli, Erdogan, & Monsen, 2014).

Currently, there has been considerable interest throughout the world's healthcare sectors to increase the quality of nursing documentation (Evatt, Ren, Tuite, Reynolds, & Hravnak, 2014). According to Wang, Yu, and Hailey (2013), the quality of nursing documentation includes three main components: content, documentation process and format or structure. Documentation content focuses on completeness and accuracy of data that reflect reality (Wang et al., 2013). The documentation process focuses on the patient's data completeness and the regularity of data in the patient's records, while documentation structure focuses on physical presentation, which includes the legibility and completeness of the patient's information.

What does this paper contribute to the wider global clinical community?

- Paper-based health records and electronic health records each have their drawbacks in the real practice of nursing documentation.
- Nursing students should be well prepared on the use and application of nursing knowledge and skills in technology, and the real world of practice for effective nursing care and best outcomes for patients.
- Bridging the gap between practice and education is important for enhancing the nursing competencies and personal qualifications.
- Policies and actions to ensure quality nursing documentation and full adoption of the EHRs at the national level should focus on improving nursing knowledge, competencies and practice.

It has been recommended that the implementation of EHRs, in comparison with paper-based records, would result in greater accuracy to the multiprofessional use of all healthcare providers (Collins et al., 2013). However, the evidence is not quite clear. This requires further assessment and investigation of the quality of nursing documentation in both paper-based and EHRs (Wang, Björvell, Hailey, & Yu, 2014).

Although the EHR has been introduced in Jordan during the last decade, its full application is still limited. Several institutions in Jordan are working on introducing the HIS in different healthcare settings to cope with the expanding technology of the information system. Currently, the EHRs in the public healthcare sector are an important part of a national initiative programme called the electronic health solution (EHS). The national EHS aims at increasing the effectiveness of medical management, reaching the best international standards and improving workflow procedures in hospitals and healthcare centres. It has several subsystems which include computerised patients' record system (CPRS), patients' booking and laboratory and pharmacy system among others. The EHS is based on a software application with a specific application for nurses.

In Jordan, there is no clear evaluation or clear evidence that indicates which of the two forms of documentation (paper-based versus EHRs) is more qualified. Ahn, Choi, and Kim (2016) reported that increased adoption of EHRs does not necessarily result in a reduction in healthcare costs or an increase in the quality of care. According to Nguyen et al. (2014), the introduction of EHRs has been

accompanied by an increasing rate of medical errors, thus leading to an increase in mortality in some settings.

Assessing the quality of nursing documentation provides insight into the best practices and limitations to improve the quality of nursing documentation and patients' outcomes. Therefore, there is persistent need for evaluating the quality of paper-based versus EHR documentation prior to further expansion of using the EHR system at the national level.

1.1 | Aim

The aim of this study was to assess and compare the quality of nursing documentation of paper-based versus EHR in terms of content, process and structure.

1.2 | Theoretical framework

The Sweden model, known as the VIPS model (Figure 1), was used as a framework for the current study. The VIPS model is a valid model, designed to be used in nursing documentation, following the nursing process. VIPS is an abbreviation of Välbefinnande, Integritet, Prevention and Säkerhet: an acronym for the Swedish terms for well-being, integrity, prevention and safety. The components of the VIPS model align very well with the goals of the nursing process (Darmer et al., 2006) that is used for nursing documentation. It is estimated that the model has a positive effect on understanding and assessing the nursing process documentation by the application of its keywords (Ehrenberg, Ehnfors, & Thorell-Ekstrand, 1996).

The model is composed of two levels of keywords and exemplifies the content underlying each keyword. The first level corresponds to the nursing process model, along with the keywords of nursing history, nursing status, nursing diagnoses, nursing goals, nursing interventions, nursing outcome and discharge notes. The second level of keywords consists of subdivisions for nursing history, nursing status and nursing interventions as shown in Figure 1 (Ehrenberg et al., 1996).

2 | METHODS

A retrospective, descriptive, comparative design was used for this study. The study was conducted in two public hospitals in the northern part of Jordan where one hospital is using paper-based records and the other is using EHRs for documentation. The two hospitals are considered to be large in the north of Jordan. Medical and surgical wards were chosen due to the similar nature of nursing documentation. The nature of documentation in terms of the nursing process in both medical and surgical wards helped in auditing the record easily, which in turn helped to compare the same wards between the two hospitals.

2.1 | Sample

A convenient sample of patients' records was used. The sampling process involved two steps. The first step included the selection of two Ministry of Health (MOH) hospitals (one used paper-based and

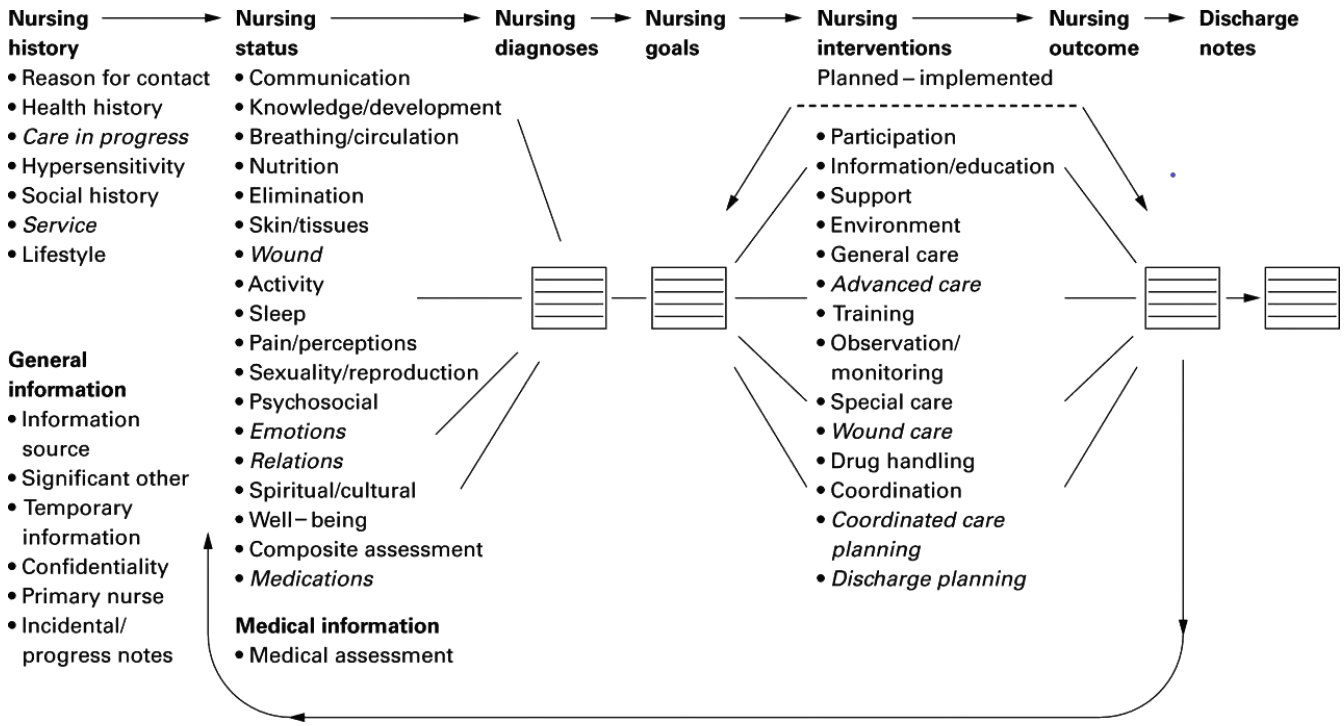

FIGURE 1 VIPS model for nursing documentation. Reprinted from nursing documentation in patients' records: experience in the use of the VIPS model, by Ehrenberg, A., Ehnfors, M. &Thorell-Ekstrand, I. (1996). *J Adv Nurs*, 24(4), 853–867

the other EHRs). The second step involved the selection of the patient's records. All electronic- and paper-based records from the medical and surgical wards of the approached hospitals, which had been saved for at least 2 months prior to data collection, were eligible to be included in the current study. A period of 2 months is a suitable period to have the patient's records ready to audit, as they can be easily audited without any interruption of the work of healthcare providers. Any records that did not meet the inclusion criteria were excluded from the auditing process. The number of records needed for auditing was determined using the guidelines of a UHBristol Clinical Audit Team (2009). The guidelines maintain that the sample size calculation takes into consideration the population size. Therefore, for a confidence level of 95%, degree of accuracy of 0.05 and expected incidence of 50%, 217 records from each of the two hospitals are required for a total of 434 patients selected conveniently.

2.2 | Instrument

The Cat-ch-Ing audit instrument developed by Bjorvell, Thorell-Ekstrand, and Wredling (2000), based on the VIPS model, was used. The Cat-ch-Ing audit instrument was designed to judge the nursing documentation quantitatively and qualitatively. The Cat-ch-Ing audit instrument consists of 17 questions: 10 reflecting the steps of the nursing process; one about VIPS keywords (Figure 1); one about the discharge note that measured the content attribute; four about data entry, nurses' signatures, the RN's name and clarification of nurses' signatures that measured the process attributes; and one is about record legibility that measured the structure attributes. The instrument items are based on a 4-point Likert-like scale from zero to three measuring quantity (3 = complete, 2 = partly, 1 = occasionally and 0 = none) and quality (3 = very good, 2 = good, 1 = less than good and 0 = poor). A manual was designed by Catrin Bjorvell to explain the scoring system of each item in the Cat-ch-Ing audit instrument (Bjorvell *et al*., 2000). The total score ranges from 0–80 points, which reflects both the quantity and the quality of the records.

The questions cover three sections related to three components of nursing documentation, which include content, process and structure. The first section is related to the process attribute that includes the presence of the following items of nursing documentation: registered nurse's (RN) name, the date of nursing documentation, RN's signature and the clarification of the RN signature. The total score is the sum of the items related to the process attribute, with a range between 0–13. Higher total score reflects better nursing documentation related to the process attribute.

The second section describes the component related to the nursing documentation content, which includes 11 items: nursing history, nursing status at arrival, nursing status updated, nursing status at discharge, nursing diagnosis, nursing intervention (planning), nursing intervention (implemented), underlying information for the nursing diagnosis described in nursing status, nursing outcome, use of VIPS keywords and nursing discharge note. Of the 11 items, the following eight items measure both the quantity and quality aspects of nursing documentation: nursing history, nursing status at arrival, nursing status update, nursing status at discharge, nursing diagnosis, nursing intervention (planning), nursing outcome and the use of VIPS keywords. The remaining three items (nursing intervention (implemented), underlying information for the nursing diagnosis described in nursing status and discharge note) measure only the quantity aspect of the documentation content. All the items related to the content aspect of nursing documentation scored on a scale from 0–3, except the discharge note item. The discharge note item, which includes the presence or absence of the nursing discharge note, has yes/no answers and a score as follows: if yes, a score of 4 was given, and if no, a score of 0 was given. The total quantity score is the sum of items related to the quantity aspect of the content component, which ranged from 0–34 points. Higher total score reflects better nursing documentation related to the quantity aspect of the content component.

On the other hand, the content component that measures the quality aspects of nursing documentation was measured using a scale ranging from 0–3. The total score of the quality aspect is the sum of items related to the quality content component, with a range from 0–24 points. A higher total score reflects a better quality of nursing documentation related to the content component.

The third section describes the structure (format) attribute related to nursing documentation, which includes only one item that measures the quality aspect of nursing documentation, concerning record legibility. This item was measured using a scale range from 0–3 (0 = poor, 1 = less good, 2 = good and 3 = very good). Higher score of record legibility reflects a better quality of the structure attribute of nursing documentation.

In the current study, the expected outcome, which is measured by both the quantity and quality aspects of the content components, was excluded from the instrument as it was not available in both forms of documentation. Also, the item related to identification of the primary nurse was modified as there is no primary nurse position in the healthcare system in Jordan; therefore, it was replaced with the registered nurse responsible for patient care. Therefore, 16 questions remained with a total score of content, process and structure, ranged from 0–74 of both quantity and quality items.

For the psychometric properties, the inter-rater reliability coefficients were found to be ranged between 0.98–0.92 (Bjorvell et al., 2000). The criterion-related validity was illustrated by a significant correlation ($r = .68$, $p \leq .0001$) between the scores items of the Cat-ch-Ing audit instrument and the Ehnfors audit instrument (Bjorvell et al., 2000). In the current study, the Cronbach's alpha was 0.67.

2.3 | Ethical considerations

Approval to conduct the study was obtained from the Institution Review Board (IRB) at the Jordan University of Science and Technology (JUST) as well as from the Ministry of Health (MOH) followed by obtaining approval from the hospital administration. The researcher was the only person with the full authority to access and audit the patients' records. Patients' names and their identification

numbers were kept confidential. In addition, the approval was obtained from the author to use the instrument.

2.4 | Procedure

Data collection was conducted between November 2015 and February 2016, and based on the hospitals' agreement to audit the records, the researcher had entry to access the record-keeping department. The researcher explained the time required to audit the records and answered the questions regarding the process of auditing, in addition to the purpose and the significance of the study. The same researcher audited both electronic- and paper-based records to minimise the risk of subjectivity bias. Generally, auditing the EHRs was easier than auditing paper-based records. Many difficulties were faced during the auditing process of paper-based records such as redundant data, blank spaces, unclear writing and use of inappropriate abbreviations. Records were selected based on the order of the ranked files from the department's archives, according to the patient's discharged date. Any records of at least 2 months of patients discharged were included in the study. The auditing process started by reading and analysing every single element of the patient's record, and then, the scoring system was calculated according to the manual of the audit instrument (Bjorvell et al., 2000). This includes admission date, nursing status (at arrival, updated and at discharge), nursing history, nursing diagnosis, nursing intervention (planning and implemented), underlying information for the nursing diagnosis described in nursing status, using VIPS keywords, nursing outcome and discharge note. Moreover, this also includes the RN's name, date entry, the RN's signature and clarification of the RN's signature.

2.5 | Data analysis

Data were analysed using Statistical Package for Social Science (SPSS), version 22, for Windows. Descriptive statistics were used according to the level of measurement to describe the study's variables. The data were checked for normality, *t* test was used if data were normally distributed, while Mann–Whitney *U* test was used to assess mean differences between paper-based and EHRs, if the data were not normally distributed.

3 | RESULTS

A total of 434 health records were audited with equal numbers of both paper-based and EHRs ($n = 217$). Of the total audited records ($N = 434$), there were 256 (59%) records from the medical wards and 178 (41%) from the surgical wards.

3.1 | Assessing and comparing the paper-based health records and EHR documentation process

There were four items in the Cat-ch-Ing audit instrument assessing the quantity aspect of the process' components of nursing documentation. The results revealed that the mean score of the items related to the documentation process of the EHRs was higher than paper-based records (Table 1).

The results revealed a mean score of 8.2 ($SD = 1.9$, range, 0–13) for the paper-based records and 12.9 ($SD = 1$, range, 0–13) for EHRs, which was statistically significant; $t\ (432) = 31.8$, $p = .000$.

3.2 | Assessing and comparing paper-based and EHR documentation structure (format)

The documentation structure in the Cat-ch-Ing audit instrument is limited to one item about record legibility, which is related to the quality aspect of nursing documentation. The scores of the records' legibility item were not normally distributed. Thus, Mann–Whitney *U* test was used to compare the mean differences in paper-based and EHRs. The results revealed a significant difference with better EHR legibility ($U = 435$, $p = .000$).

3.3 | Assessing and comparing paper-based and EHR documentation content

Measuring the total score of the documentation content in relation to the quantity aspect, the results revealed a mean score of 15.08 ($SD = 5.89$, range, 0–34) and 10.21 ($SD = 3.6$, range, 0–34) for paper-based and EHRs, respectively, which was statistically significant; $t\ (432) = 10.34$, $p = .000$. In addition, measuring the total score of the documentation content in relation to the quality aspect, the results revealed a mean score of 14.00 ($SD = 5.034$, range, 0–24) and 7.98 ($SD = 2.86$, range, 0–24) for paper-based and EHRs, respectively, and the result was statistically significant; $t\ (432) = 15.32$, $p = .000$.

Looking at the items related to the quantity aspect of documentation-related content, the results revealed statistical differences between paper-based and EHRs. The results revealed a better quantity of the nursing history ($M = 0.9$; $SD = 0.6$) of paper-based records versus EHRs ($M = 0.5$; $SD = 0.6$). Nursing diagnosis was written with better quantity using paper-based documentation ($M = 1.9$; $SD = 1.1$) compared to EHRs ($M = 0.13$; $SD = 0.59$). The planning was written with better quantity using paper-based documentation ($M = 1.1$; $SD = 0.80$) compared to EHRs ($M = 0.10$;

TABLE 1 Comparison of paper-based and electronic health records (EHRs) in terms of process attribute

Process items	Paper-based records $n = 217$ $M\ (SD)$	EHRs $n = 217$ $M\ (SD)$	t	p
Is a RN name indicated?	2.97 (1.52)	3.96 (0.38)	9.3	.000
Are all entries dated?	2.29 (0.57)	2.99 (0.20)	16.8	.000
Are all entries signed?	2.90 (0.47)	2.99 (0.20)	2.3	.004
Is there a clear signature?	0.03 (0.25)	2.97 (0.28)	113.3	.000

$p > .05$.

SD = 0.41). For implementation, paper-based was superior (*M* = 2; *SD* = 1.2) to the EHRs (*M* = 0.11; *SD* = 0.60). Writing the nursing outcome, the results revealed a better quantity of writing the nursing outcome using paper-based (*M* = 1.9; *SD* = 1.4) compared to EHRs (*M* = 0.07; *SD* = 0.45).

Looking to the audited records, in terms of the number of completed records, with regard to different items, there were differences between both records. For writing the nursing history, there was only one completed record in paper-based and electronic health-audited records. For the nursing status at discharge, 208 (95.9%) of the paper-based records were not completed compared to 169 (77.9%) EHRs. Of the EHRs, 207 (95.4%) did not include nursing diagnosis compared to 44 (20.35%) of paper-based records, and only three (1.4%) paper-based records included completed patient care planning compared to two (0.9%) of EHRs. For nursing process-related implementation, 108 (49.8%) paper-based records were completed compared to only eight (3.7%) of EHRs. For VIPS keywords content item, both records have nearly the same number of uncompleted records (Table 2).

In terms of the quality aspect of the content component, the results revealed statistical differences between audited paper-based and EHRs with better quality related to paper-based in terms of nursing history (*M* = 2.4; *SD* = 1.1) compared to EHRs (*M* = 1.5; *SD* = 1.4). Nursing status at arrival was with better quality content of paper-based records (*M* = 1.8; *SD* = 0.59) compared to EHRs (*M* = 1.6; *SD* = 0.88). On the other hand, the updated nursing status was better in the EHRs (*M* = 1.9; *SD* = 0.64) than in paper-based records (*M* = 1.7; *SD* = 0.74). For nursing diagnosis, it was written with better quality using paper-based (*M* = 1.9; *SD* = 1.1) compared to EHRs (*M* = 0.12; *SD* = 0.58). Planning was also better in paper-based (*M* = 2.1; *SD* = 1.1) compared to EHRs (*M* = 0.12; *SD* = 0.6). The nursing outcome was better using paper-based documentation (*M* = 1.9; *SD* = 1.4) compared to EHRs (*M* = 0.07; *SD* = 0.45).

Looking to the completed audited records, with regard to the nursing history, 154 (71%) paper-based records were completed compared to 86 (39.6%) EHRs. However, writing the nursing status at arrival had a poor quality of 20 (9.2%) paper-based records compared to 49 (22.6%) EHRs. Updated nursing status had a poor quality of 35 (16.1%) paper-based records compared to 19 (8.8%) in EHRs. The nursing diagnosis was of poor quality in the paper-based 49 (22.6%) versus 208 (95.9%) in EHRs. The planning had a poor-quality documentation in paper-based documentation (49 [22.6%] compared to electronic health records 208 [95.9%]). The nursing outcome had a poor quality of 75 (34.6%) paper-based records compared to poor-quality documentation of EHRs (212 [97.7%]). Finally, using VIPS keywords has poor-quality usage in both paper-based and EHRs that was 52 (24%) and 50 (23%), respectively (Table 3).

For the last item, which assessed the presence of nursing discharge note, the chi-square test was used to assess proportional differences. The results revealed there were just three (2.2%) paper-based records with nursing discharge note compared to 136 (97.8%) in the EHRs. The chi-square result revealed $\chi^2 = 187.22$, $p = .000$.

To compare the overall quality of nursing documentation of paper-based and electronic health records, the total score of process, structure and content attributes has been calculated. The results ranged between 0–54 for paper-based records; for EHRs, the score ranged between 4–59, which indicated a statistically significant difference t (434) = 3.61, $p = .000$.

4 | DISCUSSION

Nursing documentation is a major clinical source for the patient's condition, and it plays an important role in evaluating effective care delivery; therefore, it should be based on solid scientific nursing knowledge which is fundamental for the nursing profession (Noureldin et al., 2014). Improving nursing documentation is an urgent need in nursing and medical practice (Asamani et al., 2014). High-quality nursing documentation supports effective communication and cooperation among healthcare team members (Coffey et al., 2015). A well-performed nursing documentation process is of critical importance for the quality of nursing care and the development of nursing knowledge, as well as being one of the prerequisites of quality assurance in nursing care (Nguyen et al., 2014).

The present study was conducted in Jordan whereby paper-based records are the traditional method of nursing documentation. The EHRs have been established to be the method of documentation in many healthcare settings to speed up and facilitate communication of information in healthcare organisations. Since its implementation, no previous studies were conducted to assess and compare the EHR method with the traditional method, in terms of quality of nursing documentation.

The quality of nursing documentation, as indicated, has three attributes related to the content, process and structure (Wang et al., 2013). In terms of the nursing documentation process, the results of the current study revealed that the quantity of EHR documentation is better than that of paper-based records. This is not surprising, as the process' components are related to imported information in the system such as the RN's name, date of each nurse's entry and nurses' signatures with its clarification, which appears once nurses log in, using a unique password and verification code. This result was consistent with the findings of Wang et al. (2013) who found a better nursing documentation process using an electronic-based system compared to paper-based documentation.

In terms of the documentation structure, it was found that the EHRs had a better structure than the paper-based records. The quality of the structure is related to the documentation's clarity, ease of use and use of abbreviations. This result is expected as data are entered through typing, which makes it clearer. The results of the current study were consistent with those of previous studies, whereby it was found that the EHRs had a better structure than the paper-based records (Nguyen et al., 2014; Wang et al., 2013). Handwriting, using paper-based documentation, could result in pitfalls including inconsistent terminologies, incomplete records, using inappropriate abbreviation, unclear writing, illegal alteration of record

TABLE 2 Independent sample *t* test comparing the quantity content attribute between paper-based and electronic health records (EHRs)

		Paper-based records		Electronic health records			
Items	**Score**	***F* (%)**	***M* (*SD*)**	***F* (%)**	***M* (*SD*)**	***t***	***p***
Nursing history	None	50 (23)	0.9 (0.6)	115 (53)	0.5 (0.6)	7.32	.00
	Occasional	140 (64.5)		98 (45.2)			
	Partly	26 (12)		3 (1.4)			
	Complete	1 (0.5)		1 (0.5)			
Nursing status at arrival	None	20 (9.2)	2.7 (0.9)	50 (23)	2.3 (1.3)	4.07	.00
	Occasional	0 (0)		0 (0)			
	Partly	1 (0.5)		3 (1.4)			
	Complete	196 (90 3)		146 (75.6)			
Nursing status at updated	None	34 (15.7)	2.5 (1.1)	18 (8.3)	2.7 (0.8)	2.46	.01
	Occasional	2 (0.9)		0 (0)			
	Partly	2 (0.9)		4 (1.8)			
	Complete	179 (82.5)		195 (89.9)			
Nursing status at discharge	None	208 (95.9)	0.11 (0.54)	169 (77.9)	0.7 (1.2)	5.94	.00
	Occasional	0 (0)		0 (0)			
	Partly	3 (1.4)		2 (0.9)			
	Complete	6 (2.8)		46 (21.2)			
Nursing diagnosis	None	44 (20.35)	1.9 (1.1)	207 (95.4)	0.13 (0.59)	20.8	.00
	Occasional	16 (7.4)		2 (0.9)			
	Partly	58 (26.7)		8 (3.7)			
	Complete	99 (45.6)		0 (0)			
Planning	None	50 (23)	1.1 (0.80)	208 (95.9)	0.10 (0.41)	17.5	.00
	Occasional	95 (43.8)		3 (1.4)			
	Partly	69 (31.8)		4 (1.8)			
	Complete	3 (1.4)		2 (0.9)			
Implementation	None	48 (22.1)	2 (1.2)	209 (96.3)	0.11 (0.60)	20.8	.00
	Occasional	13 (6)		0 (0)			
	Partly	48 (22.1)		0 (0)			
	Complete	108 (49.8)		8 (3.7)			
Underlying information of nursing diagnosis	None	165 (76)	0.71 (1.3)	211 (97.2)	0.08 (0.49)	6.77	.00
	Occasional	0 (0)		0 (0)			
	Partly	2 (0.9)		0 (0)			
	Complete	50 (23)		6 (2.8)			
Nursing outcome	None	75 (34.6)	1.9 (1.4)	212 (97.7)	0.07 (0.45)	12.3	.00
	Occasional	0 (0)		0 (0)			
	Partly	13 (6)		0 (0)			
	Complete	129 (59.4)		5 (2.3)			
VIPS keywords used	None	52 (24)	1.1 (0.76)	50 (23)	1.1 (0.73)	0.516	.60
	Occasional	92 (42.4)		106 (48.8)			
	Partly	0 (0)		59 (27.2)			
	Complete	73 (33.6)		2 (0.9)			

content, incomplete and repeated information, as well as leaving blank notes in the wrong section and missing nurses' signatures in many nursing notes (Yu et al., 2013).

The level of completeness and legibility related to the structure's attributes of handwritten medication prescriptions were poor compared to the electronic prescription (Albarrak, Al Rashidi, Fatani, Al Ageel, & Mohammed, 2014) and that using paper-based records did not comply with the requirements of the healthcare organisation; it is often incomplete, inaccurate and lacks the nurses' signature (Yu et al., 2013). The poor structure of nursing documentation might

TABLE 3 Independent sample *t* test comparing the quality content attribute between paper-based and electronic health records (EHRs)

		Paper-based records		EHRs			
Items	**Score**	***F* (%)**	***M* (*SD*)**	***F* (%)**	***M* (*SD*)**	***t***	***p***
Nursing history	Poor	37 (17.1)	2.4 (1.1)	96 (44.2)	1.5 (1.4)	7.21	.00
	Less good	5 (2.3)		10 (4.6)			
	Good	21 (9.7)		25 (11.5)			
	Very good	154 (71)		86 (39.6)			
Nursing status at arrival	Poor	20 (9.2)	1.8 (0.59)	49 (22.6)	1.6 (0.88)	3.59	.00
	Less good	3 (1.4)		7 (3.2)			
	Good	193 (88.9)		154 (71)			
	Very good	1 (0.5)		7 (3.2)			
Nursing status at updated	Poor	35 (16.1)	1.7 (0.74)	19 (8.8)	1.9 (0.64)	2.91	.00
	Less good	4 (1.8)		6 (2.8)			
	Good	178 (82)		180 (82.9)			
	Very good	0 (0)		12 (5.5)			
Nursing status at discharge	Poor	208 (95.9)	0.08 (0.4)	170 (78.3)	0.49 (0.96)	5.79	.00
	Less good	0 (0)		0 (0)			
	Good	9 (4.1)		34 (34)			
	Very good	0 (0)		13 (6)			
Nursing diagnosis	Poor	49 (22.6)	1.9 (1.1)	208 (95.9)	0.12 (0.58)	21.6	.00
	Less good	1 (0.5)		1 (0.5)			
	Good	53 (24.4)		0 (0)			
	Very good	114 (52.5)		8 (3.7)			
Planning	Poor	49 (22.6)	2.1 (1.1)	208 (95.9)	0.12 (0.6)	21.3	.00
	Less good	1 (0.5)		9 (4.1)			
	Good	53 (24.4)		0 (0)			
	Very good	114 (52.5)		0 (0)			
Nursing outcome	Poor	75 (34.6)	1.9 (1.4)	212 (97.7)	0.07 (0.45)	18.0	.00
	Less good	0 (0)		0 (0)			
	Good	25 (11.5)		0 (0)			
	Very good	117 (53.9)		5 (2.3)			
VIPS keywords used	Poor	52 (24)	2.3 (1.3)	50 (23)	2.3 (1.3)	0.301	.76
	Less good	1 (0.5)		0 (0)			
	Good	0 (0)		0 (0)			
	Very good	164 (75.6)		167 (77)			

lead to the misinterpretation of clinical care notation, medication and treatment orders; therefore, it is considered a potential source of medical error that might affect patient safety (Bruylands, Paans, Hediger, & Müller-Staub, 2013). The findings related to paper-based documentation in this study revealed that the manual's documentation of information had increased the possibility of incomplete or missing information. Such a result might be due to a heavy workload as well as a nurse shortage.

Despite the findings of this study, which confirmed that the EHRs had a better structure than the paper-based records, many pitfalls were also revealed in using the EHRs, which is often incomplete and inaccurate. For example, while auditing the electronic patients' records in relation to the documentation structure, it was noticed that nurses used incorrect abbreviations, such as using CS for caesarean section and USA for unstable angina. It is also surprising that the system accepts the Arabic language entry in the nursing notes. The results of the current study might be due to nurses' lack of knowledge of the value of nursing documentation, coupled with the lack of follow-up on patients' records. These findings, regarding the problems of EHRs, were supported by the study conducted by Wang et al. (2013), who reported that there are many adverse consequences of using EHR as lack of certain types of electronic forms, the inability to quickly find the relevant information in certain sections of forms or charts, difficulty in generating reports and predicting trends and a lack of a built-in spell-check function. Bruylands et al. (2013) reported that this could be due to the structure of the

EHRs and how it is formatted, in terms of data entry, and whether it is highly structured or partially structured.

Accurate and complete nursing documentation that ensures high quality of records are important requirements for individuals and safe nursing practice. Insufficient nursing documentation is considered a threat for the individuality and safety of patient care, as every patient care is considered an important aspect of patients' care that needs to be documented (Ostir, Purkart, Stih, Princic, & Orel, 2012; Yu et al., 2013). Nursing documentation, which focuses on the meaning of data related to the nursing process, is the content aspect composed of two qualities regarding comprehensiveness and appropriateness of nursing documentation (Wang et al., 2014). It also reflects completeness of nursing process, which is the standard for nursing care. The use of the nursing process helps in planning a good, clear and effective care that reflects the improvement of the quality of patients' care (Zamanzadeh, Valizadeh, Tabrizi, Behshid, & Lotfi, 2015). The results of the current study revealed that paper-based records were better than EHR documentation, in relation to the content aspect of nursing documentation.

Examining the detailed items of the content-related attributes of nursing documentation had also shown other specific problems. The results of this study revealed that paper-based records were better than the electronic health records, in relation to nursing history. However, nursing history was poor in quality and quantity in both the EHRs and the paper-based documentation. This could be related to the considerable amount of time needed for data entry in nursing history, which leads to empty and incomplete records by many nurses using the EHRs, as well as the paper-based system. Again, a heavy workload and the presence of several subitems under the nursing history might also cause some confusion for many nurses especially in the EHRs. In most cases, using either paper-based or EHR documentation confirmed nurses' lack of knowledge, skills and understanding of the value of documentation of nursing history, in addition to other areas of concerns in nursing documentation.

In reference to other items of documentation-related content, the findings of the current study revealed that nurses' status at arrival and the update were reasonable to some extent in both paper-based and EHR documentations, which might be forced by the tradition of shift report for nurses. On the other hand, discharge notes were not acceptable in paper-based compared to the EHR documentation because nurses did not adhere to the policy of writing the discharge notes in patients' record. This result is consistent with that of Asamani et al. (2014) who found that a discharge note was found in every nursing record in electronic health records, while only one was found in the paper-based records. Also, the study's findings were consistent with the findings of Horwitz et al. (2013) who stated that the standard paper-based documentation is poor in writing discharge notes.

Nursing process documentation is a key component in the patients' records that reflect a nursing philosophy held by nurses in their practice. The introduction of the nursing process into the clinical settings improved nursing documentation (Bruylands et al., 2013; Xiao, Widger, Tourangeau, & Berta, 2017). The nursing process should be documented to enhance credibility and professional prospective (Lubbe & Roets, 2014). The current study revealed unfavourable results, in relation to the nursing process, for both quantity and quality aspects. It showed that the nursing process was incomplete, inaccurate or absent and did not address patients' needs with regard to the content components among nurses. Recently, Zamanzadeh et al. (2015) reported that the number of patients, number of nurses and having sufficient knowledge of the nursing process are the most important factors affecting the nursing process documentation.

Therefore, a lack of knowledge and emphasis on analytical skills of nurses could be the reasons behind poor use, application and documentation of the nursing process in this study. The findings of this study affirmed that nurses had failed to grasp the core concepts of the nursing process (nursing assessment, diagnosis, planning, implementation and evaluation). Previous studies also revealed inadequate documentation of the five steps of the nursing process (Hediger, Muller-Staub, & Petry, 2016; Wang, Yu, & Hailey, 2015; Wang et al., 2014). This is alarming to the quality and effectiveness of nursing education as well as staff development and training programmes for nurses. Poor content is a product of poor knowledge, skills and competencies of nurses, especially in translating theory into practice, which is rooted in the lack of understanding of the concept of the nursing process. Other reasons of poor content nursing process documentation might be due to the lack of follow-up by head nurses, other administrators and quality assurance departments who usually check the nursing notes by the title of the nursing sheets rather than the content of nursing documentation. In addition, the findings of the current study on the poor documentation of the nursing process might reflect the increasing nurses' workload and lack of appreciation by supervisors.

Similar issues were found in the documentation of nursing diagnosis with poorer findings of nursing diagnosis documentation using EHRs compared to paper-based records. The EHRs is provided with a structured template, containing the North American Nursing Diagnosis Association (NANDA) items that are related to the nursing diagnosis. The NANDA helps using the data to measure quality of care (Paans & Müller-Staub, 2015). It was noticed that many screens were empty, which means that they were not used by many nurses, whereby the EHR allows the screen to be closed, even if it is not completed. This is because these unexpected findings also confirm the poor education, lack of training of nurses and insufficient knowledge of the nursing process including nursing diagnosis. Previous studies revealed that educational programmes directed at improving diagnostic reasoning skills significantly increase the prevalence and accuracy of documented nursing diagnoses (Bruylands et al., 2013; Nøst, Frigstad, & André, 2017). In addition, lack of follow-up and periodic auditing of nursing documentation records from the quality department might not only initiate bad practice and poor content by nurses' documentation, but it also reflects the looseness and weakness of the quality assurance and monitoring system of the hospitals.

A standardised nursing language (SNL) is used as a tool to represent nursing knowledge, which should be periodically audited to

correct nurses' mistakes and problems regarding their documentation (Bruylands et al., 2013). Employing the SNL when implementing the EHRs can provide reliable and valid nursing data sets to be used for research purposes (Paans & Müller-Staub, 2015; Saranto et al., 2014). The results of the current study showed inadequate and inappropriate documentation and application of the five steps of the nursing process. With the application of EHR documentation, the documentation of the nursing process, in relation to the content component, was a total failure of nursing practice, in terms of quantity and quality aspects. These results were consistent with the findings of Wang et al. (2015), who reported different shortcomings of the content of the nursing care plan documentation with the introduction of the electronic health record (Wang et al., 2015). This does not mean that paper-based documentation is better than EHR documentation. Both forms of documentation presented drawbacks in practice, regarding the quantity and quality of nursing documentation.

The introduction of the EHR system caused nurses to experience a variety of feelings such as fear, anxiety, anger and technophobia (Nguyen et al., 2014; Singh & Muthuswamy, 2013). With such feelings, nurses might resist the change or apply the electronic documentation in an ineffective way. Kruse, Kristof, Jones, Mitchell, and Martinez (2016) reported that resistance to change is the main cause of using electronic documentation in an ineffective way. In addition, lack of user participation in the customisation process and readiness of nurses to use the EHRs might also contribute to the failure of nursing documentation. Bjorvell et al. (2000) reported that the perception of nurses towards documentation implies nursing documentation not only as a significant step in their daily practice but also as a crucial issue for patients' safety. Understanding the nurses' value regarding the nursing process documentation will promote the development of an appropriate educational programme for effective use and management of nursing documentation system (Okaisu, Kalikwani, Wanyana, & Coetzee, 2014). Therefore, nursing process documentation must be viewed as the guidelines for care and incorporated into clinical practice to assess and document evidence of dedication to patient care (Scruth, 2014).

The educational systems across the world and also in Jordan are to be blamed for the poor quality of nursing knowledge and skills regarding nursing documentation. Inadequate preparation of nursing students in using and managing technology in their practice might not only affect their future careers, but it also affects the nursing care outcomes and patient safety. Much more attention needs to be paid to the education of nursing documentation based on the nursing process. Education and organisational support for documentation of the nursing process helped nurses understand nursing process theory and improve clinical reasoning skills in the application of the nursing process (Müller-Staub, de Graaf-Waar, & Paans, 2016; Zamanzadeh et al., 2015). Informatics courses and capacity building programmes for effective use of technology in nursing practice are lacking in some undergraduate nursing programmes as in Jordan. Tubaishat, Aljezawi, Al-Rawajfah, Habiballah, and Akhu-Zaheya (2016) found that registered nurses thought their education in the school of nursing had failed to prepare them to employ technology in guiding their clinical practice. The gap between nursing practice and education is a global issue. Kyle and Atherton (2016) indicated the importance of bridging the gap between practice and education, to improve nursing documentation. This provides the framework for the recommendations and implications of the current study. Nursing educators and administrators should appropriately integrate the technology-related elements and applications into nursing curricula to prepare nursing students to fully use their knowledge, competencies and skills in the practice area to meet the current and future challenges of a very dynamic and interactive healthcare sector (Habibi-Koolaee, Safdari, & Bouraghi, 2015).

4.1 | Limitations

The findings of the present study were subjected to two limitations. First, the records audited from the two hospitals may not represent all hospital records, as the sample used in the current study is a convenience sample. Second, the present study is conducted in only two hospitals, one of which used paper-based documentation and the other used the electronic documentation system.

5 | CONCLUSION

The current study assesses and compares the quality of documentation of paper-based and EHRs in terms of content, process and structure. Paper-based and EHR documentation both had their drawbacks. Many problems and weaknesses of nursing documentation had surfaced in terms of content, process and structure, while using the EHR, as well as the paper-based systems. The results of this study affirmed that nurses have failed to grasp and apply the core concepts of nursing diagnosis, planning, implementation and evaluation. This is alarming to the quality and effectiveness of nursing education as well as staff development and training programmes for nurses.

Further research regarding the quality of nursing documentation and application of the nursing process in practice should be conducted prior to any further expansion of the EHR's national programmes, on a large scale. Further studies should be conducted prior to any further expansion of the EHR national programmes on a large scale, in order to identify specific factors that might influence the content and quality of nursing documentation such as nurses' competencies, knowledge and skills in documentation and application of nursing process as well as patient-to-staff ratio, nursing background and characteristics.

6 | RELEVANCE TO CLINICAL PRACTICE

Documenting the nursing process is crucial for ensuring the requirement of high-quality documentation and supporting healthcare decisions, to improve patient care and ensure patient safety. This study provides timely information to guide polices and solid decisions to

improve and identify effective strategies and actions to enhance the quality of nursing documentation of EHR and paper-based systems. It also identifies effective policies and steps to successfully implement the EHRs in hospitals and other healthcare settings at the national level. Policies and actions to ensure quality nursing documentation and full adoption of the EHRs at the national level should focus on improving nursing knowledge, competencies and practice in the nursing process, enhancing the work environment and nursing workload, as well as strengthening the capacity building of nursing practice to improve the quality of nursing care and patients' outcomes. Administrators and policy makers should assess, evaluate and monitor nursing practice in electronic- and paper-based documentation, including the nursing process and factors influencing the nursing documentation.

Bridging the gap between practice and education is important for enhancing the nursing competencies and personal qualifications to ensure that they will be ready to meet the demands of their future profession. Health informatics and nursing documentation should be considered as integral parts of the undergraduate and graduate nursing programmes. Nursing students should be well prepared on the application and use of nursing knowledge and skills, in technology and the real world of practice for effective nursing care and patients' outcomes.

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CONTRIBUTIONS

Study design: LA-Z, RA-M, SBH; data collection and analysis: LA-Z, RA-M, SBH and manuscript preparation: LA-Z, RA-M, SBH.

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