

Information Quality in Electronic Medical Records

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Abstract

Objective: Information quality is recognized as a significant contributor to success. The information-intensive nature of healthcare requires a prudent and detailed approach to electronic medical records to maximize its utility in nursing care.

Methods: An exploratory, descriptive design was used for this study. Six groups of 10-15 direct care nurses (n=66) were asked to complete a survey on information quality. Each group discussed the quality of information contained in electronic medical records. SPSS version 22 was used to determine the most important variables in describing information quality. Descriptive statistics characterized study participants, rankings of contributing variables, and factor analysis determined the significance of variables to explain the variance. Focus group discussions were recorded, transcribed, and then thematically coded.

Results: Thirty-seven variables were included in the survey; five variables were deemed most important contributors to information quality: Accuracy, Reliability, Timeliness, Completeness, and Relevancy. Factor analysis revealed that these five factors explained 49 percent of the information quality perspectives among nurses who participated in this study. The two major themes that emerged from the discussion groups were quality of content and volume of information.

Conclusions: While information quality is a subjective measure, nurses in this study were generally agreeable to factors that contribute to quality. Recommendations to increase information quality are needed.

Keywords: *Nursing documentation; Clinical informatics; Data quality*

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Introduction

The volume and availability of information are increasing in the healthcare. Delivering quality care is a complex task that is dependent upon information in electronic medical records [1]. Information drives most business and clinical decisions in

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health care. Nurses use the information in electronic medical records to mitigate uncertainty, provide answers, and may spur the request for more information. Clinical information may propel nursing decisions regarding patient care and may promote (or not) quality clinical processes. As the intricacies of nursing care increase, the need for quality information in EMRs grows.

Nurses use electronic medical records (EMRs) to access large amounts of information; this increases the potential to induce positive change in healthcare. First, the digital platform for medical records facilitates communication. Nurses are able send and receive medical information that enables other nurses to think holistically and critically about their patients' needs. EMRs potentially overcome the information needs of providers by sharing information about patient's health status, needs, and concerns [2]. They are able to review previous treatments and patients' response to care [3]. Nurses may communicate this information to patients and caregivers in the form of education and self-care management. Secondly, the appropriate use of information from EMRs has the potential to improve quality and the efficiency of nursing care [1]. Shared information may lead to cost savings that are reflected in decreasing duplicity of diagnostic tests and other services. Thirdly, digital platforms allow critical pieces of clinical information to be consistently available to nurses at the time the decision is needed [4,5]. The increased flow of information via EMRs allows nurses to access information at the point of care [6,7].

In an electronic format, the source and quality of information vary [1]. This may lead to an increased risk for liability by producing an abundance of errors or incomplete records. Prior studies suggest that most nurses are satisfied with the quality of information they received. However, they admit that the information needs are broad and data entry requires a lot of effort. A study by Verkeke et al. [2] found that 45 percent of nurses perceived that the EMR contains all the information they need and 40 percent reported that the information was precise. Tse and You [8-11] suggested that inaccuracies exist in computerized patient records. Their results found that demographic data was 94 percent accurate, allergy information was 61 percent inaccurate, and medication information was 51 percent inaccurate [12]. One in five patient records was found to have inaccuracies in the historical information. The study found that a medication list was not present in 20 percent of the notes and there was no significant association between the subjective note and the treating diagnosis [13].

Information quality is a concern in healthcare, not only because life and death decisions are made, but also the volume and velocity of information are increasing with cascading effects [14]. Information in EMRs helps nurses coordinate care, reduce errors, and promote efficacious treatments. Information quality is a multidimensional concept that is difficult to measure yet it is recognized as a significant contributor to success [15,16]. On very basic levels, for information to be valuable and meaningful, information must be of good quality [17]. A paucity of research has applied quality factors to electronic medical records information. In this study, we will explore information quality from the nurses' perspective and garner their thoughts on the current status of EMR information quality. We will also make recommendations to support information quality in EMRs.

Methods

An exploratory, descriptive design was used to gain nursing perspectives on information quality. Since information quality is a user-defined output measure, direct care nurses were solicited from local inpatient care facilities and local nursing practice associations. Six groups of 10-15 participants (n=66) were asked to complete a survey that included five demographic questions and the rank order survey proposed by Bailey and Pearson [15]. Secondly, they discussed their perspective of information quality in electronic medical records. Ethical approval was obtained by the Institutional Review Board in June

2015; informed consents were obtained by participants.

Bailey and Pearson [15] proposed a 37-item survey for measuring user satisfaction of information quality. It is an economical instrument that could be completed independently in 10 to 15 minutes. User satisfaction is defined within a domain of factors (constructs) as proposed by Bailey and Pearson [15,16]. Participants were asked to rank the variables in order of personal importance from 1 (most important) to 37 (least important) in regards to the information in electronic medical records. Survey results were then imported into SPSS version 22 for analysis. Descriptive statistics were completed using SPSS version 22 to characterize the nurses who participated in the study. Descriptive statistics were also used to describe the frequency in which nurses prioritized the most to least important variables. Factor analysis was performed to determine the degree to which the most important variables contributed to information quality. A semi-structured interview form facilitated explaining the study, obtaining informed consent, and discussing information quality. The focus groups responses were audio recorded, transcribed, and then coded by themes.

Results

A letter of invitation was randomly sent to 128 nurses across various local nursing associations and inpatient facilities using convenience sampling; 92 (72 percent) started the surveys and 66 (51 percent) completed the survey. Surveys with more than 20 percent missing were not included in the reporting of results; 21 surveys were excluded from the study due to not being direct care providers, not in inpatient care, or did not complete the survey adequately. Demographic characteristics of the participants are included in Table 1.

Gender	N (Percentage)
Males	14(21%)
Females	52(79%)
Age	Percentage
<25 years	3(4.5%)
25-35	22(33.3%)
36-45	19(28.8%)
46-55	20(30.3%)
>56	1(1.5%)
No Answer	1(1.5%)
Education	Percentage
Nursing Diploma	13(21.1%)
B.S. Nursing	22(33.3%)
M.S. Nursing	18(27.3%)
Other	7(10.6%)
No Answer	5(7.6%)
Nursing Experience	Percentage
< 2 years	3(4.5%)
3-7 years	20(30.3%)
8-12 years	25(37.9%)
13-17 years	2(3.0%)
>18 years	13(19.7%)
No Answer	3 (4.5%)
Computer Skills	Percentage
Poor	1(1.5%)
Fair	3(4.5%)
Good	12(18.2%)
Very Good	14(21.2%)
Excellent	36(54.5%)

Table 1: Descriptive Summary of Participants.

Rankings Variable

The data were first analyzed by the mean ranking responses of each variable (Figure 1). Variables that were closest to one were deemed most important. The mean rankings indicate the average that nurses perceived the variable to be important. The mode indicates the most common number assigned to a variable. Accuracy was deemed most important as indicated by the mean and mode of which nurses ranked the accuracy variable. Most of the nurses ranked accuracy as most important (#1) with a mean ranking of four. Accuracy was followed by reliability, timeliness, completeness, and relevancy (most to least important). The variables are defined as seen in Table 2. Factor analysis, using principal component analysis, revealed that these variables made a sizeable contribution to the characterization of information quality in EMRs (49 percent).

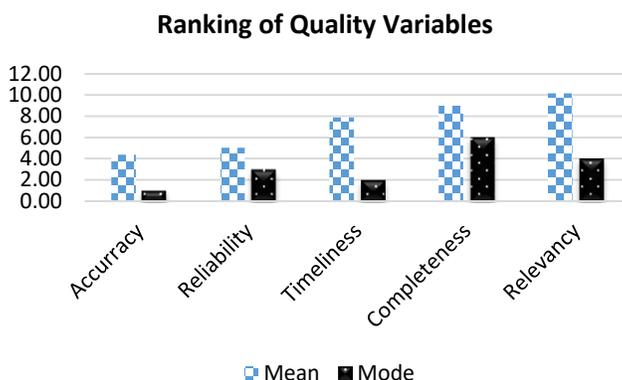


Figure 1: Results of Ranking Survey.

Factor	Definition
Accuracy	The correctness of the information
Reliability	The consistency and the dependability of the information
Timeliness	The availability of the output information at a time suitable for its use
Completeness	The comprehensiveness of the output information content
Relevancy	The degree of congruence between what the user wants or requires and what is provided by the information

Table 2: Definition of Variables.

After completing the rank order survey, participants were asked to share their experiences on the quality of information in the EMRs. The data were analyzed by transcribing the responses of each participant and then categorized by major themes that emerged from the discussions. Some participants commented on why the quality of information was important. For example, one nurse’s stated that “Quality of information is important; we need to care for our patients, especially patient orders. It’s a safety issue”. Other related comments, “It contains a wealth of information. The lab work is there and you can go back to it. You can see the vital signs it is already there.” “We can really use the history, instead of searching for the other nurses. The information is readily there. When we give medication, it is there and allergies information is already there.” Another theme was the volume of information, “You can pull information from the computer and your entire unit instead of having to manually pull a whole report”. While the comments were positive, some noted that “value of information is steadily growing, it’s just not there yet”; “finding information in the EMR is not easy”.

Discussions

The study results are similar to information quality perspectives seen in general management information systems research. Earlier studies in information systems research have characterized information quality as accuracy, output timeliness, reliability, completeness, relevance, precise, and currency [16-19]. The value of this information in nursing care cannot be understated. Critical to the provision of care is the use of valid information in the EMR. The promulgation of meaningful use criteria suggests that information quality be ascertained and maintained in EMRs. The nurses in this study affirm the need for information quality in EMRs and highlight the factors that contribute to information quality. Nursing practice involves collecting, synthesizing and acting upon information to affect patient care. The information contained in EMRs must be accurate and consistently dependable (reliable), otherwise reports about medical and medication errors and patient safety will continue to be problematic [20]. While the primary work of nurses is to deliver quality care, the driver for such care is information; it must be available to the nurses at the time the information is needed (timeliness) and have maximal utility (complete and relevant); partial information or information that does not assist the nurses in clinical care has little utility in progressing patient care.

Information quality factors are output factors that are largely determined by data entry [21]. Consequently, this falls on the nurses to enter the information. In order to fulfill the information needs and to meet the information quality requirements, nurses have to keep the records up-to-date, enter information without making mistakes, and enter the patient information in a consistent manner. The quality of information fundamentally depends on the quality and integrity of information entered [3, 21]. Nurses constitute a large portion of direct patient care professionals who contribute information to the EMR. A balanced approach that considers technology and human requirements are needed to support data entry and optimize the benefit of information to patient care personnel. This will require combined efforts from health information managers, nurses, vendors, and healthcare decision makers.

First of all, open communication with nurses and health information management (HIM) teams is critical. While nurses have an understanding of the subject matter, HIM professionals may have a better understanding of where to input and extract data and overall structural layout and technical requirements of the EMR system. HIM teams can help nurses overcome deficits in knowledge concerning EMR configuration and how it impacts accuracy and completion.

Secondly, a structured EMR could alleviate the amount of information that nurses may filter through to find needed information. Collaborations with EMR vendors could increase the EMR structure with logical linkages of data for data entry and retrieval [21]. The design process of EMR should facilitate job performance and usability.

Thirdly, administrators should consider and support time constraints that nurse have in clinical documentation. Nursing documentation is an integral part of patient care, and an environment should be fostered that creates time for documentation. In the current nursing climate, we realize the difficulty. However, without time for documentation, this portion of nursing care could be seen as a separate process. As technology advances via natural language processing methods, the timing of nursing documentation may allow for synchronous documentation at the point of care.

As clinical information systems are being developed and deployed into health care, organizations should evaluate these tools for their contribution to the overall patient care and economic feasibility. Future research should examine EMR information quality into other healthcare settings and other healthcare professionals such as medical doctors and allied health

professionals. The collaborative nature of healthcare, particularly in complex care, suggests that the impact of information quality can have significant ripple effects. The interdisciplinary nature of health care suggests that a team approach is considered in information quality. Future research should consider examining information quality across disciplines and organizations for a more comprehensive perspective of EMR quality.

Limitations

The results of the study should be considered in light of study limitations. While the Bailey and Pearson instrument is widely used in information quality assessments, rank order surveys tell of the relative position of the factors in interest, but there is little indication of how much one construct was preferred over the other. The results are limited to inpatient acute settings and may have little implications for outpatient settings. The nurses in this study self-reported higher education and computer literacy skills that may not be reflective of the general nurse population.

Conclusion

The amount and velocity of information require the healthcare field to optimize the use of data. However, as technology continues to advance, it is critical the field prudently considers the information quality among front-line users of EMRs. Nursing perception of information quality and its utility is critical to enhancing their abilities as direct care providers.

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