Content Validation of and Evaluation of an Electronic Nursing Process Documentation Form for Usefulness in Low Resource Nigerian Hospitals

Chinemerem ELEKE[1,2,3,*], Ada NWANERI[2], Anthonia CHINWEUBA[2,3], Joy SAMUEL[3], Chitoo OSUORAH[4]

[1]Department of Nursing Science, University of Port Harcourt, PMB 5323 Choba East/West Road, Port Harcourt, Rivers State, Nigeria
[2]Department of Nursing Sciences, University of Nigeria, Enugu Campus, PMB 400241 Achi-Akpugo Street, Enugu, Enugu State, Nigeria
[3]Department of Child Health, Africa Centre of Excellence for Public Health & Toxicological Research, University of Port Harcourt, PMB 5323 Choba East/West Road, Port Harcourt, Rivers State, Nigeria
[4]Department of Nursing Science, College of Nursing, University of Nigeria Teaching Hospital, PMB 01129 Ituku-Ozalla Road, Enugu metropolis, Enugu State, Nigeria
E-mail(s): chinemerem.eleke@uniport.edu.ng; sweetest623@gmail.com; anthonia.chinweuba@unn.edu.ng; joyrishsam@gmail.com; chitooosuorah@unth.edu.ng

* Author to whom correspondence should be addressed: Dr. Chinemerem Eleke, Department of Nursing Science, University of Port Harcourt, Choba, Nigeria. Email: chinemerem.eleke@uniport.edu.ng, choaxdance@yahoo.com

Abstract

Introduction: Paper-aided nursing documentation is cumbersome to navigate and requires large spaces for document storage. Electronic nursing process documentation solutions which are optimized to address paper-based documentation inefficiencies are limited in Nigerian hospitals. The Electronic Nursing Process Form (ENPF) is a digital nursing documentation solution designed in 2023. This study examined the content validity and evaluated the perceived usefulness of the ENPF in seven Nigerian Tertiary Hospitals. *Materials and Methods:* A multi-facility multi-method design was applied. A panel of nine (9) experts was purposively selected for the content validation process comprising five (5) professors of computer engineering and four (4) professors of nursing science. The evaluation for perceived usefulness was done by a random sample of 872 nurses who compared the ENPF to the traditional pen and paper approach after using each method for seven days. A content relevance checklist, the Perceived Usefulness Scale, and a feedback form were used for data collection. *Results*: On validation, the Agreement Index between experts (Content Validity Index) was 87.5%. The ENPF was perceived to have better usefulness than paper-aided documentation (3.46 vs. 3.03, $p < 0.001$). No significant associations were found between perceived usefulness of the ENPF and age, job experience, or academic qualification ($p > 0.05$). *Conclusion*: The ENPF had acceptable validity and perceived usefulness than paper-aided documentation. The ENPF is potentially useful in streamlining nursing documentation if deployed in low resource Nigerian Hospitals after large scale trials.

Keywords: Documentation; Electronic Process Documentation; Nursing Process; Tertiary care centres

Introduction

Nursing documentation is a record of nursing care planned and performed to patients and families by licensed professional nurses [1]. High-quality nursing documentation is now widely recognized as vital in professional nursing practice [2]. In practice, documented nursing activities serve as an indicator of nursing staff performance and the quality of nursing services provided in a hospital [3]. It also promotes effective communication of care

delivery across health institutions at the primary and higher levels of care, allowing for continuity and individualization of treatment [4]. Inaccurate nursing documentation, on the other hand, could lead to incorrect nursing care plan interpretations and ineffective patient care actions. In order to prevent inaccuracies and promote intelligibility of nursing documentation, the nursing process techniques are applied [5]. Documentation of the nursing process is therefore the cornerstone of nursing care [6]. The idea of nursing process has been accepted globally by nurses since its proposal by Lydia Hall in 1955 [7].

Previous studies and development initiatives have been conducted with the goal of decreasing the drawbacks of paper-aided nursing documentation and improving the usefulness of nursing documentation techniques. In Nigeria, Adedeji and colleagues as well as Ojewole and Samole highlighted various challenges inherent in the commonly used paper-aided documentation method [7, 8]. They include challenges with data retrieval, illegible handwritings, a lack of rapid transfer of data in emergencies, and patient data security concerns. Paper documentation made it difficult to swiftly obtain patient-specific data as clinicians may have to sift through vast amounts of paper sheets. Failing to review all relevant patient data before making a nursing decision results in delayed or inaccurate life-saving actions, wasting of health resources, and higher nursing care costs. A variety of nurses fills paper records out with varying handwriting styles, and some may be difficult to read, resulting in unnecessary investigations, delays in treatment, mistakes in the administration of medications, and death. Patient data security is another challenge with paper documentation because unauthorized personnel can easily breach data without being traced [9]. The mentioned limitations of paper-aided nursing documentation could therefore impact negatively on patient safety and quality of care provided by the nurse.

Major suggestions by several authors imply that a shift to electronic documentation will help nurses overcome the issues inherent in paper-aided documentation systems [7, 8]. Electronic documents can search and retrieve patient-specific data, utilize standard characters, and communicate data quickly [10]. Data security challenges might be addressed with electronic technology, such as encryption, hashing, tokenization, and passwords. It becomes necessary to explore how well electronic solutions can address the aforementioned issues with paper-based documentation.

Electronic-aided documentation systems for nursing services are not used in Nigerian public hospitals [11]. Work flow integration and the complexity of gathering electronic health data are the most commonly stated barriers to its deployment. In 2023, Eleke and colleagues developed an electronic nursing process documentation form (ENPF) as a solution for Nigerian hospitals and clinics [12]. The ENPF is yet to undergo clinical validation or field testing in Nigerian hospitals. The aim of our present study is to evaluate the ENPF for content validity and perceived usefulness in seven Nigerian hospitals.

Materials and Methods

Our study respected the Declaration of Helsinki and the study procedure was approved by the University of Port Harcourt Institutional Review Board (UPH/CEREMAD/REC/MM85/032). Written informed consent was obtained from the participants before data collection.

Description of the ENPF

The ENPF is a digital solution for documenting the nursing process of care. It has six forms: Admission, Nursing entry and exit survey, Assessment (based on the Gordon's Functional Health Pattern), Vital signs intake output, Nursing care plan (with Nursing Diagnoses support), and Medication form [12]. The ENPF is a non-internet-based database application configured using Microsoft Access 2007 to suggest nursing diagnoses and hold nursing care documented data.

Selection and Description of Participants

A multi-facility multi-method design was employed. From a faculty population of eight (8) professors in computer engineering department and four (4) professors in nursing science department, a panel of nine (9) experts was purposively selected for the content validation process. The panel comprised five (5) professors of computer engineering and four (4) professors of nursing science. The selection criteria for computer engineering professors were that they must be specialists of one of the following: networking, digital security, software development, programming, and data engineering. Professors of web development, hardware, and artificial intelligence were

excluded. For nursing science professors, eligibility for selection was that they must have at least two years experience as full professors.

For evaluation for perceived usefulness, a sample size of 872 was determined using the Cochran formula for finite population at 80% power, 5% precision, and 57.7% increase against non-response. The Cochran formula is mathematically expressed by Bolarinwa and colleagues [13] as:

$$n = [n - (Z_\alpha + Z_\beta)^2 \times P(1\text{-}P)] \div [(n\text{-}1) \times e^2 + (Z_\alpha + Z_\beta)^2 \times P(1\text{-}P)]$$

where n is the minimum required sample size, Z_α is a constant 1.96, Z_β is 0.84 corresponding to a power of 80%, and e is 0.05. A minimum required sample of 396 was obtained and was increased against non-response by 57.7% using the non-response formula: $n^* = [n \div (1 - attrition)]$ as noted in Bolarinwa and colleagues [13]. The n^* represents the final sample size, n represents the minimum required sample size of 369, attrition of 57.7% in decimal is 0.577. Substituting into the formula, a final sample size of 872 was calculated.

A random sample of 872 nurses was selected out of a population of 3,289 nurses in all the existing seven federal hospitals in the southeast and south-south of Nigeria. The ENPF was implemented in the seven hospitals and the selected nurses compared the traditional paper-aided approach to the ENPF after using each method for seven consecutive days. The language used in the surveys was the English Language. All the survey instruments were developed and validated for the purpose of this study except the Perceived Usefulness Scale which was designed and validated by Gao and colleagues [14].

Instrument and Measurements

The instruments for data collection were a demographic survey, content relevance checklist, a feedback form, and the Perceived Usefulness Scale designed by Gao and colleagues [10]. The demographic survey was designed by the research team to extract the participant's age, educational status, job experience, and self-rated computer proficiency. Age was stratified as: 20-29, 30-39, 40-49, 50-59, and 60-69. Educational status was stratified as: Diploma, Bachelors, Masters, and Doctorate. Job experience was stratified as: 1-9, 10-19, 20-29, and 30-39. Self-rated computer proficiency was stratified as: very poor, poor, good, and very good. The variables were measured on categorically.

The content relevance checklist was designed by the research team and comprised eight (8) items covering Technical and Professional domains. Six (6) items that related to the technical domain assessed Compatibility (can the application run on computer operating systems available in Nigeria), Reliability (can the application consistently suggest nursing diagnosis), Data security (does the application support password authorization to access data), Customization (Can the application's structure be adapted to different user and hospital needs), Data accuracy checks (can the application and prompt data entry errors), and Reporting analytics (Can the application provide ready-to-print summaries in either table or form formats). The other two (2) items which related to the professional domain assessed usability (How easily can clinical nurses learn to navigate the application) and usefulness (Can the application provide accurate and timely data to support clinical decisions). Each item was assessed on a Yes or No scale. The panel members were to check a Yes (Score 1) where the application satisfies the item and a No (Score 0) if otherwise, based on their experience with ENPF during a role play between a clinical nurse and a patient. A non-structured feedback form was used to gather recommendations from the panel of professors.

The perceived usefulness scale was adopted to measure perceived utility of the documentation system. It is a questionnaire comprising five (5) items: Using the ENPF would increase the efficiency of my daily work, the ENPF would help me care for my patients better, the ENPF will make it easier to keep track of my daily nursing tasks, the ENPF will allow me to better prioritize my care of patients, and the ENPF will be useful for nursing students. The items were measured on a 5 point Likert-type scale (strongly disagree = 1, disagree = 2, undecided = 3, agree = 4, and strongly disagree = 5; criterion mean 3.0). To evaluate the ENPF for usefulness, the participants used paper-aided approach for nursing process documentation for seven days after which they filled a perceived usefulness scale. Then, the participants were introduced to the ENPF and encouraged to use it for nursing process documentation for another seven days before filling out another perceived usefulness scale.

Data Analysis

For data analysis, feedback from the panel of professors was transcribed verbatim. The demographic data were analyzed using frequency and percentage. The agreement in responses of the professors was computed at item

level (Item Content Validity Index) and at scale level (Scale Content Validity Index). The Item Content Validity Index (I-CVI) was calculated by dividing the number of "Yes (score 1)" responses by the total number of expert responses. The Scale Content Validity Index (S-CVI) was calculated by averaging all I-CVI values in the instrument. The decision rule was as follows: Overall agreement index <0.50 = no valid agreement, 0.50-0.60 = low agreement, 0.70- 0.80 = moderate agreement, >0.80 = high agreement. The responses for each item in the Perceived Usefulness Scale were summarized using mean and standard deviation. Paired t-test was used to test for difference in perceived usefulness between ENPF and paper documentation. Chi-squared was used for test of association between demographic factors and perceived usefulness at a *p < 0.05* significance level.

Results

Content Validity

Table 1 summarized the Technical and professional content validation of the ENPF. The overall content validity of the ENPF was 0.875 (equivalent to 87.5% agreement between technical and industry experts). It scored highest in compatibility, reliability, data accuracy checks, usability, and usefulness but scored low in reporting analytics, data security, and customization.

Table 1. Technical and professional validation of the ENPF (n = 9)

Experts	Technical validation						Professional function validation	
	Compatibility	Reliability	Data security	Customization	Data accuracy checks	Reporting analytics	Usability	Usefulness
A	1	1	1	0	1	1		
B	1	1	0	1	1	0		
C	1	1	0	1	1	1		
D	1	1	1	0	1	1		
E	1	1	1	1	1	1		
F							1	1
G							1	1
H							1	1
I							1	1
IAI	1.00	1.00	0.60	0.60	1.00	0.80	1.00	1.00
						Overall Agreement index		0.875

Experts A-E were Professor level computer engineers, F-I were Professor level nurse academics, n = sample, Agreement index = average score, score = 1 if validation criteria is present, score = 0 if validation criteria is not present. IAI = item agreement index.

The assessors made some suggestions to improve the quality of the ENPF. The suggestions were on data security, customization, and Reporting/data analyses. For Data Security, one assessor expressed concerns about data security, particularly regarding the "UNDO" function on the form. She believed that it might allow data deletion and potential tampering, hence suggested making it "READ ONLY." She wrote:

"Does UNDO at the top of the form mean that the data can be deleted? If yes, then it means the data can be tampered with. So I suggest the data should be READ ONLY".

Nonetheless, it was later discovered that UNDO function key was already disabled by the developers of the ENPF.

For customization, one assessor recommended adding patient bio-data fields for "relationship with next of kin", "address/phone number of next of kin," and the option to specify the kin's occupation. She wrote:

"I am optimistic that the ENPF will increase proficiency, efficiency, and productivity in nursing practice, but It's needful that Patient's bio-data should include- 'relationship with next of kin' (wife, son, daughter, etc.), and address/phone number of next of kin (occupation, if you like too)".

Another assessor suggested that interventions should not be programmed as options into the ENPF. She wrote:

"The use of a Point of Care computer application that can suggest NANDA diagnosis without the additional internet cost is a fantastic idea but in contrast with the NANDA diagnosis option you provided, sometimes the nurse may need to provide an intervention that is not yet indexed in the NIC, to avoid the problems of documenting such an intervention, I recommend that rigid options should not be provided for nursing interventions, let the nurse type in what she wants to do".

For Reporting and Data Analysis, an assessor proposed the inclusion of a price list for nursing interventions to the ENPF. She wrote:

"I will like the addition of a cost implication to nursing actions as it will make nursing actions more visible. If there is an option of incorporating a price list for nursing interventions then that will be a great improvement."

Nurses Perceptions

Table 2 summarized the demographic characteristics of the participants. Majority of the participants were aged 40-49, had a university degree, with 10-19 years of work experience, and rated themselves as good in computer users.

Table 2. Demographic characteristics of the participants (n = 872)

Category	f	%
Age		
20-29	139	15.9
30-39	168	19.3
40-49	214	24.5
50-59	191	21.9
60-69	160	18.3
Highest educational qualification		
Diploma	293	33.6
Bachelors	296	33.9
Masters	277	31.8
Doctorate	6	0.7
Years of Nursing Experience		
1-9	293	33.6
10-19	296	33.9
20-29	277	31.8
30-39	6	0.7
Self-rated ability to use a computer		
Good	866	99.3
Very good	6	0.7

% = percent, f= frequency, SD = standard deviation, n = sample

Table 3 presented the t-test for comparison of perceived usefulness between paper and ENPF documentation. The ENPF was had higher perceived usefulness compared paper (3.46 vs. 3.03, *p < 0.001*). The ENPF scored significantly higher in all five items on perceived usefulness.

Table 3. T-test for perceived usefulness between paper and ENPF documentation (n = 872)

Statement	Paper, Mean (SD)	ENPF, Mean (SD)	t-test	p
Perceived usefulness	3.03 (1.41)	3.46 (1.12)	-12.85	<0.001
Using this method would increase the efficiency of my daily work.	2.97 (1.39)	3.51 (1.11)	-8.86	<0.001
This method would allow me care for my patients better	3.01 (1.43)	3.41 (1.11)	-6.34	<0.001
This method will make it easier to keep track of my daily nursing tasks.	3.14 (1.42)	3.45 (1.13)	-4.86	<0.001
This method will allow be to better prioritize my care of patients	3.00 (1.44)	3.46 (1.13)	-7.44	<0.001
This method would be useful for nursing students.	3.02 (1.41)	3.49 (1.14)	-7.59	<0.001

SD = Standard Deviation, p <0.05 = significant

Table 4 presented the chi square test of association between demographic variables and perceived usefulness of the ENPF. There was no significant association between perceived usefulness of ENPF and age, work experience, and academic qualification (p ≥ 0.05).

Table 4. Chi-squared test of association between demography and perceived usefulness (n = 872)

Categories	Perceived usefulness of ENPF			χ^2	p
	Fair	Moderate	High		
Age				6.92	0.545
20-29	19	82	38		
30-39	27	110	31		
40-49	37	129	48		
50-59	28	115	48		
60-69	22	108	30		
Years of Nursing Experience				5.66	0.462
1-9	49	183	61		
10-19	37	181	78		
20-29	46	176	55		
30-39	1	4	1		
Highest academic qualification				5.66	0.462
Diploma	49	183	61		
Bachelors	37	181	78		
Masters	46	176	55		
Doctorate	1	4	1		

p < 0.05 = significant, χ^2 = Chi–squared statistics

Discussion

The overall content validity of the ENPF was within acceptable level advocated by Polit and Beck [15]. The 87.5% agreement index found in this study suggested a high level of agreement among the experts regarding technical aspects and professional suitability. They rated the ENPF 60% on data security suggesting that there are areas for improvement in data security protocols. Additionally, customization was rated 60% indicating a need for more needed customization options to improve flexibility. The finding indicates that the ENPF has considerable technical and professional functionality attributes.

During validation, the panelists recommended refinement of the patient's bio-data interface to collect more data and adding a nursing service price option. Such refinements would improve the comprehensibility of the ENPF. Nonetheless, the price of nursing services is not universal so may not be an important inclusion for a prototype version of the ENPF. Customization can add and update a service pricing component. The validation process in this study is comparable with that in other studies. Zega and colleagues conducted a study to develop and validate an electronic nursing documentation form in Italy [16]. In the first step, they developed the form. In the second step, a panel of 11 expert nurses reviewed and validated the form using a rating scale questionnaire. This study and Zega and colleagues involved a validation process with a panel of assessors. Both studies involved the participation of expert nurses who have relevant experience in the field. In contrast, this study assessed the ENPF against criteria such as compatibility, reliability, data security, customization options, data accuracy checks, reporting and analytics capabilities, usability, and usefulness while Zega and colleagues focused on the completeness and accuracy of nursing diagnoses in the electronic documentation form. Due to the broader validation criteria used in this study the consensus Agreement index (87.5%) was lower than the 90% obtained in Zega and colleagues. Furthermore, the validation process in this study contrasted Mazlom and Rajabpoor who validated their software in terms of accuracy, precision of data, and arrangement of client problems [17].

The ENPF had higher perceived usefulness compared paper. The finding indicated that the ENPF was perceived to have useful attributes. The disparity in usefulness could be linked to the idea that the ENPF provides instant access to patient records and documentation, allowing nurses to retrieve information quickly when needed. Paper-based documentation may require physically searching through files, which can be time-consuming and less efficient. Moreover, the ENPF enforces standardized and systematic documentation, ensuring that all nurses follow consistent formats and guidelines and improve the ability to find information within the documentation system. The finding aligns with Lu and colleagues who reported in a study in Taiwan, that nurses rated perceived usefulness of documentation system to be higher in electronic compared to paper-based documentation [18]. The similarity in findings could be due to the electronic systems providing quick retrieval of patient records.

There was no significant association between perceived usefulness of ENPF and age, work experience, and academic qualification. The ENPF was designed with multiple features that are not dependent on the demographic characteristics of the end-user. The ENPF had encrypted password functions to ensure access to patient data by

only authorized healthcare professionals. The authorized access allows for efficient retrieval of patient information, promoting better continuity of care and decision-making. It also assisted nurses in making evidence-based decisions regarding nursing diagnosis formulation and coding. The ENPF can be operated on mobile devices with local area network and internet connection capabilities hence can undertake seamless data exchange with remote devices. The finding in this study is consistent with Samadbeik and colleagues who found no significant association between usefulness of an electronic documentation system and age and work experience among nurses at Lorestan University Teaching Hospital in Iran [19]. However, it is important to note that there is a lack of extensive research on system usefulness specifically related to nursing documentation applications. Thus, there is a need for more studies in this area to further explore the relationship between demographic factors and the perceived usefulness of electronic documentation systems in nursing healthcare settings.

The major limitation for this study is that it was conducted in a specific context (Nigerian public hospitals) which may limit the generalizability of the findings to other healthcare settings in Africa and beyond. Based on the idea that the peculiarities and nursing workflow differ across settings, the findings of this study has to be interpreted with caution. Additionally, this study is limited by purposive selection of members of the validation panel. Purposive sampling is not subject to chance. More experimental studies which will control the mentioned limitations are necessary.

Conclusions

Our study demonstrates that the ENPF has acceptable validity and perceived usefulness than paper–aided nursing process documentation. The usefulness of the ENPF is not significantly determined by age, work experience, and educational status. Nurse administrators should consider deploying electronic nursing documentation solutions such as the ENPF in low resource Nigerian hospitals to overcome the challenges of paper-aided nursing documentation systems.

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